FINAL REPORT

2013 INDONESIA UMBRELLA PERSUAP

(PESTICIDE EVALUATION REPORT AND SAFER USE ACTION PLAN)

November 2013

This publication was prepared by Weidemann Associates, Inc., a Crown Agents, USA company, for USAID/Indonesia.

FINAL REPORT

INDONESIA PERSUAP

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Submitted to:
USAID/Indonesia

Requisition/Reference No.:
REQ-497-13-000001

November 2013

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ACRONYMS

ABSP II	Agriculture Biotech Support Project II
ADB	Asian Development Bank
ADG	Agriculture Diversification and Growth
AI	Active Ingredient (pesticide reference)
AMARTA II	Agribusiness Market and Support Activity II
AOR	Agreement Officer's Representative (USAID)
BEO	Bureau Environmental Officer
BMP	Best Management Practice
BT	*Bacillus thuringiensis* (a bacteria that produces a toxin used as a pesticide)
CCD	Colony Collapse Disorder
CFR	Code of Federal Regulations
CLI	CropLife International (Private Sector Pesticide Companies Trade Association)
COP	Chief of Party
COR	Contracting Officer's Representative (USAID)
CRSP	Collaborative Research Support Program
DGP	Development Grant Program (Cocoa Added Value Chain and Cottage Industry in Central Sulawesi)
DS	Powders for dry seed treatment (pesticide formulation)
EA	Environmental Assessment
EC	Emulsifiable Concentrate (pesticide formulation)
EC50	Effective Concentration 50 (acute toxicity measure)
EG	Economic Growth
EPA	US Environmental Protection Agency (also known as USEPA)
ETOA	Environmental Threats and Opportunities Analysis
EU	European Union
EurepGAP	European Good Agriculture Practices
FAO	Food and Agriculture Organization (United Nations agency)
FDA	Food and Drug Administration (US)
FIELD	Farmers' Initiatives for Ecological Livelihoods and Democracy
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act
FRAC	Fungicide Resistance Action Committee
FS	Flowable concentrate for Seed treatment (pesticide formulation)
GAP	Good Agriculture Practice
GlobalGAP	Global Good Agriculture Practices, a certification system
GMO	Genetically Modified Organism
GOI	Government of Indonesia
GUP	General Use Pesticide
Ha	Hectares
HPAI	Highly Pathogenic Avian Influenza
HRAC	Herbicide Resistance Action Committee
HT	Highly Toxic
ICBDA	Indonesia Cooperative Business Development Alliance
ID	Identification
IEE	Initial Environmental Examination
IGR	Insect Growth Regulator
IPM	Integrated Pest Management
IR	Intermediate Result
IRAC	Insecticide Resistance Action Committee

IUWASH	Indonesia Urban Water, Sanitation and Hygiene
JICA	Japan International Cooperation Agency
LC50	Lethal Concentration 50 (acute toxicity measure)
LD50	Lethal Dose 50 (acute toxicity measure)
LGB	Larger Grain Borer
MOA	Ministry of Agriculture
M&E	Monitoring and Evaluation
MD	Micro Dispersion (pesticide formulation)
MEO	Mission Environmental Officer
MRL	Maximum/Minimum Residue Level/Limit
MSDS	Material Safety Data Sheet
MSL	Meters above Sea Level
MT	Metric Tons
MT	Moderately Toxic
NAT	Not Acutely Toxic
NCAT	National Center for Appropriate Technology
NEPA	US National Environmental Policy Act
NIFA	National Institute of Food and Agriculture
PAN	Pesticide Action Network
PEA	Programmatic Environmental Assessment
PER	Pesticide Evaluation Report
PERSUAP	Pesticide Evaluation Report and Safe Use Action Plan
pH	log of Hydrogen concentration, measure of acidity
PHI	Pre-Harvest Interval
PIC	Prior Informed Consent (a treaty, relates to toxic pesticides)
POPs	Persistent Organic Pollutants (a treaty, relates to toxic persistent pesticides)
PMP	Pest Management Plan
PNT	Practically Non-Toxic
PPE	Personal Protection Equipment
R&D toxin	Reproductive and Developmental toxin
REA	Regional Environmental Advisor
Reg 216	Regulation 216 (USAID Environmental Procedures)
REI	Re-Entry Interval (safety period after pesticide spraying)
RUP	Restricted Use Pesticide
S&C	Standards and Certification
SAINS	Sayogyo Institute
SC	Suspension Concentrate (pesticide formulation)
SOW	Scope of Work
ST	Slightly Toxic
SUAP	Safe Use Action Plan
UC	University of California
UN	United Nations
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
USEPA	US Environmental Protection Agency (also known as EPA)
VHT	Very Highly Toxic
WHO	World Health Organization
WP	Wettable Powder (pesticide formulation)
WS	Water dispersible powder for Slurry treatment (pesticide formulation)

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ACKNOWLEDGEMENTS

This PERUAP team of Local Consultant Dini Rahim and International Consultant Alan Schroeder would like to warmly acknowledge the assistance of USAID/Indonesia staff member Donald Tambunan for guidance, advice and presence with the team in the field. USAID Asia Bureau Regional Environmental Advisor and Bureau Environmental Officer, who will also review the draft document and provide valuable comments, are also acknowledged.

Other individuals and institutions—too numerous to list—availed themselves for interviews and contributed to the accuracy and completeness of this study. They are listed in Annex 13 to this document.

EXECUTIVE SUMMARY

Introduction

22 CFR 216, or USAID's Regulation 216, in section 216.3 (b)(1)(i), asserts "When a project includes assistance for procurement or use, or both, of pesticides registered for the same or similar uses by USEPA without restriction, the Initial Environmental Examination [IEE] for the project shall include a separate section evaluating the economic, social and environmental risks and benefits of the planned pesticide use to determine whether the use may result in significant environmental impact." That 'separate section' referred to above has evolved into a tool named a PERSUAP (Pesticide Evaluation Report and Safer Use Action Plan).

The main purpose of a Pesticide Evaluation Report (PER) and Safe Use and Action Plan (SUAP) is to bring USAID-funded projects into compliance with USAID's environmental regulations (Title 22 of the Code of Federal Regulations (CFR), part 216, or Regulation 216) on pesticide use. Beyond compliance, this document offers best practices and helps ensure that the USAID-funded projects reduce the chances of environmental and health impacts due to pesticide training, promotion or use. USAID projects desiring to promote or use pesticides rejected by this PERSUAP analysis will need to perform an Environmental Assessment (EA) on those chemicals and their use.

Background

To achieve their objectives, USAID projects in Indonesia may need to support the use of pesticides, as part of an Integrated Pest Management (IPM) approach. IEEs have been produced that recommend the production of this PERSUAP study in order to analyze such pesticide use, within the Indonesia pesticide system. This is the first Programmatic or Umbrella PERSUAP produced for USAID Indonesia.

Purpose

In compliance with USAID's Pesticide Procedures (22 CFR 216.3(b)), this 2013 Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP) for the USAID/Indonesia Agriculture and Health/Water/Sanitation Portfolios:

- **Establishes the subset of pesticides (of those registered by Indonesia) for which support is authorized** on USAID/Indonesia programs, projects and activities.

- **Establishes requirements attendant to support for these pesticides to** assure that pesticide use/support (1) embodies the principles of safer pesticide use and, (2) per USAID policy, is within an Integrated Pest Management (IPM) framework.

These requirements come into effect upon approval of the PERSUAP.

Scope

Specifically, the following sectors and projects are covered by this PERSUAP:

Under Agriculture (now Environment):

- Agribusiness Market and Support Activity (AMARTA II)

- Integrated Pest Management Collaborative Research Support Program (IPM CRSP)
- Indonesia Cooperative Business Development Alliance (ICBDA)
- Cocoa Added Value Chain and Cottage Industry in Central Sulawesi, Development Grant Program (DGP-Agriculture)
- Development Credit Authority with Bank Andara.
- Development Credit Authority with Bank Danamon.

Under Environment:

- Indonesia Urban Water, Sanitation and Hygiene Program (IUWASH).

Under Health:

- Highly Pathogenic Avian Influenza (HPAI) Program

Legal and Regulatory Standing

In 2008, a PERSUAP was drafted to address the activities of USAID's IPM Collaborative Research Support Project (CRSP) South-East Asia projects in the Philippines and Indonesia at that time. That document is now long out of date. This 2013 Indonesia Umbrella PERSUAP replaces this document, and responds to the Conditions that request such a PERSUAP in current USAID Indonesia IEEs, as follow:

<u>Agriculture (now Environment)</u>

- Activities initially covered under the IEE for the Agricultural Development and Growth Program as approved on June 25, 2010:
    - Agribusiness Market and Support Activity (AMARTA II)
    - Integrated Pest Management Collaborative Research Support Program (IPMCRSP)
    - Indonesia Cooperative Business Development Alliance (ICBDA)
- Cocoa Added Value Chain and Cottage Industry in Central Sulawesi, Development Grant Program (DGP-Agriculture), IEE approved on October 1, 2010 (reference Asia 11-02)
- Development Credit Authority with Bank Andara. IEE approved January 19, 2011
- Development Credit Authority with Bank Danamon. IEE approved March 20, 2012

<u>Environment</u>

- Indonesia Urban Water, Sanitation and Hygiene Program (IUWASH). IEE approved May 20, 2009 (reference: Asia 09-86) and IEE Amendment#1 approved on June 8, 2012 (reference: Asia 12-113)

<u>Health</u>

- Highly Pathogenic Avian Influenza (HPAI) Program

All IEEs recommended a Negative Determination (meaning that a full Environmental Assessment—EA has not been recommended to be done) with Conditions for any pesticide use. In addition to USAID's regulatory obligations, Indonesia's environmental regulations must be understood and adhered to by all USAID projects.

Pesticide Definition by EPA

For the purposes of this PERSUAP, the word *pesticide* is used, following EPA's guidelines[1], for the following: fumigants, insecticides, miticides/acaricides, nematicides, molluscicides, fungicides, antimicrobials, bactericides/biocides, microbicides/antibiotics, herbicides, rodenticides, avicides, algicides, ovicides (kill eggs), disinfectants/sanitizers and anti-fouling agents (chemicals that repel or kill things like barnacles that attach to boats). Even biological agents such as biopesticides, microbial pesticides, attractants/pheromones, repellents, defoliants, dessicants and insect growth regulators are included as pesticides.

Support for Pesticide "Use"

Pesticide "use" by any USAID Indonesia project was defined and agreed upon at the outset of this PERSUAP study as including:

- Promotion during project training,
- Use on project demonstration farms,
- Procurement directly by project for beneficiaries or spray services, or
- Subsidization or financing by the project through sub-grantees or credit agreements.

Pesticides *rejected* by this PERSUAP analysis cannot be 'used' for any of the above project activities, unless an Environmental Assessment (EA) is performed. That said, USAID's manageable interests cannot include control of the procurement—by beneficiaries with their own resources—and use by beneficiaries of pesticides on their own farms (unless they are project demonstration farms), although USAID projects can and should make recommendations for the purchase and use of safer alternatives.

Farmer Phase-Out of Rejected Pesticides Over Life of Projects

Over the life of the projects, participating farmers should be encouraged to choose newer, safer pesticides to replace some of the older and higher risk products rejected by this PERSUAP.

Modern Agriculture, Quality Control Standards and Market Access

USAID projects that aim to help beneficiaries capture pieces of quality foreign markets by use of volunteer Standards and Certification (S&C) systems, like GlobalGAP, Organic, Fair Trade, or Scientific Certification Society (SCS) that audits and certifies coffee in Indonesia could limit the pesticides permitted on participant farms, in order to meet those standards as a group or cooperative. And, these S&C systems, primarily GlobalGAP, provide quality farm standards, or "Good Housekeeping for the Farm", that should be adopted by USAID projects without other S&C systems.

Pesticides Requested or Desired or Available for use by USAID Indonesia Projects

This 2013 PERSUAP first evaluates the pesticides requested or desired or available for 'use' by staff and beneficiaries of the USAID-supported projects. Then it evaluates other pesticides registered and found available in Indonesia so that decisions can be made when choosing, or avoiding, alternatives. Finally, it evaluates pesticides that potential project beneficiary farmers currently desire and use so that recommendations can be made for safer alternatives as higher risk products are phased out.

[1] http://www.epa.gov/pesticides/about/types.htm

Findings: Allowed and Rejected Pesticides

Upon approval of this Umbrella PERSUAP, the pesticide active ingredients (AIs) listed as "allowed" in the tables that follow—and ONLY those AIs—may be supported by the USAID/Indonesia projects covered by this PERSUAP. Such support is subject to the safer use conditions summarized below and set out in detail in the SUAP, section 4 of this PERSUAP.

For reference, the tables below also set out all AIs considered but rejected, along with the reasons for the rejection. Allowed pesticides are those that passed the 12-factor analyses, particularly Factor A (EPA & Indonesia Registration and EPA RUP Status) & Factor E (Acute/Chronic Toxicological Hazards), as analyzed and summarized in Annex 7.

Synthesizing across the PER analysis, ONLY the below-listed pesticides (active ingredients) on the left side of this page are permitted for use/support in USAID/Indonesia Sustainable Economic Growth projects. For reference, AIs considered, but REJECTED are also listed. The pesticide AIs on the right side of this page have been rejected by this PERSUAP.

Allowed Fumigant AIs **(with strict conditions)**

- aluminum phosphide for stored grains (for use only by trained and certified applicators, not farmers; see Fumigation PEA)
- metam sodium for soil pests, diseases and weed seeds (for use only by trained and certified applicators, not farmers; see Fumigation PEA)

Allowed Miticide AIs registered by Indonesia MOA

- abamectin/avermectin (use only formulations below 1.9%)
- amitraz

Rejected Miticide AIs registered by Indonesia MOA and considered but **Rejected for "Use" by USAID Projects**

- tetradifon (not EPA registered)

Allowed Insecticide AIs registered by Indonesia MOA

- abamectin/avermectin (use only formulations below 1.9%)
- acetamiprid (but only when plants are in vegetative state, not when flowering due to risk to pollinators and honeybee colony collapse disorder)
- *Bacillus thuringiensis*-BT
- *Beauveria bassiana*
- dichlorvos/DDVP (use only acute

Rejected Insecticide AIs registered by Indonesia MOA and considered but **Rejected for "Use" by USAID Projects**

- acrinathrin (not EPA registered)
- alpha-cypermethrin (not EPA registered)
- benthiocarb (not EPA registered)
- carbofuran (RUP, Class I)
- cartap hydrochloride (not EPA registered)
- chlorfenvinphos (not EPA registered)
- endosulfan (being phased out as banned under POPs Treaty)

toxicity Class II and III products; not Class I)
- chlorpyrifos-ethyl (for uses except spraying for household pests, favor the use of granular formulations for soil pests)
- cyfluthrin (use only acute toxicity Class III products; not Class II)
- cypermethrin (registered USA for medical, veterinary and household use)
- cyromazine (for use only in areas without high water table and sandy soil)
- deltamethrin
- dimethoate
- ethofenprox
- fenitrothion
- fipronil (registered USA for use against termites, ticks, mites, fleas, ants, roaches and mole crickets)
- imidacloprid (but only when plants are in vegetative state, not when flowering due to risk to pollinators and honeybee colony collapse disorder)
- lambda cyhalothrin (use only formulations 10% and below)
- lufenuron
- malathion
- methomyl (use only acute toxicity Class II and III products; not Class I)
- permethrin
- pyrimiphos-methyl
- propoxur pyrethrins (Marigold extract)
- spinosad
- thiamethoxam (but only when plants are in vegetative state, not when flowering due to risk to pollinators and honeybee colony collapse disorder)
- fenamiphos (not EPA registered)
- methamidophos (not EPA registered)
- monocrotophos (not EPA registered)
- profenofos (RUP)
- terbufos (RUP, Class I)
- triflumeron (not EPA registered)

Allowed Fungicide AIs registered by Indonesia MOA

- boscalid (nicobifen)

Fungicide AIs registered by Indonesia MOA and considered but **Rejected for "Use" by USAID Projects**

- alkyldimethylbenzyl ammonium

- carbendazim
- chlorothalonil
- copper ammonium complex (acetate, carbonate)
- copper hydroxide
- copper (cuprous) oxide
- copper oxychloride
- copper sulfate
- cymoxanil
- difenoconazole
- famoxadone
- fenamidone
- folpet
- fosetyl aluminum
- kresoxim-methyl
- mancozeb/maneb-zinc
- metalaxyl
- phosphorous acid
- propamocarb HCl
- propiconazole
- pyraclostrobin
- sodium metabisulfite
- tebuconazole
- thiram
- triadimefon
- triadimenol
- *Trichoderma species*

Allowed Herbicide AIs registered by Indonesia MOA

- 2 4 DB acid
- 2 4 D isooctyl ester
- ametryne
- bentazon
- bromoxynil
- clethodim
- clomazone
- dacthal/DCPA (for use only in areas without high water table and sandy soil)
- diuron (for use only in areas without high water table and sandy soil)
- fluazifop-p-butyl
- fluometuron

chloride (not EPA registered)

- benomyl/benalate (not EPA registered)
- dichlorophen (not EPA registered)
- epoxiconazole (not EPA registered)
- flusilazole (not EPA registered)
- flutriafol (not EPA registered)
- penconazole (not EPA registered)
- iprovalicarb (not EPA registered)
- propineb (not EPA registered)

Rejected Herbicide AIs registered by Indonesia MOA and considered but **Rejected for "Use" by USAID Projects**

- acetochlor (RUP)
- atrazine (RUP)
- chlorimuron (ethyl) (not EPA registered)
- cyanazine (not EPA registered)
- paraquat (RUP)
- propaquizafop (not EPA registered)
- sulcotrione (not EPA registered)

- fomesafen (use only acute toxicity Class II and III products; not Class I)
- glyphosate
- halosulfuron (methyl)
- hydramethylnon
- imazethapyr
- linuron
- MCPA
- mepiquat chloride
- mesotrione
-
- metolachlor/S-metolochlor (for use only in areas without high water table and sandy soil)
- metribuzin
- metsulfuron-methyl
- nicosulfuron
- nicosulfuron (methyl)
- oxyfluorfen
- pendimethalin
- prometryn
- propachlor (continued use without PPE could increase cancer risk)
- propanil
- pyrothiobac-sodium
- quizalofop-p-tefuryl
- terbuthylazine
- thiobencarb(e)/benthiocarb
- trifluralin

Allowed Rodenticide AIs registered by Indonesia MOA

- bromadiolone
- difethialone
- zinc phosphide (only in concentrations of 2% and lower, which are EPA acute toxicity Class III)

Rejected Rodenticide AIs registered by Indonesia MOA and considered but **Rejected for "Use" by USAID Projects**

- coumatetralyl (not EPA registered)

Allowed Nematicide AIs registered by Indonesia MOA

- *Paecilomyces lilacinus* Strain 251 (attacks nematode eggs)

Rejected Nematicide AIs registered by Indonesia MOA and considered but **Rejected for "Use" by USAID Projects**

- fenamiphos (not EPA registered)
- oxamyl (RUP, Class I)

- terbufos (RUP, Class I)

Allowed Molluscicide AIs registered by Indonesia MOA

- iron phosphate
- metaldehyde

Rejected Molluscicide AIs registered by Indonesia MOA and considered but **Rejected for "Use" by USAID Projects**

NONE

Allowed Microbicide AIs registered by Indonesia MOA

- bromine
- chlorine dioxide
- copper (do careful calibration; overuse of copper increases toxicity in soil, and is toxic)
- copper ammonium complex (do careful calibration; overuse of copper increases toxicity in soil, and is toxic)
- didecyldimethyl ammonium chloride
- hydrogen peroxide
- iodine
- phenol
- sodium hypochlorite (corrosive, use with gloves, goggles, carbon-filter respirator and protective clothes)

Rejected Microbicide AI registered by Indonesia MOA and considered but **Rejected for "Use" by USAID Projects**

- alkyldimethylbenzyl ammonium chloride (not EPA registered)
- bromine chloride (Class I)
- formaldehyde (known carcinogen)
- quaternary ammonium (not EPA registered)
- sulfuric acid (RUP, Class I—too toxic)

Allowed Bird Repellant AI registered by Indonesia MOA

- methyl-anthraniliate

Allowed (when registered) **Nitrogen-Fixing Organism** AIs **proposed for registration** by Indonesia MOA

- *Rhizobium leguminosarum*
- *Bradyrhizobium japonica*

Allowed Wood Preservative Pesticide AIs registered by Indonesia MOA

Rejected Wood Preservative Pesticide AIs registered by Indonesia MOA and considered

but **Rejected for "Use" by USAID Projects**

- fipronil

- chlorpyrifos-ethyl (no longer registered for this use by EPA)
- creosote (RUP)

Results of Pesticide Evaluation Report (PER) 12-Factor Analyses

<u>Factor A</u> (EPA & Indonesia Registration and RUP Status) &
<u>Factor E</u> (Acute/Chronic Toxicological Hazards)

The primary outcomes of Factor A & E analyses are the allowed AIs listed above in the left column. A key point from this analysis is that **<u>several dangerous chemicals that should be banned or restricted are still encountered in Indonesia.</u>** These include the pesticide AIs:

- endosulfan (banned internationally on the Persistent Organic Pollutants, or POPs list in 2011),
- insecticides containing carbofuran (Class I), methamidophos, (PIC list, Class I);
- herbicides containing known water pollutants alachlor and atrazine, as well as highly-toxic paraquat.

Pesticides containing endosulfan, methamidophos, and paraquat were found in small agrodealer shops, and small-scale farmers should be encouraged by USAID projects to not use them. Several safer alternatives to these older types of chemicals now exist. For loans through MFIs, MEO and Agriculture Officer visits, bank/MFI reports and service provider reports will be required to ensure that no PERSUAP non-approved pesticides are financed nor utilized by loans guaranteed by USAID. In addition, MFIs should be mandated to certify in writing that PERSUAP non-approved pesticides will not be purchased or used with loan money.

<u>Factor B</u> (Pesticide Selection Basis): Farmers Select Pesticides by Agrodealer Advice and Cost

Most Indonesia farmers use relatively high quantities of pesticides. Those that do use pesticides often do so based upon the advice of agrodealers or neighbors. And, they will often select the lowest cost pesticides, which is not ideal as many of the low-cost generic products, particularly from China and India, are also of low quality.

Just the fact that a few farmers will already value or buy and use pesticides, even the cheapest pesticides, provides a market entry point for name-brand products once their benefit for cost value is realized. This PERSUAP makes pesticide selections based upon registration, safety and resistance management. And, it encourages USAID projects to promote name brand pesticides where applicable.

<u>Factor C</u> (IPM): Little use of IPM &
<u>Factor I</u> (Chemical and Non-Chemical Alternatives Available): Little use of Chemical and Non-Chemical Alternatives

Most small-scale farmers use very few preventive non-chemical IPM tools and tactics on row crops, root crops, vegetables and fruits. Exceptions include small-scale production of high-value crops cotton, groundnuts, sugarcane, soybeans, and some export fruit crops. Estate farms growing high-value crops like sugar have incentives to produce clean produce for export. They have access to high levels of resources, education, information and training, and they actively use preventive IPM tools and tactics to the maximum in order to reduce costs and pesticide residues.

This PERSUAP provides the beginnings of Pest Management Plans (PMPs) in Annex 1. This annex contains numerous non-chemical preventive measures and curative chemical pesticide choices for crop-pest pairs likely to be encountered in Indonesia on crops supported by current or future USAID projects. USAID project training on these elements will help further socialize and raise awareness of the importance and benefits of using an IPM approach to agricultural production, including pesticide rotation.

Factor D (Pesticide Application & Safety Equipment):

- **Knapsack Sprayers Leak onto Users.** Hand-pump backpack sprayers, used by small- and medium-scale farmers, among others, can and do eventually develop leaks at every junction where sprayer parts meet (filler cap, pump handle entry, exit hose attachment, lance attachment to the hose and at the lance handle) and these leaks soak into exposed skin. Moreover, clothing serves as a wick that holds these pesticides in constant contact with the skin. Unless the clothes are washed immediately after use, other family members may also come in contact with pesticide residues.

USAID-funded projects, where applicable, could promote the development and use of professional spraying and record-keeping services. These can be designed to be accessible by farmers at congregation places (farms stores, cooperatives/associations, produce consolidation/cold storage/processing sites). Such services will be encouraged to properly maintain spray equipment and use recommended PPE. In the absence of such spray services, promote and teach proper sprayer maintenance and repair, and post-spraying hygiene during training.

- **Farmers and some Fumigators do not use Personal Protection Equipment.** Very few small-scale producers have access to, or can afford, or will use Personal Protection Equipment (PPE) when applying pesticides. Larger-scale certified estate farms have, and make their farm laborers use, PPE. Most village and city agrodealers visited do not stock sufficient or appropriate PPE.

Provision of PPE and repeated training on pesticide risks and the use of appropriate (for the pesticide) PPE are recommended for reducing risks to users.

USAID projects are recommended to encourage farmers to purchase pesticides only from reliable companies and in the original bottles with safety labels.

- **Females, Immune Compromised Pesticide Applicators and Children.** Although pesticide use in Indonesia is relatively low, there are risks, especially in households that are headed by women. Some female farmers and immune compromised individuals will use pesticides on their crops. Pesticides add additional stresses to the health of individuals who are pregnant, lactating or immune compromised. Furthermore, farmers often store pesticides in the home. This increases the risks that children will get access and accidentally ingest them.

USAID projects are recommended to discourage pregnant and lactating female farmers, as well as immune compromised (HIV, TB, malaria, etc) individuals, from using pesticides. All pesticide applicators, including women, need to use recommended PPE. Project staff should train farmers on the risks to children, and the need to secure pesticides from them.

- **No Proper Disposal of Empty Pesticide Bottles.** Empty pesticide bottles are thrown in the field, burned, buried or reused. There is a system being developed for collecting empty bottles for disposal or recycling. Ideally, empty bottles would be collected, cleaned properly and recycled into plastic objects like fence posts. In the absence of such a collection and recycling system, the next best approach is to wash, puncture and burry empty bottles. Burning them creates toxic and carcinogenic fumes.

Factor E (Acute/Chronic Toxicological Hazards) All Pesticide AIs Present Risks & Factor G (Target and Non-Target Hazards) Pesticides Kill More Than Target Pests

In addition to acute and chronic human health hazards and water pollution risks of the proposed chemicals, listed above in red color, almost all pesticide AIs present some degree of additional chronic risks to people including potential carcinogenic, endocrine, developmental and reproductive risks. And, almost all pesticide AIs present risks to some other organisms, including fish, honeybees, birds, amphibians, earthworms, mollusks, crustaceans, aquatic insects and plankton. Moreover, "natural" pesticide AIS extracted from plants and microbes carry these risks as well.

For pesticides that possess chronic health risks for humans, pesticide users need to be encouraged to use appropriate PPE. For pesticides highly or very highly toxic to honeybees, all spraying should be done late in the day when the winds have calmed and bees are at the hive. For pesticides highly or very highly toxic to aquatic organisms, application should not be done within 30 meters of open water.

Factor F (Pesticide Effectiveness): Variable Product Quality, Development of Pesticide Resistance

This PERSUAP does not, and cannot, make pesticide brand or content quality determinations or distinctions; the body that can and should do this is Indonesia MOA, when it tests, accepts, registers, samples and controls pesticide products entering Indonesia. However, known multinational companies like Arysta, Bayer, BASF, Dow, DuPont, FMC, Monsanto and Syngenta, as well as other companies from developed market countries that produce generics have reputations to protect. Thus their products are more likely to be of a consistently high quality. This is often reflected in higher pricing, or value, as well. Some generic pesticides from companies in China may or may not be as reliable.

Pesticide resistance can become a problem when the same chemicals are used over and over to control a particular pest. After a period of time, the pest may develop resistance to a chemical so that the chemical no longer effectively controls the pest at the same rate. Higher and higher rates or dosages and more frequent applications become necessary until eventually the chemical ceases to provide adequate control. Farmers who use cheap unreliable generic pesticides can exacerbate the development of resistance.

USAID-funded projects can encourage beneficiaries to use reliable name brand products and rotate pesticides from one class or type of chemical to another to reduce the development of pesticide resistance.

Factor H (Climate, Flora, Fauna, Geography, Hydrology, and Soils Pesticide Use Conditions): The Lack of Use of GAPs Can Lead to Damage of Natural Resources

The 2008 and 2013 USAID Foreign Assistance Act (parts 118/119) study on the Conservation of Tropical Forests and Biodiversity in Indonesia provides ample information on the natural resources at risk from multiple threats. Principal among them is agriculture.

The overwhelming majority of deforestation, soil erosion and loss of fertility, as well as loss of biodiversity, is due to small-scale producers. Alternatively, the vast majority of pesticide pollution comes from large-scale commercial and estate farms. Clearly, USAID projects have a major challenge to promote GAPs and IPM in order to improve agricultural production among small- to medium-scale farmers, so that natural resources are less threatened.

Factor J (Host Country Pesticide Management Abilities): A Lack of Resources Can Lead to Increased Risks

Most emerging market countries, Indonesia included, do not have sufficient resources to do all that is needed to better manage pesticides and use. As noted above, some very toxic and banned pesticides are still found in Indonesia, and the extension service cannot reach most farmers. The lack of resources lead to increased risks.

Fortunately, projects from developed market countries help fill this resource gap, often serving as de facto extension services. What this means is that donor projects also have a responsibility to know about, understand and promote the best practices and recommendations available. For USAID projects, this PERSUAP, and the information in it, is meant to assist with this challenge.

Factor K (Training): Limited IPM and Pesticide Safety Training of Implementers and Beneficiaries

Indonesia farmers have had limited national and donor assistance with farmer IPM and pesticide safety training. As a follow-up to this PERSUAP, such training should be performed by USAID projects for select leader beneficiaries on all projects doing agriculture value chain and food security projects. USAID projects are expected to use the GAP/IPM information in Annex 1 as well as hot-linked pesticide safety websites referred to in this PERSUAP to train beneficiaries.

Factor L (Monitoring): Small Scale Farmers do not Monitor or Keep Farm Records

Indonesia small-scale farmers do not keep records of information on crops grown, production, pest attack, pesticides used, if the pesticides worked well or not, and post-harvest intervals to reduce pesticide residues. Certified large-scale commercial and estate farms, on the other hand, all keep detailed records. As small and medium scale farmers move further toward producing certified (Organic, FairTrade, GlobalGAP, British Retail Consortium—BRC) export crops, they will need to be taught how to do proper record keeping. USAID projects can teach this during training.

USAID projects will keep records of crops supported, primary production constraints, as well as IPM, pesticides and PPE used on supported farms.

How to Use this PERSUAP Efficiently

The best way to use this document is to focus on the parts that apply to the crops produced, the pests of each and the preventive and curative tools and tactics, including pesticides. To do this efficiently, search this document for the crops or pests (common or scientific name) using the Word computer program's "Find" feature, which allows one to enter the word or phrase desired, and then takes one to the exact parts of the report where the word or phrase is used. Specific pesticide active ingredients in Annexes 1 and 7 can be found using the same method.

Update the Report Annually and Amend the Report in Two Years

New pesticides and EPA registrations change weekly. In addition, new human health and environmental data is produced continuously. For these reasons and others, this PERSUAP should be updated at least annually, and amended after two years in order to remain current and accurate.

SECTION 1: INTRODUCTION

1.1 Purpose, Scope & Orientation

Purpose. In compliance with USAID's Pesticide Procedures (22 CFR 216.3(b)), this 2013 Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP) for the USAID/Indonesia Portfolios:

- **Establishes the set of pesticides for which support is authorized** on USAID/Indonesia Economic Growth activities. *Support includes purchase, direct use, recommending for use, financing, and other actions that directly facilitate the use of pesticides.*

- **Establishes requirements attendant to support for these pesticides to** assure that pesticide use/support (1) embodies the principles of safer pesticide use and, (2) per USAID policy, is within an Integrated Pest Management (IPM) framework.

These requirements come into effect upon approval of the PERSUAP.

Scope. Specifically, the following special projects are covered by this PERSUAP.

Under Agriculture (now Environment):

- Agribusiness Market and Support Activity (AMARTA II)
- Integrated Pest Management Collaborative Research Support Program (IPMCRSP)
- Indonesia Cooperative Business Development Alliance (ICBDA)
- Cocoa Added Value Chain and Cottage Industry in Central Sulawesi, Development Grant Program (DGP-Agriculture),
- Development Credit Authority with Bank Andara.
- Development Credit Authority with Bank Danamon.

Under Environment:

- Indonesia Urban Water, Sanitation and Hygiene Program (IUWASH).

Under Health

- Highly Pathogenic Avian Influenza (HPAI) Program

Orientation. The set of authorized pesticides and requirements for safer use are established through Section 3 of the document, the Pesticide Evaluation Report (PER), which assesses the 12 pesticide risk evaluation factors (a through l) required by 22 CFR 216.3(b).

The Safer Use Action Plan (SUAP, Section 4) provides a succinct, stand-alone statement of compliance requirements, synthesized from the 12-factor analysis. It also provides a template for assigning responsibilities and timelines for implementation of these requirements. Each project subject to this PERSUAP must complete this SUAP template and submit to its AOR/COR.

1.2 USAID Environmental Regulations Development

From 1974 to 1976, over 2,800 Pakistan malaria spray personnel were poisoned (5 to death) by insecticide mishaps on a USAID/WHO anti-malaria program[2]. In response to this and other incidents arising from USAID programs, a lawsuit was brought by a coalition of environmental groups for USAID's lack of environmental procedures for overseas projects. USAID, in response to the lawsuit, drafted 22 CFR 216 (Reg. 216). This regulation, which was updated in 1979 to include extraterritorial affairs in response to changes in the scope of the application of the National Environmental Policy Act (NEPA), now guides most USAID activities that could have potentially negative environmental impacts.

1.3 Regulation 216

According to Regulation 216, all USAID activities are subject to analysis and evaluation via – at minimum – an Initial Environmental Examination (IEE), and – at maximum – an Environmental Assessment (EA). Two IEEs were written in 2008 to cover Indonesia Functional Objective 4: Economic Growth. One covered Program Areas 4.5 on Agriculture and 4.7 on Economic Development. The other covered Program Areas 4.8 on Economic Growth and 5.2 on Humanitarian Assistance. Both recommended that a PERSUAP be produced to deal with reducing risks with use of pesticides on USAID projects. This 2012 Umbrella PERSUAP responds to those IEE recommendations.

A large part of Regulation 216 – part 216.3 – is devoted to pesticide use and safety. Part 216.3 requires that if USAID is to provide support for the use of pesticides in a project, 12 pesticide factors must be analyzed and recommendations be written to mitigate risks to human health and environmental resources. This plan must be followed up with appropriate training, monitoring and reporting for continuous improvement on risk reduction and adoption of international best practices for crop production, protection and pesticide use safety is strongly encouraged.

1.4 The Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP)

In the USA, the EPA can rely on the following safety-enhancing factors and features, not present to the same degree in most emerging market countries—including Indonesia:

- An educated literate population of farmers and farm laborers
- Quality IPM information and Pest Management Plans (PMPs)
- A well-functioning research and extension system to extend IPM information to farmers
- Certification systems for farmer training on restricted and other pesticides
- Quality affordable PPE to reduce pesticide exposure
- Quality pesticide labels and Material Safety Data Sheets (MSDS) to guide farmer safety
- Accurate information and training on pesticide use, transport, storage and disposal

Because of the differences in infrastructure and resource availability, USAID and US regulations require location-specific analysis of pesticide use in emerging market countries, and development of procedures to ensure safe use.

[2] http://www.ncbi.nlm.nih.gov/pubmed/74508

In the late 1990s, USAID's Bureau for Asia staff developed the Pesticide Evaluation Report and Safe Use Action Plan (PERSUAP)—a tool to analyze the pesticide system or sector in any given country or territory. The PERSUAP tool—which was not envisioned and is not contained per se in Regulation 216's language—focuses on the particular circumstances, crops, pests and IPM/pesticide choices of a project or program. This "systems approach" analyzes the pesticide sector or system from registration to import through use to disposal, and develops a location-specific pesticide risk profile based on the analysis.

A PERSUAP is generally recommended by and submitted as an amendment to the project IEE or an EA (although most PERSUAPs are very similar to an EA in terms of breadth and detail). Although not actually an explicit goal of the PERSUAP, the application of PERSUAP recommendations has additional benefits. It helps to prepare project participants to be able to more rapidly adopt Best Management Practices (BMPs) and meet the needs of Standards and Certification (S&C) Systems like GlobalGAP, Organic, Fair Trade, Rainforest Alliance, British Retail Consortium and other S&C systems, as desired, for future market access.

1.5 Integrated Pest Management—USAID Policy

In the early 1990s, USAID adopted the philosophy and practice of Integrated Pest Management (IPM) as official policy. IPM is also strongly promoted and required as part of Regulation 216.3. Since the early 2000s, IPM—which includes judicious use of 'safer' pesticides—has been an integral part of GAPs and is increasingly considered to constitute best management practices in agriculture.

A good definition of IPM from OECD[3] follows:

> "Integrated pest management (IPM) is an approach to the management and control of agricultural pests which relies on site- and condition-specific information to manage pest populations below a level that causes economic injury and that minimizes risks to humans and the natural environment.
>
> Although any among a wide range of pest control agents may be used (including chemical sprays), IPM generally stresses the use of alternatives, such as crop rotations, mechanical cultivation, and biological agents, where such methods are deemed to be effective."

The strongest selling points for IPM beyond the health and environmental benefits are, that IPM:

- Is, in the long run, more effective than using synthetic pesticides
- Is, once-established, self-perpetuating to a degree
- Is less damaging to essential soil health and nutrient cycling
- Leaves fewer pesticide residues that confound international trade
- Generally requires less capital (but more labor) investment
- Can be used preventively to eliminate or minimize the need for "responsive" controls (e.g. applying pesticides after a pest outbreak occurs to an already-damaged area)

IPM can include possible pest management techniques and tools including:

- Soil and water tests, raised-bed production, tunnels, drip-irrigation[4]

[3] http://stats.oecd.org/glossary/detail.asp?ID=1379

[4] Note that drip irrigation does not re-charge underground aquifers, so water must be used carefully.

- Pest scouting, monitoring, and identification for accurate decision-making
- Cultural methods that promote pest avoidance and a healthy plant that can better tolerate or resist pests. These methods include, but are not limited to, use of resistant varieties, early/late plantings/harvestings, crop rotation, pruning diseased parts, destruction of pest refuge plants near fields and in crop residues, and GAP practices
- Natural pest control by encouraging and protecting (or purchase and release of) parasitoids, predators, and pest diseases
- Mechanical weed or insect pest control using manual, hoe and machine practices
- Chemical practices such as use of judicious, knowledgeable, and safe application of 'natural' (derived from nature; extracted from plants, microbes, and other organisms) or synthetic pesticides

Good soil characteristics are essential to plant health. For most crops, soils need to provide adequate nutrients and moisture and be well drained. A healthy soil will have a greater capacity to moderate the uptake of fertilizers and will allow a more balanced uptake of nutrients, creating a healthy plant that is less attractive to some pests and more resistant to pest damage.

1.6 Indonesia PERSUAP Methodology and Scopes of Work (SOW)

USAID Indonesia mission requested that this Umbrella PERSUAP be produced to respond to needs found in recent Indonesia IEEs covering agriculture, water/sanitation, and bird flu under the health sector. Weidemann Associates financed and implemented this work, and the Indonesia USAID mission supported the study with IEEs, information and good advice.

Indonesia IEEs and a 2013 ETOA were analyzed while field travel preparations were made. In Indonesia, the consultant interviewed USAID staff, USAID projects staff and field sites, beneficiary farmers, staff of the Indonesia MOA, Bogor Agriculture University, Crop Life International (CLI), The United Nations Food and Agriculture Organization (UNFAO), Rainforest Alliance, the PT. Armajaro Group and PT. Olam Group cacao buyers, the FIELD (Farmers' Initiatives for Ecological Livelihoods and Democracy) Group, Agriculture Biotech Support Project (ABSP) II, Sayogyo Institute (SAINS), Jaya Mandiri Women Farmer Group, Nimbura Kencana Cooperative, pesticide importers/distributors and village agrodealers.

The complexity of the tasks needed for this study required that the consultants provide wide-ranging and cutting-edge IPM, agronomic, business, entomological, phytopathological, rodentological, weed and chemical advice, in addition to environmental compliance interpretation. In order to make this PERSUAP study unbiased and as objective as possible, pesticide Active Ingredients (AIs) are chosen as the common denominator for analysis, and product brand names were avoided.

The strategy used for writing this PERSUAP is for it to contain as many links to websites with best practices as possible, both to make it easier to use (reduce the report's length and thickness) and more up-to-date or accurate (as websites are updated, but static information is not). So, instead of having numerous Annexes containing pesticide safety equipment recommendations or safe pesticide use practices, hot-linked websites now take their place. However, if project participants do not have access to the Internet, USAID projects should reproduce and distribute key information.

The SOWs for this work are attached as Annex 13.

SECTION 2: BACKGROUND

2.1 Country Background

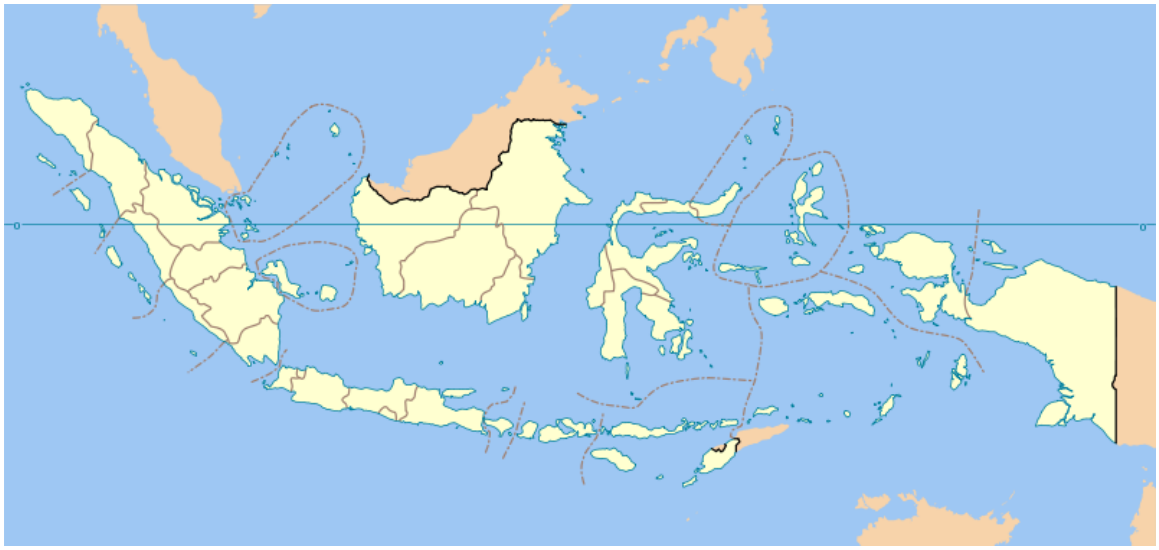

Figure 1: Map of Indonesia, http://en.wikipedia.org/wiki/Indonesia

Indonesia, officially the **Republic of Indonesia** (Indonesian: *Republik Indonesia*), is a country in Southeast Asia and Oceana. Indonesia is an archipelago comprising approximately 17,508 islands. It has 37 provinces with over 246 million people, and is the world's fourth most populous country. Indonesia is a republic, with an elected legislature and president. The nation's capital city is Jakarta. The country shares land borders with Papua New Guinea, East Timor, Brunei Darussalam and Malaysia. Other neighboring countries include Singapore, Philippines, Australia, Palau, and the Indian territory of the Andaman and Nicobar Islands.

Indonesia is a founding member of ASEAN and a member of the G-20 major economies. The Indonesian economy is the world's sixteenth largest by nominal GDP and fifteenth largest by purchasing power parity.

The Indonesian archipelago has been an important trade region since at least the 7th century, when Sriwijaya and then later Majapahit traded with China and India. Local rulers gradually absorbed foreign cultural, religious and political models from the early centuries CE, and Hindu and Buddhist kingdoms flourished. Indonesian history has been influenced by foreign powers drawn to its natural resources. Muslim traders brought the now-dominant Islam, while European powers brought Christianity and fought one another to monopolize trade in the Spice Islands of Maluku during the Age of Discovery.

Following three and a half centuries of Dutch colonialism, Indonesia secured its independence after WWII. Indonesia's history has since been turbulent, with challenges posed by natural disasters, corruption, separatism, a democratization process, and periods of rapid economic change.

Across its many islands, Indonesia consists of hundreds of distinct native ethnic and linguistic groups. The largest—and politically dominant—ethnic group are the Javanese. A shared identity has developed, defined by a national language, ethnic diversity, religious pluralism within a

majority Muslim population, and a history of colonialism and rebellion against it. Indonesia's national motto, *"Bhinneka Tunggal Ika"* ("Unity in Diversity" *literally*, "many, yet one"), articulates the diversity that shapes the country. Despite its large population and densely populated regions, Indonesia has vast areas of wilderness that support the world's second highest level of biodiversity. The country has abundant natural resources, yet poverty remains widespread.

Indonesia Agriculture[5]

Indonesian agriculture supports the livelihood of millions of Indonesians. Three out of five Indonesians still live in rural areas and farming is their main occupation. While Indonesian agriculture has performed well historically and contributed to significant growth with increased employment and reduction of poverty, productivity gains of most crops have now slowed down significantly and the majority of farmers operate in less than one-half hectare today.

Revitalizing the agricultural sector is necessary to underpin renewed and robust growth of the economy and is a key component of the Government's rural development strategy.

With agriculture now averaging only half of rural households' incomes, a strategy for rural development will also need to focus on the non-farm rural economy which will demand close cross-sectoral collaboration. An additional challenge is that big-bang decentralization is altering fiscal and administrative relations between central and sub-national governments, regulatory systems are struggling to maintain nationally coherent frameworks in the face of decentralized implementation capacity, and public/private roles are being re-examined for extension, research animal health services, and others.

The rural development agenda will need to focus on two areas: **reinvigorating productivity gains among rural producers**, and **providing the foundation for the long-run sustainability of these productivity gains.**

To alleviate rural poverty, broad-based growth in rural productivity is essential with robust systems for generating, adapting and disseminating technology relevant to small-scale producers. While Indonesia has concentrated on these in the past through public sector research and extension institutions, these public systems are facing severe challenges due to decentralization.

Progress

Over the past decade, Indonesia has achieved and was, until the East Asia economic crisis struck, considered to be among the best performing East Asian economies. Indonesia grew at a rate of 7.1 percent between 1985 and 1995, and attained real GDP growth of 7.8 percent in 1996. Between 1970 and 1996, the proportion of the population living below the official poverty line declined from 60 percent to an estimated 11 percent -- about twenty-eight million people -- reflecting the government's strong commitment to poverty reduction. However, this rose to 23.4 percent at the peak of the crisis in 1999 but has since dropped back to 16.7 percent, lower than the pre-crisis level of 17.6 percent.

Indonesia Topography

[5] http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/EASTASIAPACIFICEXT/0,,contentMDK:23186152~pagePK:146736~piPK:146830~theSitePK:226301,00.html

Indonesia topography is shown clearly by use of colors in Figure 2, below. Greener areas are near sea level, while yellow and orange/red show increasing altitude.

Figure 2: Indonesia Topography, http://keith-travelsinindonesia.blogspot.com/2010/09/why-are-there-so-many-volcanoes-here.html

Indonesia Climate

The **climate of Indonesia** is almost entirely tropical. The uniformly warm waters that make up 81% of Indonesia's area ensure that temperatures on land remain fairly constant, with the coastal plains averaging 28°C, the inland and mountain areas averaging 26 °C, and the higher mountain regions, 23 °C. Temperature varies little from season to season, and Indonesia experiences relatively little change in the length of daylight hours from one season to the next; the difference between the longest day and the shortest day of the year is only forty-eight minutes. This allows crops to be grown all year round.

The main variable of Indonesia's climate is not temperature or air pressure, but rainfall. The area's relative humidity ranges between 70 and 90%. Winds are moderate and generally predictable, with monsoons usually blowing in from the south and east in June through September and from the northwest in December through March. Typhoons and large-scale storms pose little hazard to mariners in Indonesia waters; the major danger comes from swift currents in channels, such as the Lombok and Sape straits.

Indonesia Rainfall and Temperatures

Indonesia rainfall (green line) and average temperatures (purple line) are shown clearly by use of colors in Figure 3, below.

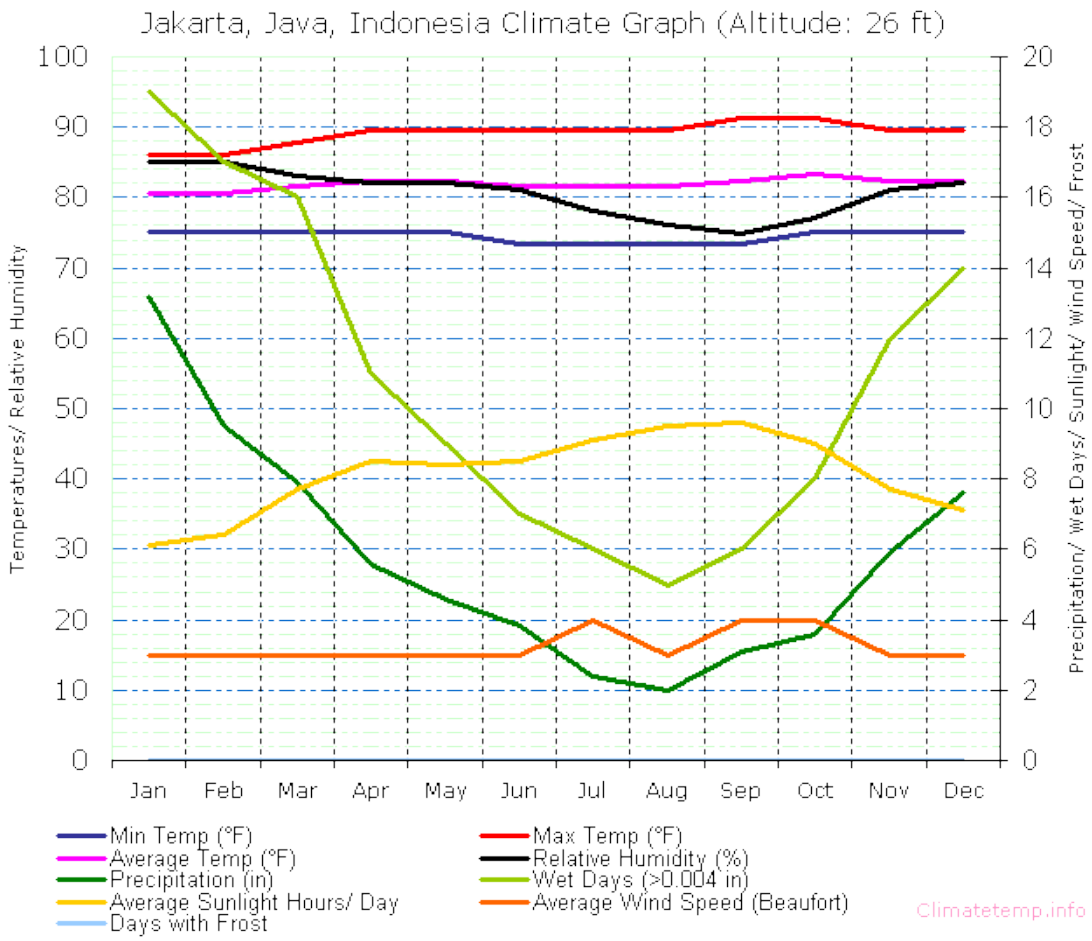

Figure 3: Indonesia rainfall and temperatures, http://www.indonesia.climatemps.com

2.2 USAID Indonesia Projects Backgrounds

Agribusiness Market and Support Activity (AMARTA II)
High-value agriculture products have real potential to drive growth, employment and incomes. However, in Indonesia, the competitiveness of this sector is constrained by low investment, inadequate infrastructure and underdeveloped agribusiness practices. AMARTA II is USAID's response to these challenges in four key provinces: West Java, North Sumatera and South Sulawesi.

USAID's Agricultural Market and Support Activity II will have three components, organized around the value chains of five high-value export-quality commodities: horticulture (chilies, potatoes, French green beans, and bananas), cocoa and coffee.

Value Chain Development:
AMARTA II activities will improve value chains for horticulture crops (), cocoa and coffee. AMARTA II will provide technical assistance across the key value chain links, train farmers, strengthen farmers associations, support the growth of small and medium agribusiness enterprises, including domestics and export marketing, and will work with and support GOI

institutions involved in agricultural technology transfer and technology development. These activities will improve incomes and employment in the target regions.

Facilitating Access to Credit:
AMARTA II will provide technical assistance to banks participating in the USAID-funded Loan Guarantee Program. Under a separate arrangement with USAID/Development Credit Authority (DCA), USAID/Indonesia will fund an agricultural loan guarantee program to enable access to credit by farmers and small and medium agribusinesses. AMARTA II will provide technical assistance to work with these banks to facilitate upstream and downstream credit processes.

Using Technology to Improve Agriculture:
AMARTA II will develop and integrate innovative technology solutions into the areas that it works in, with the anticipation that these technologies can be adapted and adopted in other value chains as well. The AMARTA II program will address problems specific to rural agriculture, including sharing market and crop-specific information in remote areas and electronic money transfers along the value chain.

Integrated Pest Management Collaborative Research Support Program (IPM CRSP)

IPM CRSP Regional Program: Ecologically-based Participatory and Collaborative Research and Capacity Building in IPM in Southeast Asia

This project includes research activities in nine research sites in Cambodia, the Philippines and Indonesia. In Indonesia, research on vegetable IPM is centered in North Sumatra, West Sumatra, West Java, East Java, Bali and North Sulawesi Provinces. Cocoa IPM is studied in South Sulawesi, North Sulawesi and East Java Provinces, and coffee and citrus IPM is studied in North Sumatera Province.

The project is participatory, involving farmers, extension workers, NGOs, IARCs, and national research agencies, as well as scientists from U.S. universities and the USDA. Field research is targeted to activities that directly address farmer needs, while providing ancillary benefits to the environment, rural communities, and consumers. Social scientists assess IPM systems in terms of economic impacts and changes in the social dynamics of farm communities, including the role of women in agriculture and the effect of changing women's roles as IPM systems are implemented.

Education activities form the cornerstone of the project. Adoption of IPM requires innovative programs of farmer training and communications. Training of field workers and future IPM scientists is also needed to ensure the future of IPM development. Communication across the many research/demonstration sites is promoted to create opportunities for synergistic efforts in the Southeast Asia region.

Indonesia Cooperative Business Development Alliance (ICBDA)

ICBDA, an alliance consisting of several farmers' cooperatives, the National Cooperative Business Association (NCBA) and Cooperative Business International (CBI) proposes to increase employment and incomes in eastern Indonesia through the development of long-term partnerships that will result in strengthening of agricultural cooperatives and enhancement of value-added processing systems and market channels for high value domestic and export crops. The activities described in this proposal are designed to support USAID Indonesia's Assistance Objective of "Increased Employment" and the Intermediate Result (IR2) "Increased Production of High-Value Crops".

Over the past 35 years NCBA, working in partnership with Indonesian and East Timor cooperatives, has established sustainable, cooperative procurement and processing activities together with marketing channels for coffee, vanilla, cinnamon, nutmeg, mace, cloves, essential oils, black pepper, cassava and cattle. More than 500,000 small farmers are selling their crops through these channels. Farmers working in partnership with NCBA benefit in three ways: Farmers receive an integrated package of technical advice and inputs, designed to increase productivity and crop quality. The effectiveness of these packages has been proven over 35 years of work on the ground in East Timor and throughout Indonesia.

NCBA mentors its cooperative partners, building their capacity to operate profitable businesses in an inclusive fashion. NCBA has established business ventures with U.S. corporations in partnership with cooperatives from Indonesia and East Timor in agricultural processing and trading companies, generating more than $1 billion in total exports. These public private partnerships will be expanded in number and scope through this proposed program.
NBCA established and assisted ventures in the region are most often the volume and price leaders for many commodities and markets, usually paying higher prices and offering a greater level of services to farmers. This is particularly true in underserved remote markets, such as Papua and West Timor.

With this project, NCBA proposes to bring its experience and access to lucrative international markets to approximately 5,000 farm families in Papua, East Nusa Tenggara and South Sulawesi Provinces, replicating what it has achieved in East Timor, Alor, West Timor, Aceh, North Sumatra, Lampung, West Sumatra, Java, Flores, Sulawesi and elsewhere in Indonesia. It is planned that approximately two-thirds of the program resources will be allocated to the activities proposed in Papua.

Cocoa Added Value Chain and Cottage Industry in Central Sulawesi, Development Grant Program (DGP-Agriculture)

Working in two of the most productive districts of Central Sulawesi Province, Indonesia's largest cocoa producing area, the DGP project, run by the Sayogyo Institute (SAINS), aims to improve the quality and quantity of cocoa beans grown and processed for export as well as for domestic markets. SAINS intends to work with smallholder cocoa farmers, who are mostly female, to enhance their farm management techniques, their access to capital and other resources from financial institutions, and act collectively to boost their livelihoods.

Development Credit Authorities with Bank Andara and Bank Danamon

Both of these development credit authorities activities provide credit to farmers and producers, and could be used for pesticide purchase.

Indonesia Urban Water, Sanitation and Hygiene Program (IUWASH)

USAID/Indonesia has launched the Indonesia Urban Water, Sanitation and Hygiene (USAID IUWASH) project**,** which will support Government of Indonesia efforts to achieve Indonesia's Millennium Development Goal targets for safe water and sanitation. The USAID IUWASH project will work with Indonesian government agencies (central, provincial, and local), local government owned water utilities (PDAMs), the Association of Indonesia Water Utilities (PERPAMSI), non-governmental organizations, communities, universities, and the private sector. The project will also address the challenges water utilities face to ensure water quality and availability in a context of climate change and increasing demand for water.

Expected results include:

- A 20% reduction of per unit water costs paid by the poor in targeted communities;
- Increased access to safe water for 2 million people and an improved sanitation for 200,000 people; and
- Mainstreamed models for providing water and sanitation to poor populations in urban areas.

To achieve these results, activities under the following components will be implemented:

1. Demand for safe drinking water access and improved sanitation increased among urban communities and households with currently unimproved access;
2. The capacity to sustainably supply this mobilized demand with improved water and sanitation services built among the public and private sector institutions best placed to provide these services in urban areas; and
3. A governance and financial enabling environment created that supports equitable access to safe drinking water and improved sanitation in urban areas.

Highly Pathogenic Avian Influenza (HPAI) Program

The U.S. Government is the largest donor supporting Indonesia's efforts to control Highly Pathogenic Avian Influenza (H5N1) and USAID plays a key role. USAID supports efforts to reduce the impact of H5N1 in Indonesia on animals and humans and to limit emergence of an influenza pandemic. Since 2005, USAID has provided $120 million to support Avian and Influenza Pandemic (API) control and prevention in Indonesia.

Indonesia is uniquely vulnerable to Highly Pathogenic Avian Influenza (HPAI) and the emergence of new influenza viruses due to its large population, high poultry density, and the close interaction of poultry with humans. Routine HPAI outbreaks in poultry still occur, particularly during rainy season, and mainly across Java, Sumatra, South Sulawesi, Bali, and sporadically elsewhere. The introduction of a new clade of H5N1 in Indonesia has increased outbreaks in poultry and particularly in the duck population.

Avian influenza will be a long term epidemic in Indonesia, so there is a need to develop a sustainable program which helps to strengthen animal and human health systems to better track, control, and respond to influenza outbreaks and other emerging zoonotic diseases which have pandemic potential. USAID activities focus enhancing GOI capacity for integrated animal and human surveillance, cleaning and disinfection of markets, improved biosecurity at farms, strengthening standards of care and health seeking behaviors, and identifying and changing risky behaviors.

2.2 Other Indonesia Donor Projects Backgrounds

The top five donors[6] active in Indonesia, in terms of dollar value, in 2012, were Asian Development Bank, World Bank, Japan International Cooperation Agency, Australian AID, and WHO Global Fund to Fight AIDS, Tuberculosis and Malaria.

Asian Development Bank (ADB)

[6] https://www.devex.com/en/news/indonesia-s-top-10-donors-responding-to-the-promise-of-transformation/78905

In 2009, President Susilo Bambang Yudhoyono initiated the government's pro-poor, pro-jobs, pro-growth, and pro-environment strategy to pursue national development. Consistent with this strategy, the Asian Development Bank's work in Indonesia focuses on poverty reduction through "rapid, sustainable, and inclusive" economic growth projects. Over the next two years, the bank has allocated $2.5 billion in programmable funding for its operations in the middle-income country. In an effort to synchronize programming, ADB's 2012-2014 Country Partnership Strategy is closely aligned with Indonesia's 2010-2014 National Medium-Term Development Plan, or RPJMN.

Through the partnership, ADB aims to address constraints posed by poor infrastructure, weaknesses in governance, and inadequately skilled labor to Indonesia's development. Focus areas of the bank's operations include energy, transport, natural resource management, finance, water supply and other municipal services, and education. Recently, ADB approved $500 million in funding for a Precautionary Financing Facility, meant to sustain Indonesia's pro-poor economic growth by maintaining market confidence and meeting public financing needs in the event of external shocks.

World Bank

Since 2004, recognizing Indonesia's emerging middle-income country status, World Bank support has shifted toward a country-led and owned development strategy. Citing the lack of effective and accountable institutions as the main constraint to further development, the World Bank's 2009-2012 Country Partnership Strategy for Indonesia focuses on investing in institutions. Though a notional annual World Bank investment of $2 billion is expected under the partnership, actual annual lending can vary significantly up or down. The Washington-based lender recognizes that a much larger share of Indonesia's own spending or private investment is needed to ensure demonstrable impact.

The current CPS aims to improve existing government programs, strengthen institutions, and encourage the replication of effective reforms in private sector development, infrastructure, community development and social protection, education, and environmental sustainability and disaster mitigation. In particular, given that the development of large-scale infrastructure is crucial to Indonesia's progress, the WB provides financial and advisory support for the roads, energy, and water—including irrigation and water and sanitation—sectors.

Japan International Cooperation Agency (JICA)

With an estimated $662 million earmarked in programmable funding for 2012, the Japan International Cooperation Agency is Indonesia's largest bilateral donor. Since 2004, guided by the Country Assistance Program for Indonesia, JICA's work in the resource-rich archipelago has prioritized promoting sustainable growth through the private sector, building a democratic and fair society, and ensuring peace and stability. However, with the publication of the 2010-2014 RPJMN, Japan in close dialogue with the government of Indonesia has been formulating a new policy framework for development.

With a view of Indonesia as a strategic partner, Japan envisions further cooperation to focus on improvements in the investment environment, economic partnership agreement, environment and climate change, energy cooperation, disaster prevention, and measures against external shocks brought about by terrorism and piracy, diseases, and financial and economic crises. Last year, Japan signed an agreement to provide about 62.3 billion yen ($808 million) in new climate aid to Indonesia for the construction of five geothermal power plants, among other climate-related initiatives.

AusAID (Australia AID)[7]
Probably one of the most widespread and influential donors present in Indonesia, due to proximity and interests, is AusAID. They work in education, health, HIV, infrastructure, water/sanitation, decentralization, infrastructure, biodiversity, forestry and natural resources, greenhouse gasses, government policy, and disaster preparedness. They do not work in agriculture in Indonesia, other than providing social support services for farm families.

Given the doubling of operations and financing in the build-up towards a $1 billion annual aid program by 2016, the Australian Agency for International Development may soon become Indonesia's leading bilateral donor. The middle-income country is currently receiving the largest share of Australian overseas development assistance—$521 million or 10 percent of the total. Aligned with the RPJMN, the Australia Indonesia Country Partnership Strategy 2008-2013 articulates Australian commitment and support for Indonesia's further development.

Australia's work in Indonesia concentrates on the areas of sustainable growth and economic management, education, health, democracy, justice and good governance, and safety and peace. To build on and strengthen these sectoral investments, Australia is funding Indonesia's underdeveloped research sector through The Australia-Indonesia Partnership for Pro-Poor Policy: The Knowledge Sector Initiative. Further, as Australian assistance to Indonesia grows, developmental work in education, infrastructure and social protection are prioritized for expansion.

Global Fund to Fight AIDS, Tuberculosis and Malaria
After funding freezes, leadership changes, and staff cuts, the Global Fund to Fight AIDS, Tuberculosis and Malaria is back to business as normal. This time, however, health programming under the Global Fund stresses value for money through strategic interventions in 20 high-impact countries, one of which is Indonesia. Though likely to meet its health Millennium Development Goals, Indonesia will miss its targets of halting the spread of tuberculosis, reducing malaria incidence, and improving HIV/AIDS prevention and care without significant investment.

To date, total approved funding for the middle-income country is $544 million, of which $411 million has been disbursed. To stem the spread of the "Big 3" of communicable diseases in Indonesia, the Global Fund has allocated $145.4 million for tuberculosis, $142.4 million for malaria, and $122.1 million for HIV/AIDS. At present, the Global Fund has 13 grants in progress—tuberculosis (5), HIV/AIDS (4), malaria (3), and others (1)—in Indonesia.

2.3 Indonesia Pesticides and Standards Issues

Neonicotinoid Pesticides, Risks to Pollinators and Colony Collapse Disorder
A group of new (since the late 1990s) neonicotinoid pesticides has, for the past 5 years, been implicated as one—among several—factors in the unusual die-off of honeybee colonies in the USA and throughout Europe. Other factors include parasitic honeybee mites, viruses transmitted by these mites, climate change, loss of habitat, other pesticides and changes in nutrition. This honeybee die-off phenomenon is named Colony Collapse Disorder (CCD). Neonicotinoid pesticides registered by Indonesia MOA include acetamiprid and imidacloprid. Other countries in Southeast Asia register additional neonicotinoids named clothianidin, thiacloprid and

[7] http://www.ausaid.gov.au/countries/eastasia/indonesia/Pages/education.aspx

thiamethoxam. Of these, clothianidin has been most strongly implicated as a potential key factor in CCD.

On April 30, 2013, the EU (European Union) imposed a two-year ban on the use of clothianidin, imidacloprid and thiamethoxam on flowering crops pollinated by honeybees, to take effect in December 1, 2013, unless compelling scientific evidence to the contrary becomes available[8].

Then, on May 2, 2013, the EPA and USDA published a study[9] of their own on CCD. One of the principal authors, Dr. May Berenbaum, herself a professional beekeeper and renowned entomologist, disagrees with this approach. In an interview with the New York Times[10], Dr. Berenbaum notes that it is not a simple matter of just removing pesticides. There are too many factors involved. And, the authors prefer to "let science drive the outcome of decision making" instead of jumping to conclusions based upon the results of a few studies.

And, in Australia and Canada, where neonicotinoid pesticides are also extensively used, CCD is not a serious issue. This implies that other factors, or combinations of factors, are at work. USAID regulations follow EPA regulations and advice.

Termite Treatments for Construction and Wood Structures

Creosote, also known as coal tar, one of the chemical products available for use in wood latrine construction is not registered by Indonesia MOA. Creosote has completed re-registration through EPA in 2008 (http://www.epa.gov/oppsrrd1/reregistration/creosote/) and is currently contained in 15 registered products[11]. Fourteen of these 15 products are listed as RUP. Creosote is also shown on this above-cited website to be a known carcinogen. Thus, it is not advisable, or allowed by this new 2013 Umbrella PERSUAP, for use on WASH type projects.

Chlorpyrifos-ethyl, the second pesticide available for use is registered by Indonesia MOA. EPA also registers it. However, at the end of 2001, in order to protect children and public health, EPA and the manufacturer of insecticides containing chlorpyrifos-ethyl agreed to eliminate their use for nearly every household purpose, and to move to significantly reduce residues of it on several foods regularly eaten by children. The agreement mandated that all uses would be phased out in 2001 in areas where children could be exposed, including schools, daycare centers, parks, recreation areas, hospitals, nursing homes, stores and malls. See EPA website with this decision: http://web.archive.org/web/20011210104016/http://www.epa.gov/epahome/headline_0608.htm.

In 2005, EPA announced its intention to phase out use of chlorpyrifos-ethyl as a pre-construction termiticide (http://www.epa.gov/oppfead1/cb/csb_page/updates/chlorpy-phasout.htm). Due these decisions, and known risks to children, it would not be wise for USAID or WASH programs to allow or use chlorpyrifos-ethyl for schoolyard latrine foundation, frame, wall or ceiling/roof construction.

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[8] http://www.bbc.co.uk/news/world-europe-22335520
[9] http://www.usda.gov/documents/ReportHoneyBeeHealth.pdf
[10] http://www.nytimes.com/2013/05/03/science/earth/government-study-cites-mix-of-factors-in-death-of-honeybees.html?nl=todaysheadlines&emc=edit_th_20130503&_r=0
[11] http://www.pesticideinfo.org/List_Products.jsp?Rec_Id=PC33535&Chem_Name=Creosote&PC_Code=025004

Foundation, framing and walls of latrines can be constructed from cement and metal, at nominal additional cost. Ceiling/roof construction may require wood and pesticide use. Some wood preservation pesticide products that have been used in the USA are found on the following website: http://npic.orst.edu/ingred/ptype/treatwood/types.html, however not all of these would be approved by a PERSUAP and may not be wise to propose to Indonesia MOA.

Fipronil, another alternative not considered until now, if Indonesia MOA registers it, could be used for termite control in soil and foundation around structures, to stop them from invading and moving up a structure. EPA registers fipronil as a termiticide. The BASF Corporation has an EPA-approved line of products named Termidor that contain fipronil for termite control in soil and slab around structures.

Use of GlobalGAP as a Quality Farm Standard

Started in 1997 as EurepGAP (European Good Agriculture Practices), the new GlobalGAP (Good Agriculture Practices) is a private sector body that sets voluntary standards for the certification of agricultural products around the globe. The GlobalGAP standard is primarily designed to reassure consumers about how food is produced on the farm by minimizing detrimental environmental impacts of farming operations, reducing the use of chemical inputs and ensuring a responsible approach to worker health and safety as well as animal welfare.

GlobalGAP serves as a practical manual for Good Agricultural Practice anywhere in the world. The basis is an equal partnership of agricultural producers and retailers who wish to establish efficient certification standards and procedures. The GlobalGAP website, www.globalgap.org, is a comprehensive knowledge base for all interested parties: producers, suppliers, retailers, journalists and consumers. With its clear and easy navigation, the website incorporates exhaustive information on the GlobalGAP standard and its modules and applications.

Water and Santitation

Water disinfection/sanitization for household and drinking water use presents challenges. The primary chemicals used in Indonesia for water treatment are based on chlorine. Additional chemicals that can less commonly be used include those based on other halogens like bromine, iodine, as well as ozone and hydrogen peroxide. Wikipedia provides a very nice summary of water treatment and some mitigation measures at http://en.wikipedia.org/wiki/Water_purification. The American Chemistry Council has some mitigation measures: http://www.americanchemistry.com/100years/Practices.html.

Bird Flu Disinfection and Microbiocide Procurement and Use[12]

HPAI virus can be serially transmitted between and among wild and domestic bird populations and can decimate domestic production and harm trade. Migrating wild birds may transfer HPAI long distances and across international borders, and are one source of the current outbreaks. Another source is the movement of infected birds in the commercial trade, both caged wild birds and poultry. The HPAI virus may also be transmitted to humans by direct contact with infected birds, body parts and waste, leading to sickness and potential death. The worst-case scenario is that the virus may mutate to become able to be transmitted from human to human, leading to an epidemic or pandemic.

[12] http://www.usaid.gov/our_work/global_health/home/News/news_items/avian_influenza.html

USAID recognizes the highly pathogenic H5N1 avian influenza virus as a threat to public health, economic stability, and development in affected and at-risk countries. Indonesia is considered to be HPAI epidemic country[13] and in the mid-2000s USAID and FAO contracted HPAI activities there.

HPAI activities involve extensive use of microbiocides to kill pathogens. These are the same as disinfectants used for cleaning water of pathogens. EPA's list of 100 approved disinfectant pesticide products registered for use against AI is found at the following website: http://www.epa.gov/pesticides/factsheets/avian_flu_products.htm. Thus, this PERSUAP will refer to and not duplicate this process. However, in Annex 7, this PERSUAP evaluates AIs contained in the most common water disinfectant microbiocides (pesticides).

Advantages for HPAI and Water Treatment

The HPAI virus and other microbial contaminants can be transmitted from dead birds, bird waste and bird parts. Disinfection reduces these risks. Water is treated by many of the same microbiocides as HPAI disinfection, as well as by ultraviolet light.

Risks from Treating HPAI and Water with Pesticides

Water disinfection with chlorine gas from sodium chlorite and chloramines sometimes react with organic matter to produce side product chemicals, some of which are called trihalomethanes (THM). Mitigation of THMs includes reducing the amount of organic matter in water before treatment. Most disinfectants are Class I toxins and are highly corrosive to skin eyes and mucous membranes. Thus, they require the use of gloves, splash-proof safety glasses and a carbon-filtered facemask or respirator.

2.4 Indonesia Pesticide Sector, Risks and Areas for Improvement

Indonesia International Obligations

Pesticides

- Stockholm Convention on Persistent Organic Pollutant (POPs) (signatory since 5/23/2001, ratified 9/28/2009)
- Rotterdam Convention on Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides (signatory 9/11/1998, not yet ratified)
- Basel Convention on the Control of Transboundry Movement of Hazardous Wastes and their Disposal (accession 9/20/1993)
- Montreal Protocol on Substances Depleting Ozone Layer (ratified in 1992)

Stockholm

Persistent Organic Pollutants (POPs) are chemicals that are toxic, persistent in the environment, and liable to bioaccumulate. These chemicals are among the most dangerous and highly toxic pollutants released into the environment every year by human activity. Their effects on humans can include cancer, allergies and hypersensitivity, damage to the central and peripheral nervous

[13] http://www.usaid.gov/our_work/global_health/home/News/ai_docs/ai_outbreaks.pdf

systems, reproductive disorders, and disruption of the immune system. Some POPs are also considered to be endocrine disrupters, which, by altering the hormonal system, can damage the reproductive and immune systems of exposed individuals as well as their offspring; they can also have developmental and carcinogenic effects.

The Stockholm Convention on Persistent Organic Pollutants was established to eliminate or restrict the production and use of POPs. Through the World Bank's Global Environment Fund (GEF), countries are creating sustainable capacity and ownership so as to meet their obligations under the Stockholm Convention including preparation of POPs National Implementation Plans. A National Implementation Plan describes how each country will meet its obligations under the Convention to phase-out POPs sources and remediate POPs contaminated sites.

Rotterdam

The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, more commonly known simply as the Rotterdam Convention, is a multilateral treaty to promote shared responsibilities in relation to importation of hazardous chemicals. The convention promotes open exchange of information and calls on exporters of hazardous chemicals to use proper labeling, include directions on safe handling, and inform purchasers of any known restrictions or bans. Signatory nations can decide whether to allow or ban the importation of chemicals listed in the treaty, and exporting countries are obliged make sure that producers within their jurisdiction comply.

Basel

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, usually known as the Basel Convention, is an international treaty that was designed to reduce the movements of hazardous waste between nations, and specifically to prevent transfer of hazardous waste from developed to less developed countries. It does not, however, address the movement of radioactive waste. The Convention is also intended to minimize the amount and toxicity of wastes generated, to ensure their environmentally sound management as closely as possible to the source of generation, and to assist LDCs in environmentally sound management of the hazardous and other wastes they generate.

Montreal

The Montreal Protocol on Substances that Deplete the Ozone Layer (a protocol to the Vienna Convention for the Protection of the Ozone Layer) is an international treaty designed to protect the ozone layer by phasing out the production of numerous substances believed to be responsible for ozone depletion. The treaty was opened for signature on September 16, 1987, and entered into force on January 1, 1989, followed by a first meeting in Helsinki in May 1989. Since then, it has undergone seven revisions. It is believed that if the international agreement is adhered to, the ozone layer is expected to recover by 2050. Methyl bromide used for agricultural fumigation is one of the protocol chemicals being phased out worldwide.

Indonesia Pesticide Sector

According to FAO, most emerging market countries as it is in Indonesia, pesticides have been using for more than four decades. Pesticides application has become one of the most important means in dealing with pest and disease control of either crops or any other fields such as household, quarantine, fishery, wood preservative, pre-shipment, stored products and so on.

There are many more activities in the communities where pesticides are being applied for their own purposes.

When the use of pesticides was introduced at the first time, it was mostly intended to control pest on important crops like paddy and secondary crops. Unfortunately, no one was aware how its use would induce negative impacts to the environment as its use grew substantially. In addition, most farmers have not been well trained yet to handle pesticides properly, and consequently occupational death, environmental damage and severe injuries were hence, unavoidable.
No sufficient regulation existed as the use of pesticides began in the early sixties and there were no technical instruments as well as technical adviser available. Farmers learned how to use these products from their neighborhood and to some extent they asked field worker to make sure of the choice.

As most pesticides in Indonesia were applied for agricultural practices, the government of the Republic of Indonesia assigned the Minister of Agriculture to manage pesticides through the Government Stipulation No. 7 of 1973. Any pesticides intended for use and distribution in Indonesia should hold permission issued by the Minister of Agriculture or otherwise it is considered as illegal use and distribution.

Based on the above government stipulation, Minister of Agriculture then, has issued a number of decrees dealing with procedure on registration, requirement on label and packaging, limitation on registration, terminating of registration and so on. Those split policy was issued within different periods of time as it brings inconsistency when going through implementation. Hence, the government has to provide one comprehensive regulation at once to be the only powerful rule in serving people at better standard.

It was started in 2001 when the Minister of Agriculture issued the Ministry of Agricultural Decree No. 434.1 as so called De-regulation on pesticides registration. It was a spectacular decree as all previous decree of different aspects were compressed into one single package of regulation containing most recent technical requirement that are more or less international standard. Besides, such regulation opened more opportunity to any new player in pesticides business as far as all technical as well as administrative requirements are fulfilled. All registration documents should comply with standard data as issued by FAO/WHO or any other recognized institute specification. In addition, validity data have become imperative for evaluation. It means, not all data and information are accepted unless they are considered valid and be worthy of further evaluation.

To get along with the harmonization program on the pesticides registration, the government of Republic of Indonesia has kept trying to adopt standards (when applicable) issued by dedicated international institution such as FAO/WHO, US-EPA, OECD and so on. Nowadays, any pesticide product that is registered in the country bears international standard as it was evaluated quite strictly when it applied for registration.

Pesticides application in Indonesia

From the perspective of crop management, the use of pesticides will be only the last alternative as the concept of IPM has been socialized as well as implemented to most Indonesian farmers, including those working on estate crops. Field schools were established at considerable number of the production center throughout the country. The implementation of IPM concept was successfully done except for those who are cultivating crops in the remote areas. There were hundreds thousands of farmers trained on IPM concept and farmer's understanding on such a concept was quite high.

Due to such a consideration, de-regulation on pesticides registration was issued on the base of IPM approach. Meanwhile, government has offered industry to apply for new registration for their products as it may create more products available in the market, hence it brings about more competition, empowering bargaining position of farmers, availability of good but affordable products, guarantee availability and so on. However, all marketed pesticide products are subject to review as they indicate negative evidence that harm people or environment when it is applied not complying with IPM concept.

Even more items are now available in the market, but in fact not all of them are really absorbed. It is going to be back on the market mechanism where the best and most competitive product can remain in the market to help farmers. Many of them seem not too attractive to use.
Pesticides may help increase the quality of agricultural products in many ways as its use quite large in quantity. Some pesticides have to be applied on the basis of interval application in case of preventing crop from suffering from a number of major diseases. Most horticultural products are considered as high-economic commodity that needs to be more protected from pest and diseases rather than any other agricultural commodity.

Meanwhile, pest and diseases problems on crops occur all the time at any time since crop are always there. Planting season all the year round obviously provide sufficient food for pest. This situation help promote threatening any cultivated crop from loss due to pests. Therefore, pesticides application may not be held from use what so ever.

Indonesia Pesticides Profile: Pesticide System Risks

The following table consolidates and prioritizes pesticide system risk in Indonesia

Problems, constraints or risks in the Indonesia pesticide cycle of use	Recommendations for donors and USAID projects	Priority
Banned POPs and PIC chemicals still enter Indonesia via informal channels	Sensitize GOI officials about the threats to Indonesia's trade potential, and do training	High
Large quantities of obsolete pesticides, including POPs and PIC chemicals, remain	Combine resources from several donors to implement disposal programs	Med
Lower quality, illegal & pirated Chinese AIs and pesticides present	Do repeated training on pesticide quality choices	Med
Funds for analyzing and monitoring pesticides and residues is insufficient	Donors and produce exporters and authorities combine resources	Med
Limited resources for pesticide regulations enforcement	Taxes need to be levied from agriculture sector	Low
Limited resources for extension	Do demonstration farms and field days	High
Lack of pesticide toxicity awareness by farmers	Do repeated training on pesticide choice and risks	Med
Limited farmer knowledge of pest Identification (ID) & IPM tools	Increase knowledge, do repeated training on IPM	High
Over- and under-applications of pesticides	Do repeated training on calibration & application	Med
Illiterate farmers cannot read pesticide labels	Do repeated training on pesticide cautions	High

Wrong pesticide applied for pest	Do repeated training on pesticide choice	High
Proximity to major cotton, tobacco and rice production & chemicals	Diversify production, knowledge & input demand	High
Pesticide shops with limited safety equipment (PPE) on hand	Train shop-keepers and farmers on proper pesticide safety	Med
Pesticides subdivided into un-labeled containers, like empty water bottles, and sold	Train shop-keepers and farmers on proper pesticide safety	Med
Pesticides stored in the home, often in un-labeled containers	Do repeated training on proper pesticide storage	High
Pesticide mixing with bare hands and little use of PPE by pesticide appliers	Do training on proper mixing and PPE to use; provide PPE	High
Pesticides applied at wrong time of day and with winds too high, and rain	Do repeated training on application times risks	Med
Back-pack sprayers leak onto spray personnel	Do repeated training on sprayer maintenance	High
Endosulfan available in bazaars and stores, and used	Do repeated training on pesticide choice & quality	High
Toxic aluminum phosphide present in input stores	Do repeated training on pesticide choice & quality	High
Proper unused pesticides & empty container disposal lacking	Do repeated training on proper disposal	High

Indonesia Pesticides Profile: Factors that reduce risks from pesticides

Reduced risk inherent in the cropping and input systems in Indonesia

- Many less toxic products are being registered and used by farmers in Indonesia, than compared with just 8 years ago when some highly toxic chemicals were still being registered and promoted.
- Many farm stores in developing countries are beginning to stock ever-increasing quantities of green-label biological pesticides (like neem oil, BT, oils with copper and sulfur, and extracts of garlic and chili pepper) made in India or Indonesia for both organic and conventional markets.
- Lower costs for biologically-derived, highly effective and approved for Organic insecticide products like spinosad, an extract from a soil bacterium are now a reality. Many newer nicotinoid insecticides are also now available, as long as they are not used when crops are in flower.
- The fact that Indonesia will, in many cases, have to follow European standards systems in order to reach European markets. Many farms oriented for export will be ever more organized following S&C systems like GlobalGAP, Organic, Fair Trade and others, which inevitably contain recommended IPM measures that work and reduced-risk pesticide products.
- The increasing world-wide availability and use of small, single-use sachets and smaller bottles of pesticides (as opposed to one and five liter bottles) with labels containing important and potentially life-saving information (in local languages) that are marketed

by the formal pesticide importer/distributor sector. These small quantities and labels help resolve on-farm pesticide quantity storage, illegal subdividing and use issues.

- The likely small scale of most USAID-supported beneficiary farms, combined with lack of financial resources, will limit the quantities of synthetic pesticides used, and will promote the use of other cultural techniques to solve pest issues.

Conclusion: There still remain some issues with pesticides that can increase the risk for errors to occur, and thus the risks that farmers, laborers, farm family members, and even international consumers may be acutely or slowly poisoned and/or their environment may become polluted and damaged. Thus the pesticide risk profile for Indonesia is higher than might be encountered in some more developed as well as other developing countries, though it is rapidly changing for the better as S&C-GAP systems are being implemented and EU rules for import tolerances are adopted. Extra care will be needed with emphasizing and implementing mitigation measures that work.

SECTION 3: PESTICIDE EVALUATION REPORT

This part of the PERSUAP, the PER (Pesticide Evaluation Report), addresses pesticide choices based upon environmental and human health issues, uses, alternate options, IPM, biodiversity, conservation, training, PPE options, monitoring and mitigation recommendations according to the twelve Regulation 216.3(b)(1) Pesticide Procedures Factors, outlined and analyzed below.

Reg. 216.3(b)(1)(i) stipulates: "When a project includes assistance for procurement or use, or both, of pesticides registered for the same or similar uses by USEPA without restriction, the Initial Environmental Examination for the project shall include a separate section evaluating the economic, social and environmental risks and benefits of the planned pesticide use to determine whether the use may result in significant environmental impact. Factors to be considered in such an evaluation shall include, but not be limited to the following:" (see box, right)

THE 12 PESTICIDE FACTORS

Factor A. *USEPA Registration Status of the Proposed Pesticides*

Factor B. *Basis for Selection of Pesticides*

Factor C. *Extent to which the proposed pesticide use is, or could be, part of an IPM program*

Factor D. *Proposed method or methods of application, including the availability of application and safety equipment*

Factor E. *Any acute and long-term toxicological hazards, either human or environmental, associated with the proposed use, and measures available to minimize such hazards*

Factor F. *Effectiveness of the requested pesticide for the proposed use*

Factor G. *Compatibility of the proposed pesticide use with target and non-target ecosystems*

Factor H. *Conditions under which the pesticide is to be used, including climate, geography, hydrology, and soils*

Factor I. *Availability of other pesticides or non-chemical control methods*

Factor J. *Host country's ability to regulate or control the distribution, storage, use, and disposal of the requested pesticide*

Factor K. *Provision for training of users and applicators.*

Factor L. *Provision made for monitoring the use and effectiveness of each pesticide*

The PERSUAP can recommend or propose specific pesticides to replace those highly used or desired pesticides that are rejected, but the job of recommending pesticides for specific uses against specific pests is usually the mainstay of a ministry of agriculture's extension service, if they have such a capability. In Annex 1, this PERSUAP proposes IPM choices available, including proposed *possible* pesticides used for the same pests in the USA and other developed countries that might be used after all other options are exhausted. Usually, a PERSUAP should not replace an extension service and the expert advice that they can provide.

It would be ideal to find pesticides for every need that are Class IV acute toxicity, have no chronic human health issues, no water pollution issues and no aquatic ecotoxicity issues. Such pesticides do not exist. Most pesticides, including "natural" pesticides, have toxicity to at least one aquatic organism, or bees, or birds.

3.1 Factor A: USEPA Registration Status of the Proposed Pesticide

USAID project activities are effectively limited to promoting during training, recommending, buying, subsidizing, financing or permitting on demonstration farms, pesticides containing active ingredients (AIs) in products registered in Indonesia by Indonesia MOA (or those that become registered by Indonesia MOA in the near future) and in the US by the EPA for the same or *similar* uses, without restriction. Emphasis is placed on "similar use" because often the crops and their pest species found overseas are not present in the US, and therefore pesticides may not be registered for the exact same use, but often are registered for similar crops, pests, methods of application, and pest situations.

The USEPA classifies pesticides according to actual toxicity of the formulated products, taking formulation types and concentrations into account, thus generally making the formulated product less toxic than the active ingredients alone would be. This method of classifying acute toxicity is accurate and representative of actual risks encountered in the field. By contrast, the WHO acute toxicity classification system is based on the active ingredient only. For a comparison of USEPA and WHO acute toxicity classification systems, see Annex 6.

In the USA, only, some specific commercial pesticide products are labeled as Restricted Use Pesticides (RUPs) due to inordinate risks, usually under specific circumstances of use, such as formulation or crop. However, for each AI, which may be present in a number of RUP products, there are generally additional or other products, formulations and uses—with the exact same AI—that do not possess the same risks and are thus labeled or determined to be General Use Pesticides—that is—not RUP. Ergo, for each AI, there may be RUP and non-RUP products depending upon risks they do or do not pose.

Analysis: Annex 7 provides EPA registration status analysis for each AI found in selected pesticides currently registered (and proposed for imminent registration) for import, imported and used in the Indonesia. Annex 7, column number three, labeled "EPA Registered" has a "yes" if the AI is registered by EPA in pesticides for same or similar uses. If column three has a "no" it is not registered by EPA and is thus one reason for shading the AI line with red—signifying that it is not approved by the PERSUAP Annex 7 analysis. Pesticide AIs that pass this registration factor, and all following pertinent factor analyses, are shaded with green.

Issue: Pesticide products analyzed and found containing active ingredients not EPA-registered or in same or similar RUP pesticide products

The following is the result of the Factor A analysis, showing pesticide AIs in Indonesia MOA-registered products, imported and used by Indonesia desired by USAID farmers, that are NOT in EPA registered products or in RUP products.

Rejected Miticide AI

- tetradifon (not EPA registered)

Rejected Insecticide AIs

- acrinathrin (not EPA registered)
- alpha-cypermethrin (not EPA registered)
- benthiocarb (not EPA registered)
- carbofuran (RUP, Class I)
- cartap hydrochloride (not EPA registered)
- chlorfenvinphos (not EPA registered)
- endosulfan (registration being phased out as banned under POPs Treaty)

- fenamiphos (not EPA registered)
- methamidophos (not EPA registered, Class I)
- monocrotophos (not EPA registered, Class I)
- profenofos (RUP)
- terbufos (RUP, Class I)
- triflumeron (not EPA registered)

Rejected Fungicide AIs
- benomyl/benalate (not EPA registered)
- iprovalicarb (not EPA registered)
- propineb (not EPA registered)
- alkyldimethylbenzyl ammonium chloride (not EPA registered)
- dichlorophen (not EPA registered)
- epoxiconazole (not EPA registered)
- flusilazole (not EPA registered)
- flutriafol (not EPA registered)
- penconazole (not EPA registered)

Rejected Herbicide AIs
- acetochlor (RUP)
- atrazine (RUP)
- chlorimuron (ethyl) (not EPA registered)
- paraquat (RUP)
- propaquizafop (not EPA registered)
- sulcotrione (not EPA registered)
- cyanazine (not EPA registered)

Rejected Rodenticide AI
- coumatetralyl (not EPA registered)

Rejected Nematicide AIs
- fenamiphos (not EPA registered)
- oxamyl (RUP, Class I)
- terbufos (RUP, Class I)

Rejected Microbicide AI
- alkyldimethylbenzyl ammonium chloride (not EPA registered)
- bromine chloride (Class I)
- formaldehyde (known carcinogen)
- quaternary ammonium (not EPA registered)
- sulfuric acid (RUP, Class I—too toxic)

Rejected Wood Preservative Pesticide AIs
- chlorpyrifos-ethyl (no longer EPA registered for use on structures where children are present)
- creosote (RUP)

Compliance Requirements

- For loans through MFIs, MEO and Agriculture Officer visits, bank/MFI reports and service provider reports will be required to ensure that no PERSUAP non-approved pesticides are financed nor utilized by loans guaranteed by USAID. In addition, MFIs should be mandated to certify in writing that PERSUAP non-approved pesticides will not be purchased or used with loan money.
- USAID project will only promote, finance and use on demonstration farms, pesticides registered by EPA for same or similar use and not classified by EPA as RUP products.
- If USAID wishes to authorize the support of any non-EPA registered or RUP product in a USAID project, including use on any demonstration farm, then a full Environmental Assessment (EA) must be done and approved by the Bureau for Asia BEO.

3.2 Factor B: Basis for Selection of Pesticides

This procedure generally refers to the practical, economic and/or environmental rationales for choosing a particular pesticide. In general, best practices and USAID – which promote IPM as policy – dictate that the *least toxic* pesticide that is effective is selected. Fortunately, as a general but important trend, the more toxic pesticides (Class I) are decreasing in number worldwide and the number of least toxic pesticides (Class IV) is increasing. Thus, farmers may be able to choose products of lower toxicity (Class III and IV/U pesticides), especially if PPE is not available or used.

Environment/Agriculture

Farmers most often choose pesticides based upon price, availability, proven efficacy (known to control the pests) and recommendations from neighbors or agrodealers. This PERSUAP, however, uses additional criteria for selection of pesticides based upon safety and acute toxicity ratings, chronic toxicity issues, groundwater safety and relative ecotoxicological safety. It is important to recall that almost every pesticide known, including almost every "natural" pesticide has toxicity to at least one aquatic organism, or bees, or birds. Most also have some human chronic health issues. Mitigation measures allow us to use these pesticides with reduced risks to human health and the environment.

Water and Sanitation

The primary chemicals used in Indonesia for water treatment are based on chlorine. Additional chemicals that can less commonly be used include those based on other halogens like bromine, iodine, as well as ozone and hydrogen peroxide. Wikipedia provides a very nice summary of water treatment and some mitigation measures at http://en.wikipedia.org/wiki/Water_purification. Mitigation measures are found at: http://www.americanchemistry.com/100years/Practices.html. Water and sanitation chemicals are chosen based upon past experience and cost.

Avian Influenza Disinfectants and Sanitizers

Because governments and donors control Avian Influenza and water disinfection, selection is made by them, generally not by beneficiaries.

EPA's list of 100 disinfectant pesticide products registered for procurement and use against HPAI in the USA is at: http://www.epa.gov/pesticides/factsheets/avian_flu_products.htm. Disinfectants are chosen depending upon cost and availability.

Safer Use Actions/Risk Mitigation

- USAID projects use and support pesticides with the lowest human and environmental risk profiles (see decision matrix in Annex 7, MSDSs, and pesticide labels), as practical. This criterion shall be fully reflected in the pest management plans (PMPs) required by this PERSUAP.
- Recommendation: Encourage Indonesia MOA to become increasingly aware of EPA-approved biological and naturally derived pesticides, as practical, such as some of those listed in Annexes 4 and 5, and consider registering some additional natural and Class IV pesticides.

3.3 Factor C: Extent to Which the Proposed Pesticide Use Is, Or Could Be, Part of an IPM Program

USAID promotes training in and the development and use of integrated approaches to pest management tools and tactics whenever possible. This section emphasizes how any of the approved pesticides can be incorporated into an overall IPM strategy, as the ultimate pest control tools, following exhaustion of all preventive tools and tactics.

Environment/Agriculture

Certainly, some of the approved pesticides are more useful and gentler on the environment than others; Annex 7 shows relative toxicities of each pesticide AI. In general, most of the natural products and extracts are less disruptive to the ecosystem. However, agricultural production cannot rely solely on the use of natural pesticides, unless they are certified as Organic.

Good crop management practices can strongly affect the success of IPM, and good agronomic or cultural practices are the most basic and often the most important prerequisites for an effective IPM program. A healthy and vigorous crop optimizes both capacity to prevent or tolerate pest damage while maintaining or increasing yield potential.

In the USA, the USDA supports several programs aimed at investigating and developing IPM tools and tactics. These include NIFA[14] (the National Institute of Food and Agriculture) and the National Sustainable Agriculture Information Service of the National Center for Appropriate Technology[15] (NCAT). Indonesia has a cadre of experts who recognize the importance of these tools and techniques, and are ready to implement them in crop-specific PMPs.

According to USAID experts in the crop protection sector, the requested pesticides are fitted into overall GAPs and IPM programs, and their use is reduced when in combination with other preventive tools, as follow:

- Soil quality and nutrition testing
- Resistant varieties
- Certified seed
- Seed treatment

[14] http://www.csrees.usda.gov/pesticides.cfm
[15] http://www.attra.ncat.org/

- Soil solarization (heating under plastic with direct sun heat)
- Raised-bed production
- Use of plastic and organic mulches
- Proper seeding/thinning rate
- Soil moisture testing
- Organic fertilizers/compost
- Synthetic fertilizers
- Crop rotation
- Green manures
- Manipulate plant/harvest time
- Trap crops
- Pruning
- Farmscaping[16]
- Correct pest/disease ID
- Weekly monitoring
- Baited traps
- Sticky traps
- Pheromone traps
- Pheromone inundation
- Crop residue destruction
- Artisanal (home made) pesticides
- Conservation practices
- Mechanical weeding
- Spot pesticide treatments
- Production of natural microbial pesticides

To further put IPM tools and tactics into practice, Annex 1 contains a detailed Crop-Pest-IPM-Pesticide matrix for each crop to be grown by USAID-assisted farmers, noting most major pests of each crop, a list of preventive tools and tactics recommended for the same pests in countries with significant commercial production and a list of natural and synthetic chemical alternatives recommended by leading state extension services in the USA.

IPM philosophy includes the use of synthetic pesticides as part and parcel of an overall harmonized and coordinated approach to pest management. The principles of IPM were initially developed by entomologists for farmers and users of insecticides, miticides, nematicides and molluscicides—because all of these chemicals impact animal biochemical pathways and are thus capable of harming other animals and beneficial animals if used unwisely or over-used. Thus, the most intense focus of traditional IPM is on these types of organisms and chemicals.

Water and Sanitation

Integrated Pest Management per se does not necessarily apply to water and sanitation. However, best practices do apply, and there are non-chemical means to disinfect or sanitize water. These include the use of ultraviolet radiation, solar treatment and membrane filtration. Other techniques include those based on mechanical and biological processes, as follows[17]: mechanical systems: sand filtration, lava filter systems and systems based on UV-radiation biological systems including plant systems as constructed wetlands and treatment ponds (sometimes incorrectly called reedbeds and living walls) and biological systems including compact systems as activated

[16] https://attra.ncat.org/attra-pub/farmscape.html
[17] http://en.wikipedia.org/wiki/Water_purification#Other_mechanical_and_biological_techniques

sludge systems, biorotators, aerobic biofilters and anaerobic biofilters, submerged aerated filters, and biorolls.

In order to purify the water adequately, several of these systems are usually combined to work as a whole. Combination of the systems is done in two to three stages, namely primary and secondary purification. Sometimes tertiary purification is also added.

Avian Influenza/Disinfectants and Sanitizers

The international—as well as many national—strategies being implemented to deal with HPAI already form an integrated program. In addition to control of the HPAI virus, most initiatives include monitoring and surveillance, zoning and compartmentalization, regulations and quarantine, vaccination, disinfection and disposal of waste[18].

Safer Use Actions/Mitigation

- Pesticide Safer Use training required under this PERSUAP will include IPM principles as well as crop- or pest-specific IPM practices relevant to the audience. (See Annex 1).
- Starting from the information in PERSUAP Annex 1 & Annex 2, value-chain projects and those otherwise supporting crop production will adopt/develop crop- and pest-specific IPM-based Pest Management Plans (PMPs)[19]. Chemical controls specified in these plans will weight low-toxicity options.
- PMPs will be translated into posters/handouts for on-farm use in prediction and management of the major pests of each crop.
- Value-chain projects and those otherwise supporting crop production will train appropriate project staff, partners and beneficiaries in these PMPs.
- These projects will require and enforce PMP implementation in situations where the project has direct control over pesticide use, and require and enforce that field extension under direct project control be PMP-based.
- Where project control over extension or agricultural practice on the ground is less than complete, these projects will promote and support PMPs to the greatest practicable extent.

3.4 Factor D: Proposed Method or Methods of Application, Including the Availability of Application and Safety Equipment

This section examines how the pesticides are to be applied, to understand specific risks with different application equipment available and application methodologies, and the measures to be taken to ensure safe use for each application type. Pesticides can and do enter the body on the hands, skin or eyes when mixing and from splashes, on back, arms and hands from leaky backpack sprayers when spraying, through the nose and mouth as vapors while spraying and from spray drift, and by mouth from ingestion on food or cigarettes.

Environment/Agriculture

[18] http://www.oie.int/animal-health-in-the-world/web-portal-on-avian-influenza/
[19] http://www.ipm.ucdavis.edu/PMG/crops-agriculture.html, see "Year-Round IPM Programs" on upper left side of website

Findings from a survey show that all of the following types of equipment or methods are used to apply pesticides to field crops or orchards in Indonesia:

- hand-pump backpack
- motorized backpack
- granular

Issue: Leaky backpack sprayers. Hand-pump backpack sprayers, used by small- and medium-scale farmers, among others, can and do eventually develop leaks at almost every parts junction (filler cap, pump handle entry, exit hose attachment, lance attachment to the hose and at the lance handle) and these leaks soak into exposed skin. Moreover, clothing serves as a wick that holds these pesticides in constant contact with the skin. Unless the clothes are washed immediately after use, other family members may also come in contact with pesticide residuals.

Safer Use Actions/ Mitigation

- USAID projects, during the pesticide safer use training required by this PERSUAP, will (1) promote and teach proper sprayer maintenance and repair; and (2) train participants on post-spray hygiene.
- USAID projects will assure and require well-maintained sprayers and proper post-spray hygiene and facilities for pesticide use under their direct control.
- Where pesticide use is not under project direct control, but the project is nonetheless supplying or directly supporting the purchase of pesticides or application equipment, the project will assure that appropriate post-spray facilities for washing clothing and equipment, and proper disposal of wastes are in place.

Issue: Pesticide granules and powders applied by hand. Many farmers that use pesticides formulated as granules or powders apply these by hand, without benefit of gloves. Gloves must be used for these applications.

Issue: Farmers do not use PPE. Most Indonesia farmers do not use PPE. However, pesticide labels provide guidance on appropriate PPE to use, and EPA has such guidance on a dedicated website[20].

Water and Sanitation

Drinking water sanitizers are generally applied by a water treatment facility. Best practices for handling, applying and reducing risks from water sanitizers are found through the Asian Development Bank[21].

Avian Influenza/Disinfectants and Sanitizers

Annex 7 contains microbicides registered for use in Indonesia for disinfecting water and for use in HPAI. Most disinfectants are Class I toxins and are exceptionally corrosive to eyes, skin and mucous membranes, especially necessitating the use of goggles or eye protection, chemical-

[20] http://www.epa.gov/oppfead1/safety/workers/equip.htm
[21] http://www.adb.org/Evaluation/case-studies/2006-AER/Best-Practices-WaterSupply-Sanitation.pdf

resistant gloves, a carbon-filter respirator and a spray suit to protect clothing and skin. For this reason, most microbicides/disinfectants are shaded yellow for caution. For water treatment, water is exposed to a disinfectant while it is pumped through a treatment facility. Disinfectants for Avian Influenza are often applied by bucket and mop or hand brush.

The best information on how to apply the disinfectants safely will be found on the product or container labels. In the USA, EPA requires that all products have labels containing application and safety procedures. For products that are registered in the USA, it is best to use the following website http://oaspub.epa.gov/pestlabl/ppls.home to see web copies of the labels. Products not registered in the USA are also likely to have labels with the same type of information, as most international standards require. It is not efficient to repeat that information here; click on the website for updated information.

Safer Use Actions/ Mitigation

- The pesticide safer use training required by this PERSUAP will include descriptions of health risks to spray operators (see risks for each pesticide AI in Annex 7), use of appropriate PPE and its maintenance, and advice on minimizing discomfort from wearing PPE, such as spraying in the afternoon when it is cooler and the honeybees do not forage, and when there is little wind or sun and no rain.
- Where pesticide use is under their direct control, USAID projects shall assure that appropriate PPE is provided, is well maintained, and properly utilized. This includes the use of gloves for granular applications.
- Where pesticide use is not under project direct control, but the project is nonetheless supplying or directly supporting the purchase of pesticides or application equipment, the project will assure that appropriate PPE is available and undertake all feasible measures to promote its use.
- Recommendation: As appropriate, USAID projects will promote the development and use of professional spraying and record-keeping services, accessible by farmers at congregation places (farms stores, cooperatives/associations, produce consolidation/cold storage/processing sites). Spray service companies that may be specifically promoted by USAID projects will demonstrate that they maintain spray equipment and use recommended PPE.

3.5 Factor E: Any Acute and Long-Term Toxicological Hazards, either Human or Environmental, Associated With the Proposed Use, And Measures Available To Minimize Such Hazards

This section of the PERSUAP examines the acute and chronic toxicological risks associated with the proposed pesticides. Information on specific risks to environmental resources and how to mitigate or minimize such risks are detailed below under Factor G.

Pesticides are poisons, and nearly all of them—including natural ones—present acute and/or long-term toxicological hazards, especially if they are used incorrectly. The pesticide AI analysis matrix in Annex 7 contains information on acute and chronic human and environmental toxicological risks for each AI in products registered for use in Indonesia.

Pesticides that are rejected by this Factor E analysis are as follows:

Rejected Insecticide AIs

- carbofuran (Class I)
- endosulfan (registration being phased out as banned under POPs Treaty)
- methamidophos (Class I)
- monocrotophos (Class I)
- terbufos (Class I)

Rejected Nematicide AIs

- oxamyl (Class I)
- terbufos (Class I)

During the entire PERSUAP study, there were no documented instances of pesticide poisoning of people or environmental resources, other than uses of pesticides for suicide. There were no recorded fish or wildlife kills.

The Stockholm Convention on Persistent Organic Pollutants (POPs) and Rotterdam Convention's Prior Informed Consent (PIC) procedure which list banned and highly regulated toxic chemicals, respectively, were not known when Regulation 216 was written, so there is no language directly governing their use on USAID projects. Nevertheless, they present high risks to users and the environment, due to persistence and toxicity. It is thus prudent that they be discussed. The following websites contain current lists of all POPs and PIC chemicals: http://www.pops.int; http://www.pic.int.

With the exception of chlordane, endosulfan and monocrotophos, none of the chemicals contained on the 2011 POPs or PIC lists were found to be present in Indonesia and they will be increasingly unlikely to be found in the future as world-wide production of most of these chemicals has ceased or is ceasing. Further, there are numerous less-toxic replacements for all of these chemicals. These newer chemicals are rapidly replacing the older, more dangerous chemicals. Pesticides containing chlordane, endosulfan and monocrotophos should not be used on USAID projects.

Safer Use Actions/ Mitigation

- Since many Indonesia farmers will not use PPE, pesticides with high acute toxicity (Class I) will not be used or supported on USAID activities. PPE use must be ensured for those chemicals that are potential carcinogens (PC) or likely carcinogens (LC) in Annex 7. No known carcinogens are on the allowed pesticides list. (See Section 4: Safer Use Action Plan). All of these have been shaded in red in Annex 7 and do not appear in Annex 1.
- The pesticide safer use training required by this PERSUAP will include basic first aid for pesticide overexposure, availability and use of antidotes, and following recommendations found on pesticide Labels and MSDSs for commonly used pesticides.

3.6 Factor F: Effectiveness of the Requested Pesticide for the Proposed Use

This section of the PERSUAP requires information similar to that provided previously, but more specific to the actual conditions of application and product quality. This section considers the use of low-quality generic products (such as some of those imported from China and India, from where most generic pesticides originate) as well as the development of pest resistance to proposed pesticides, both of which will decrease effectiveness (efficacy).

Environment/Agriculture

Pesticides are important pest management tools. Many pesticides gradually lose their effectiveness—especially if overused and not rotated with other classes of pesticides—due to the development of resistance by pests. Pest resistance is a heritable and significant decrease in the sensitivity of a pest population to a pesticide that is shown to reduce the field performance of those specific pesticides.

The management of the development of pesticide resistance is an important part of sustainable pest management and this, in conjunction with alternative pest management strategies and Integrated Pest Management (IPM) programs, can make significant contributions to reducing risks to humans and the environment. Annex 7 serves as one tool for managing resistance by providing the class of each pesticide AI, so that project field managers and farmers can rotate pesticides among classes.

Pests known to have developed significant pesticide resistance (especially to older-generation organophosphate, carbamate and synthetic pyrethroid insecticides, strobin fungicides and azine herbicides) globally:

- Whiteflies
- Aphids
- Spider mites
- Thrips
- Mealybugs
- Scales
- Psyllids
- Colorado Potato Beetle
- Corn Earworm
- Powdery mildew
- Downy mildew

Pesticides with known global resistance by certain pests or diseases (use with care—do careful calculations of dose—and rotate with other classes or families of pesticides)

- Most of the older and more toxic pesticides no longer registered by EPA, already rejected
- Many of the synthetic pyrethroids already rejected due to RUPs
- Permethrin
- Strobin fungicides
- Glyphosate herbicide
- Azine herbicides

Issue: Lack of knowledge and information on reduced pesticide effectiveness and resistance. At some point, project field staff and farmers may begin to note that some products no longer work well to control pests in their field, and will likely begin to blame pesticide manufacturers for

a weaker product. This could be due to the use of cheap generic products, improper dosing, or the development of resistance. Farmers should be trained to understand the development of resistance, and project implementers should be on the lookout for it during their field visits.

A resistance management strategy should also consider cross-resistance between pesticides with different modes/target sites of action. Pests may develop cross-resistance to pesticides based on mode/target site of action. Annex 1 shows IPM tools that are currently effective against specific pests of USAID crops. It also contains, where relevant, comments about rotating pesticides or any resistance issues of importance that are known for that pest and type of pesticide.

The website http://www.pesticideresistance.com/ can be used to search for specific known resistance issues in countries with certain pest or disease resistance to specific pesticide AIs with the resources to buy and use large quantities of pesticides. Fungicide resistance and rotation recommendations are found on the Fungicide Resistance Action Committee (FRAC) website http://www.frac.info/frac/index.htm.

If pesticide use is warranted and a risk of pesticide resistance development is identified, a ***Resistance Risk Management*** approach should be followed. The following section details points of concern for both application equipment and pesticide applications.

Ways to address and manage or mitigate pest resistance:

- **Use IPM to minimize pesticide use:** Minimizing pesticide use is fundamental to pesticide resistance management. IPM programs incorporating pest monitoring in USA states of California, New York, Maryland and Canada have demonstrated 25 to 50% reduction in pesticide use with an increase in crop quality. IPM programs will help determine the best application timing for pesticides (when they will do the most good), thus helping to reduce the number of applications.

  The use of nonchemical strategies, such as pest exclusion (e.g., screening, microtunnels, greenhouses), host-free periods, crop rotation, biological control, and weed control may reduce the need to use chemicals and consequently slow the development of pesticide resistance.

- **Avoid Knapsack Mixes:** Never combine two pesticides with the same mode of action in a tank mix (e.g., two organophophate insecticides or two azine herbicides). Such a 'super dose' often increases the chances of selection for resistant individuals. In some cases, mixing pesticides from two different classes provides superior control. However, long-term use of these two-class pesticide mixes can also give rise to pesticide resistance, if resistance mechanisms to both pesticides arise together in some individuals. Continued use of the mixture will select for these multiple-pesticide-resistant pests.

- **Avoid Persistent Chemicals:** Insects with resistant genes will be selected over susceptible ones whenever insecticide concentrations kill only the susceptible pests. An ideal pesticide quickly disappears from the environment so that persistence of a 'selecting dose' does not occur. When persistent chemicals must be used, consider where they can be used in a rotation scheme to provide the control needed and with a minimum length of exposure.

- **Use Long-term Rotations:** Resistance management strategies for insects, weeds, and fungal pathogens all include rotating classes of pesticides. Pesticides with the same modes of action

have been assigned the same group number by their respective pesticide resistance action committees, Insecticide Resistance Action Committee (IRAC), Fungicide Resistance Action Committee (FRAC), and Herbicide Resistance Action Committee (HRAC). These group numbers have been included in the treatment tables of this guideline to help clarify when rotating pesticides, which ones can be rotated.

However, the strategies used in rotations differ. For example, with fungicides, it is suggested that classes be rotated every application. With insecticides, a single chemical class should be used for a single generation of the target pest followed by a rotation to a new class of insecticide that will affect the next generation and any survivors from the first generation. Longer use of a single chemical class will enhance the chance of resistance since the survivors of the first generation and the next will most likely be tolerant to that class. Rotating through many chemical classes in successive generations will help maintain efficacy.

Water and Sanitation

Although microbial resistance to antibiotics like pharmaceuticals is well known, resistance by microbes to highly toxic disinfectants is rare. Furthermore, chlorine compounds used for treating water are highly effective and this is the reason that they continue to be used to the present time. These microbicides and disinfectants remain effective.

Avian Influenza/Disinfectants

Fortunately, most disease-causing viruses have not developed resistance to most disinfectants. The HPAI virus is not omnipresent and thus is not continuously exposed to disinfectants to which it might develop some resistance. However, it is still a good idea to rotate disinfectants to reduce the chance of resistance.

Safer Use Actions/ Mitigation

- For any pesticides directly purchased or applied, USAID projects will use quality name-brand products.
- The pesticide safer use training required by this PERSUAP and extension activities will include the fundamentals of "safer pesticide purchase," including to encourage farmers to use quality name-brand products and discourage farmers from using cheap generic products.
- The pesticide safer use training required by this PERSUAP and extension activities will teach and emphasize proper sprayer calibration and spray nozzle choice.
- PMPs and extension will include and emphasize pesticides rotation among the classes of pesticides to reduce the development of resistance and the above recommendations for reducing resistance.

3.7 Factor G: Compatibility of the Proposed Pesticide Use with Target and Non-Target Ecosystems.

This section examines the potential effect of the pesticides on organisms other than the target pest. Non-target ecosystems include protected areas, species and water resources. Non-target species of concern include fish, honeybees, birds, earthworms, aquatic organisms and beneficial insects.

Issue: Pesticides can impact biodiversity and protected areas

Annex 7 compiles the known risks to the different types of terrestrial and aquatic organisms referred to above for each pesticide active ingredient found in pesticide products registered for use in Indonesia and covered by this PERSUAP, so that informed product choices can be made if a pesticide is to be used in or near sensitive areas or resources.

A USAID Environmental Threats and Opportunities Assessment (ETOA) analysis was performed in 2011 for Indonesia and it identified critical protected areas and biodiversity protection issues. Among them, under Economic Growth, is support to agriculture initiatives including use of fertilizers, pesticides and potential future use of Genetically Modified Organisms (GMOs).

Major National Parks in Indonesia are listed and detailed very nicely, by island, on Wikipedia website http://en.wikipedia.org/wiki/List_of_national_parks_of_Indonesia, thus they will not be copied and repeated here. Just click on the link and see them. Furthermore, the wiki website will be updated from time to time and hot linking to it will provide those updates.

Safer Use Actions/ Mitigation of Risks to Sensitive Areas

- Before the development of PMPs, identify and map all sensitive areas near the project sites.
- Maintain a 2.5 to 5 km buffer no-spray zone around national parks or other protected areas.
- Use GAPs and avoid using highly toxic or persistent pesticides where endangered species are known to exist.
- Recommendation: If agricultural production is done within 10km up-wind or up-stream from a protected area, USAID projects should investigate and strongly recommend the use of botanical and biological controls, as practical, or produce Organic crops near these valuable natural resources.

Issue: Pesticides can persist in the environment after application

The effect of each pesticide on non-target ecosystems will depend on how long it stays in the environment, that is, its rate of breakdown, or half-life. Half-life is defined as the time (in days, weeks or years) required for half of the pesticide present after an application to break down into degradation products. The rate of pesticide breakdown depends on a variety of factors including temperature, soil pH, soil microbe content and whether or not the pesticide is exposed to light, water, and oxygen.

Many pesticide breakdown products are themselves toxic, and each may also have a significant half-life. Since pesticides break down with exposure to soil microbes and natural chemicals, sunlight and water, there are half-lives for exposure to each of these factors. Fortunately, most of the very persistent pesticides AIs, like chlorinated hydrocarbons, are no longer available or used in modern agriculture.

Pesticides with a long residual period (that are labeled persistent and may last for years) include atrazine herbicide and organochlorine pesticides. Many if not most of the newer carbamate, organophosphate, neonicotinoid, synthetic pyrethroid, natural botanical and microbial extracts,

mineral and vegetable oils, soap fatty acids and growth regulator insecticides and most fungicides recommended in Annex 1 break down much more quickly in the environment, generally within weeks.

Safer Use Actions/ Mitigation

- Wherever possible, USAID projects use those pesticide AIs suggested in Annex 1 (none of which are judged to be unreasonably persistent or known water pollutants—see below).

Issue: Pesticides can adsorb (stick to) to soil, leach and contaminate groundwater resources

Each pesticide has physical and chemical characteristics, such as solubility in water, ability to bind to soil particles and be held there (adsorbed) and their natural breakdown rate in nature. If they are strongly held by soil they do not enter the soil water layers and the ground water table as easily. A listing of these properties for at least some of the pesticides in use in Indonesia can be found by checking at this website: http://sitem.herts.ac.uk/aeru/footprint/en/index.htm.

In general, pesticides with water solubility greater than 3 mg/liter have the *potential* to contaminate groundwater; and pesticides with a soil adsorption coefficient of less than 1,900 have the *potential* to contaminate groundwater. In addition, pesticides with an aerobic soil half-life greater than 690 days or an anaerobic soil half-life greater than 9 days have the *potential* to contaminate groundwater. Moreover, pesticides with a hydrolysis half-life greater than 14 days have *potential* to contaminate groundwater.

The potential for pesticides to enter groundwater resources depends, as indicated above, on the electrical charge contained on a pesticide molecule and its ability and propensity to adhere to soil particles, but this also depends on the nature and charge of the soil particles dominant in the agriculture production area. Sand, clay and organic matter, and different combinations of all of these, have different charges and adhesion potential for organic and inorganic molecules. Sandy soil often has less charge capacity than clay or organic matter, and will thus not interact significantly with and hold charged pesticide molecules. So, in areas with sandy soil, the leaching potential for pesticides is increased, as is the velocity with which water and the pesticide migrate.

A pesticide's ability to enter groundwater resources also depends on how quickly and by what means it is broken down and the distance (and thus time) it has to travel to the groundwater. If the groundwater table is high, the risk that the pesticide will reach it before being broken down is increased. Thus, a sandy soil with a high water table is the most risky situation for groundwater contamination by pesticides. Groundwater contamination potential for each pesticide active ingredient available in Indonesia is provided in Annex 7.

The following are *known* water pollutants and thus should not be used in areas with high water tables and sandy soil:

AIs in Insecticides known to pollute water

- cyromazine

AIs in Herbicides known to pollute water

- dacthal
- diuron

- metolachlor/S-metolachlor

Safer Use Measures/Mitigation

- Do not use or recommend for use herbicides or other pesticides with high leaching and groundwater pollution potential (see Annex 7) near drinking water sources, on highly sandy soils or soils with water tables close (2-3 meters) to the surface.

Issue: Pesticides can damage environmental resources/non-target organisms

Improperly used pesticides can and do damage the following natural resource/non-target organisms:

- honeybees—needed for pollinating two-thirds of all crops
- fish—needed for aquifer health and human food
- birds—needed to control insect pests
- predators and parasitoids—needed to control insect pests
- earthworms—needed for soil health
- mollusks and crustaceans—needed for aquifer health and human food
- clean water—needed for drinking, irrigating and washing
- biodiversity and rare species—needed for ecosystem functioning

Safer Use Actions/Mitigation

Where a project has direct control over pesticide use, assure the following. Where a project is supporting or recommending pesticide use but has less than complete control, take all practicable measures to assure the following:

- Do not apply granular pesticides in fields frequented by migratory waterfowl. Completely cover granules with soil, especially spilled granules at the ends of rows
- Do not spray or rinse equipment in or within 30 meters of ponds, drainage ditches, and surface waters
- Minimize chemical spray drift by using low-pressure sprays and nozzles that produce large droplets, properly calibrating and maintaining spray equipment, and use of a drift-control agent
- Do not spray pesticides with high toxicities to aquatic organisms before an impending rainstorm, as they can be washed into waterways before breaking down.
- Ensure that pesticides labeled for certain types of use environments, or areas, are in fact used according to label recommendations.
- Since transport of soil particles with pesticides adsorbed to them is a likely transportation route to waterways, employ techniques to reduce farm soil erosion whenever erosion is likely (such as terracing, employing ground covers between rows, planting rows perpendicular to the slope, using drip irrigation, and so on).
- Warn beekeepers of upcoming spray events so that they may move or protect their hives;
- Spray at night (best), very early morning or late afternoon when winds are below 13 kph, there is no rain and bees do not forage
- Read and follow pesticide label instructions including environmental warnings

- Choose the pesticide least toxic to fish and wildlife (see Annex 7, MSDS and pesticide label)
- Properly dispose of empty pesticide containers (provide training on what this means locally)

3.8 Factor H: Conditions under Which the Pesticide Is To Be Used, Including Climate, Geography, Hydrology, and Soils

In general, in addition to covering biodiversity and protected areas under Factor G above, this requirement attempts to protect natural resources from the dangers of pesticide misuse and contamination, especially of groundwater resources.

Indonesia Climate and Geography

Indonesia's climate and geography are described in the background section to this report, with maps on rainfall, temperatures and country relief; refer to them for background on this factor.

Indonesia Watersheds and Hydrology

The FAO website http://www.fao.org/docrep/006/ad085e/ad085e17.htm provides a very nice discussion of watersheds and issues in Indonesia. There is no need to copy and repeat the same information here. Just click on the above link to find updated watershed information and discussion, as FAO updates their site.

Recommendation:

- Avoid applying pesticides within 30 meters of watersheds and bodies of water.

Indonesia Soils

The map below http://eusoils.jrc.ec.europa.eu/esdb_archive/eudasm/asia/maps/ID1000_08SO.htm shows Indonesia soils. A discussion of Indonesian soils, with a 2010 map, database and soil organic carbon content (useful for climate change estimations) is also available at http://balittanah.litbang.deptan.go.id/dokumentasi/prosiding/fftc/05-Rizatus%20Shofiyati_soil%20database.pdf.

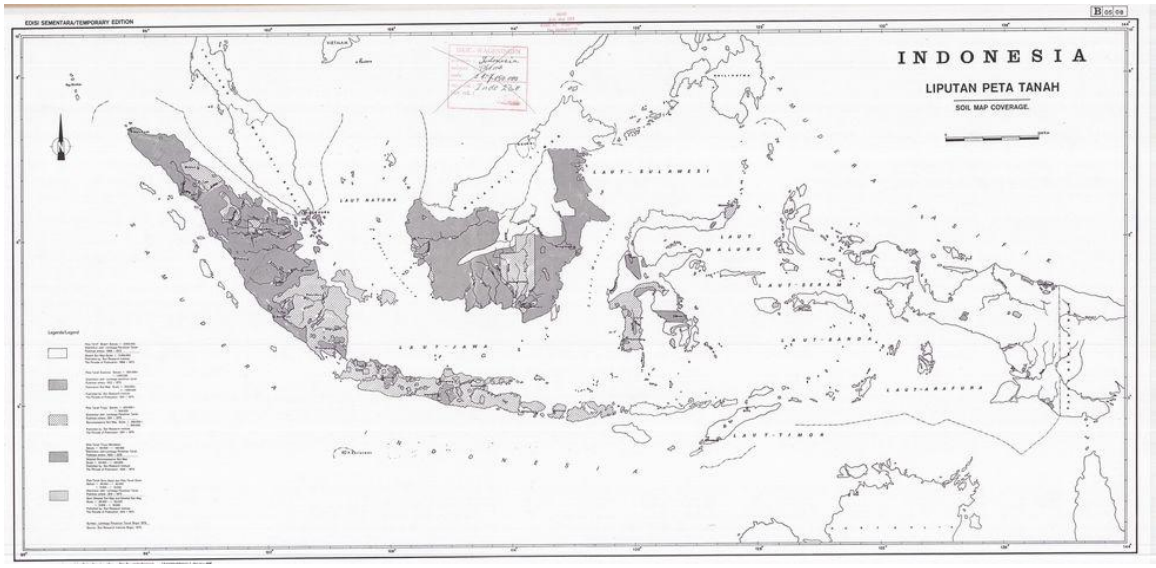

Figure 4: Indonesia soils map

The rocks of Indonesia, the source of soil, are predominantly andesitic volcanics (dark gray rocks made of the minerals oligoclase or feldspar), rhyolites (an acidic lava form of granite), granites and sediments. The soils in humid regions are mainly lateritic (containing mostly iron oxides and aluminum hydroxide) and of varying fertility depending on the source rock. These include gray-black margalite soils, heavy black soils and limestone soils.

Safer Use Actions/Mitigation

Where a project has direct control over pesticide use, assure the following. Where a project is supporting or recommending pesticide use but has less than complete control, take all practicable measures to assure the following:

- **Hydrology.** Do not spray or rinse pesticide equipment in or within 30 meters of ponds, irrigation and drainage ditches, and other surface waters.

  Do not spray pesticides with high toxicities to aquatic organisms before an impending rainstorm, as they can be washed into waterways before breaking down.
- **Soils:** Do not use or recommend for use herbicides or other pesticides with high leaching and groundwater pollution potential (see Annex 7) near drinking water sources, on highly sandy soils or soils with water tables close (2-3 meters) to the surface.
- **Soils:** Since transport of soil particles with pesticides adsorbed to them is a likely transportation route to waterways, employ techniques to reduce farm soil erosion whenever erosion is likely. Such techniques include vegetated buffer strips, green manure, mulching, terracing, employing wind breaks, employing ground covers between rows, planting rows perpendicular to the slope, using drip irrigation, and so on).

3.9 Factor I: Availability of Other Pesticides or Non-Chemical Control Methods

This section identifies less toxic synthetic, as well as non-synthetic or 'natural' (extracts of naturally-occurring plants, spices, oils, fatty acids, induced resistance elicitors, minerals, microbes or microbial extracts) pesticide options for control of pests, and their relative advantages and disadvantages. Many of these 'natural' pesticides can be toxic to humans, and several are even classified as RUPs due to environmental risks; thus safe pesticide use practices extend to these natural as well as synthetic (produced in laboratories or factories) pesticides.

Environment/Agriculture

Annex 1—the heart of this PERSUAP—contains numerous non-chemical control methods for every major pest of every USAID-supported crop in Indonesia. It is the intent of this PERSUAP that USAID projects dealing with agriculture use this valuable resource, which compiles all known IPM tools and tactics for each pest of each crop. It can be considered as a pullout, stand-alone section that can be reproduced as necessary, and should be considered for translation into local languages, lamination, and distribution to farm input supply companies to help advise farmers at point-of-purchase.

Issue: Natural pest controls availability

Natural chemicals: Many non-synthetic chemical IPM tools and technologies are listed in Annexes 4 and 5. The list of natural pesticides likely entering Indonesia is not very extensive compared with other emerging market countries.

In general, most synthetic nematicides and soil pesticides/fumigants are very highly toxic. However, there are some companies producing next-generation natural chemicals in the USA: Bio Huma Netics, http://www.bhn.name for natural nematicides and Agra Quest, http://www.agraquest.com for bioactive essential oils.

For commercial operations, especially greenhouses, biological controls and beneficial organisms are available commercially from two large international companies, Koppert of Holland and Biobest of Belgium. Koppert provides many biological controls against spider mites, beetles, leaf miners, mealy bugs, thrips, aphids, whiteflies, and moth and butterfly larvae. Koppert also provides the Koppert Side Effects List, a list of the side effects of pesticides on biological organisms, at http://www.koppert.com.

Biobest of Belgium provides many of the same or similar biological controls as Koppert, and includes a control against leafhoppers. Their website is: http://www.biobest.be. These are especially useful for greenhouse and seedling production systems. Both companies also sell live bumblebees for greenhouse pollination assistance.

Avian Influenza/Disinfectants

The primary alternatives to disinfectants to control bird flu are containment and quarantine of both infected and uninfected birds, as well as practices found in website noted above under Factor C[22]. The non-chemical alternative to chemical water disinfection is to use radiation, like UV rays.

Safer use Measures/Mitigation

[22] http://www.oie.int/animal-health-in-the-world/web-portal-on-avian-influenza/

- As appropriate, USAID projects will promote low-risk preventive and natural chemical pest controls that are found in Annexes 1, 4 and 5 of this PERSUAP, including incorporating these controls in the pest management plans (PMPs) developed under this PERSUAP.

3.10 Factor J: Host Country's Ability to Regulate or Control the Distribution, Storage, Use, and Disposal of the Requested Pesticide

This section examines the host country's existing infrastructure and human resources for managing the use of the proposed pesticides. If the host country's ability to regulate pesticides is inadequate, the proposed action – use of pesticides – could result in greater risk to human health and the environment.

The Ministry of Agriculture in Indonesia has produced pesticide regulations and has a long list of permitted pesticides for agricultural pest control. Some unregistered pesticides, likely entering the country informally through Malaysia, are found in Indonesia pesticide stores.

For a country where PPE is, for all intents and purposes, not much used on small-scale farms, there are still some very toxic products being sold in quantity, all of which leads to increased risk. Several dangerous chemicals that should be banned or restricted are still encountered in Indonesia. These include insecticide AI containing carbofuran (Class I), endosulfan (banned internationally on the POPs list), methamidophos (PIC chemical) and herbicides containing alachlor, atrazine, and paraquat. Fumigant AIs aluminum phosphide and metam-sodium present some of the highest risks to those on USAID activities not using them properly to treat stored grains and soil pests. Small-scale farmers should be encouraged by USAID projects to switch to newer chemicals. Several safer alternatives to these older types of chemicals now exist.

Disposal of obsolete pesticides

As of 2006, Indonesia retained almost 19,000 kgs of obsolete pesticides. As of 2013, there is no news of these stockpiles being disposed of.

Disposal of pesticide containers

Discussions with Indonesia pesticide system actors indicate that the issue of the final disposition of empty pesticide containers is well understood. The present solution is to triple-rinse the containers, puncture them to discourage re-use, and bury or burn them. Burning plastic bottles and single-use sachets can lead to the formation of toxic furans and dioxins, and is not recommended. CropLife International is in the process of promoting a program to collect, clean, puncture and recycle empty containers in Indonesia.

GlobalGAP and other S&C systems require that empty pesticide containers are triple rinsed over a pesticide mixing pit, and then properly stored in plastic drums in the field or storage shed, to await disposal. Website http://www.epa.gov/oppfead1/labeling/lrm/chap-13.htm provides pesticide and container best practices disposal options.

Safer Use/Mitigation Actions

- Absolutely no POPs or PIC chemicals will be used or supported on USAID projects. This includes but is not limited to, the following chemicals encountered in Indonesia: methamidophos (PIC chemical) and endosulfan (added in 2011 as a POPs chemical). No

such AIs are included in the allowed pesticides list. (See Section 4: Safer Use Action Plan.)

- Where alternatives (Classes III and IV/U) exist, do not recommend or use EPA and WHO Acute Toxicity Class II pesticide products on USAID projects, unless the USAID project can verify that producers and laborers (pesticide applicators) properly and consistently utilize PPE as recommended by the pesticide label and MSDS.
- PMPs and field extension will give preference to the use of Class III and IV/U pesticide alternatives, which exist in large numbers in farm stores visited.
- For all project commercial farms supported by USAID, encourage and support the use of GlobalGAP best practices with pesticide storage, use and disposal, whether or not certification is sought.
- If the Indonesia pesticide container recycling facility is brought on-line during the life of the project, USAID should encourage its use.

3.11 Factor K: Provision for Training of Users and Applicators

USAID recognizes that, in addition to the use of PPE, safety training is an essential component in programs involving the use of pesticides. The need for thorough training is particularly acute in emerging market countries, where the level of education of applicators may typically be lower than in developed countries.

Issue: Farmers need intensive and repeated training

Training in Safe Pesticide Use and GAP/IPM are of paramount importance for USAID project beneficiary farmers and farm laborers using pesticides. Donors have been providing such training. Additional and refresher trainings are superb means for effecting beneficiary farmer behavioral change, now especially, as they expand their agricultural opportunities, and before risky behaviors become set.

Safer Use/Mitigation Actions

- USAID projects will implement IPM and Pesticide Safer Use training for all relevant project staff and beneficiaries, training all target individuals within 6 months and providing short annual refresher training thereafter.
- Wherever relevant, USAID projects will provide training to project staff, and beneficiary farmers and extension agents on the crop-specific, IPM-based pest management plans required by this PERSUAP. Simple crop/pest cycle handouts for farmers should be introduced in these trainings and used in field extension.
- Recommendation: USAID projects develop and deliver a course to train trainers in GlobalGAP to compliant procedures and to work with the MOA on chemical registration, storage, and disposal issues.
- USAID projects conduct farmer-training programs on monitoring and data record keeping techniques for pest control and pesticide needs and/or effectiveness.

3.12 Factor L: Provision Made For Monitoring the Use and Effectiveness of Each Pesticide

Evaluating the risks, impacts and benefits of pesticide use should be an ongoing, dynamic process. Pest resistance is one of the risks for which this element is intended, as well as human health and safety and environmental effects.

Record keeping should track quantities and types of pesticides used, where they were used and what they were used for with notes on efficacy. Records of training received are also important to keep, if GlobalGAP standardization or certification will be sought. Notes on effectiveness of individual pesticides and pest numbers will help develop a more sustainable pesticide use plan for USAID beneficiary producer. Records of farmers will need to make note of any reductions in pesticide efficacy experienced, which is the first indication that resistance may be developing, and then a strategy needs to be in place to determine a shift to a different pesticide class, and rotation among classes, to overcome resistance development.

Issue: USAID beneficiaries and farm record keeping

On USAID project demonstration farms, pesticide use documentation is available sporadically and not retained from year to year. Developing a more systemized approach to record keeping will allow seasonal and annual comparison of pesticide effectiveness, pest numbers, crop production, maintenance of safety equipment, and so on. The following aspects should be included in the record keeping system, for a USAID-funded program:

- Local regulatory compliance: A list of country laws related to the use of agrochemicals for plant protection, short notes on the relevance of the law, dates the laws come into or exit force and MRLs for each crop-pesticide combination.
- A pesticide checklist: This list allows agronomists to ensure that the pesticides they are using are registered. It should also provide notes on special safety requirements.
- GAPs/IPM measures tried/used (see Annex 1): USAID agronomists should try to incorporate a minimum of at least ten new IPM measures per annum and document their success or failure.
- PPE: Lists of the types of equipment made available to applicators, number of pieces, prices and contact details of suppliers, dates when equipment needs to be washed, maintained or replaced. PPE should be numbered or personally assigned to applicators to ensure that it is not taken into the home where (as a contaminated material) it could pose a risk to family members.
- Monitoring/recording pests: Agronomists should incorporate into their records regular field pest monitoring and identification. This could be done by the agronomists themselves, or if properly trained, by farmers.
- Environmental conditions: Field conditions should be incorporated into the record keeping system (for example; precipitation, soil analyses and moisture, soil pH, temperatures and so on).
- Information should be transmitted at least annually and USAID should report to USAID on this progress in pesticide safety and GAP/IPM use in annual reports.

Issue: Monitoring by USAID field staff and beneficiary farmers should detect:

- Resistance: Pesticide resistance development among pests has likely occurred and could eventually occur more, and will be noted by farmers complaining that the spray no longer works as it once did.
- Human poisonings and any incidences of chronic health issues.
- Farm animal and livestock deaths.
- Any incidences of water pollution.
- Fish, bird, wildlife or honeybee kills.

Any of the above items should be reported immediately to USAID. Other information should be transmitted at least annually to USAID, and USAID should report on this progress in pesticide environmental and human health safety in annual reports.

Issue: USAID Planning and Reporting

Several issues could receive even more attention in USAID annual work plans and annual reports. These include a section on Environmental Impact Mitigation and Best Practices, with subsections (and issues) on:

- Country and EPA regulation compliance (documents and enforcement status, risk, pollution, mitigation)
- GAPs/IPM measures tried/used and on what percent of project farms
- Biodiversity and conservation (soil, water, energy, protected habitats, biodiversity and protected species) measures used on what percent of farms
- Inputs and PPE use and issues (types, amounts and issues with products, sprayers, MRLs, REIs, PHIs, MSDSs)
- Training/capacity building in IPM and Safe Use (hands-on, demos, sessions, meetings, extension, flyers, brochures, pamphlets, posters, crop technical GAP information sheets, and radio and TV outreach/safety message enforcement)
- Using Annex 10, USAID project staff should put brief plans for monitoring the environmental and human health impact of production activities, incorporating recommendations found in this PERSUAP into the Annual Action Plans.
- USAID staff keeps records on the implementation of the recommendations found in this PERSUAP, and report on them in Quarterly and Annual Reports, under a heading titled "Environmental Impact Mitigation and Best Practices".
- USAID projects COR, MEO and REA, at least two times annually, make auditory visits to several randomly selected farms receiving assistance through the USAID project and check for non-compliance with the recommendations on pesticides and IPM found in this PERSUAP.

SECTION 4: PESTICIDE SAFER USE ACTION PLAN (SUAP)

4.1 Introduction

This Safer Use Action Plan, is the definitive statement of IP pesticide compliance requirements and is synthesized from the PER analysis:

- Section 4.2, immediately below, enumerates allowed pesticides.
- Section 4.3 establishes USAID field monitoring requirements for compliance with safer use conditions
- Section 4.4 summarizes the safer use conditions attendant to use/support of these pesticides.
- These conditions are then detailed in the attached **mandatory template** for assigning responsibilities and timelines for implementation of these requirements, and for tracking compliance.

Each project subject to this PERSUAP must submit a completed SUAP template to its AOR/COR by September 30, 2013 and provide an annual update thereafter.

With respect to pesticides, the Safer Use Action Plan satisfies the requirement for an environmental mitigation and monitoring plan (EMMP). The project EMMP should simply incorporate the SUAP by reference.

4.2 Allowed Pesticides

Synthesizing across the PER analysis, ONLY the below-listed pesticides (active ingredients) on the left side of this page are permitted for use/support in USAID/Indonesia Sustainable Economic Growth projects. For reference, AIs considered, but REJECTED are also listed. The pesticide AIs on the right side of this page have been rejected by this PERSUAP.

Allowed Fumigant AIs **(with strict conditions)**

- aluminum phosphide for stored grains (for use only by trained and certified applicators, not farmers; see Fumigation PEA)
- metam sodium for soil pests, diseases and weed seeds (for use only by trained and certified applicators, not farmers; see Fumigation PEA)

Allowed Miticide AIs registered by Indonesia MOA

- abamectin/avermectin (use only formulations below 1.9%)
- amitraz

Rejected Miticide AIs registered by Indonesia MOA and considered but **Rejected for "Use" by USAID Projects**

- tetradifon (not EPA registered)

Allowed Insecticide AIs registered by Indonesia MOA

- abamectin/avermectin (use only formulations below 1.9%)
- acetamiprid (but only when plants are in vegetative state, not when flowering due to risk to pollinators and honeybee colony collapse disorder)
- *Bacillus thuringiensis*-BT
- *Beauveria bassiana*
- dichlorvos/DDVP (use only acute toxicity Class II and III products; not Class I)
- chlorpyrifos-ethyl (for uses except spraying for household pests, favor the use of granular formulations for soil pests)
- cyfluthrin (use only acute toxicity Class III products; not Class II)
- cypermethrin (registered USA for medical, veterinary and household use)
- cyromazine (for use only in areas without high water table and sandy soil)
- deltamethrin
- dimethoate
- ethofenprox
- fenitrothion
- fipronil (registered USA for use against termites, ticks, mites, fleas, ants, roaches and mole crickets)
- imidacloprid (but only when plants are in vegetative state, not when flowering due to risk to pollinators and honeybee colony collapse disorder)
- lambda cyhalothrin (use only formulations 10% and below)
- lufenuron
- malathion
- methomyl (use only acute toxicity Class II and III products; not Class I)
- permethrin
- pyrimiphos-methyl

Rejected Insecticide AIs registered by Indonesia MOA and considered but **Rejected for "Use" by USAID Projects**

- acrinathrin (not EPA registered)
- alpha-cypermethrin (not EPA registered)
- benthiocarb (not EPA registered)
- carbofuran (RUP, Class I)
- cartap hydrochloride (not EPA registered)
- chlorfenvinphos (not EPA registered)
- endosulfan (being phased out as banned under POPs Treaty)
- fenamiphos (not EPA registered)
- methamidophos (not EPA registered)
- monocrotophos (not EPA registered)
- profenofos (RUP)
- terbufos (RUP, Class I)
- triflumeron (not EPA registered)

- propoxur pyrethrins (Marigold extract)
- spinosad
- thiamethoxam (but only when plants are in vegetative state, not when flowering due to risk to pollinators and honeybee colony collapse disorder)

Allowed Fungicide AIs registered by Indonesia MOA

- boscalid (nicobifen)
- carbendazim
- chlorothalonil
- copper ammonium complex (acetate, carbonate)
- copper hydroxide
- copper (cuprous) oxide
- copper oxychloride
- copper sulfate
- cymoxanil
- difenoconazole
- famoxadone
- fenamidone
- folpet
- fosetyl aluminum
- kresoxim-methyl
- mancozeb/maneb-zinc
- metalaxyl
- phosphorous acid
- propamocarb HCl
- propiconazole
- pyraclostrobin
- sodium metabisulfite
- tebuconazole
- thiram
- triadimefon
- triadimenol
- *Trichoderma species*

Fungicide AIs registered by Indonesia MOA and considered but **Rejected for "Use" by USAID Projects**

- alkyldimethylbenzyl ammonium chloride (not EPA registered)
- benomyl/benalate (not EPA registered)
- dichlorophen (not EPA registered)
- epoxiconazole (not EPA registered)
- flusilazole (not EPA registered)
- flutriafol (not EPA registered)
- penconazole (not EPA registered)
- iprovalicarb (not EPA registered)
- propineb (not EPA registered)

Allowed Herbicide AIs registered by Indonesia MOA

Rejected Herbicide AIs registered by Indonesia MOA and considered but **Rejected for "Use" by USAID Projects**

- 2 4 DB acid
- 2 4 D isooctyl ester
- ametryne
- bentazon
- bromoxynil
- clethodim
- clomazone
- dacthal/DCPA (for use only in areas without high water table and sandy soil)
- diuron (for use only in areas without high water table and sandy soil)
- fluazifop-p-butyl
- fluometuron
- fomesafen (use only acute toxicity Class II and III products; not Class I)
- glyphosate
- halosulfuron (methyl)
- hydramethylnon
- imazethapyr
- linuron
- MCPA
- mepiquat chloride
- mesotrione
-
- metolachlor/S-metolochlor (for use only in areas without high water table and sandy soil)
- metribuzin
- metsulfuron-methyl
- nicosulfuron
- nicosulfuron (methyl)
- oxyfluorfen
- pendimethalin
- prometryn
- propachlor (continued use without PPE could increase cancer risk)
- propanil
- pyrothiobac-sodium
- quizalofop-p-tefuryl
- terbuthylazine
- thiobencarb(e)/benthiocarb
- trifluralin

Allowed Rodenticide AIs registered by Indonesia MOA

- acetochlor (RUP)
- atrazine (RUP)
- chlorimuron (ethyl) (not EPA registered)
- cyanazine (not EPA registered)
- paraquat (RUP)
- propaquizafop (not EPA registered)
- sulcotrione (not EPA registered)

Rejected Rodenticide AIs registered by Indonesia MOA and considered but **Rejected for "Use" by USAID Projects**

- bromadiolone
- difethialone
- zinc phosphide (only in concentrations of 2% and lower, which are EPA acute toxicity Class III)

- coumatetralyl (not EPA registered)

Allowed Nematicide AIs registered by Indonesia MOA

- *Paecilomyces lilacinus* Strain 251 (attacks nematode eggs)

Rejected Nematicide AIs registered by Indonesia MOA and considered but **Rejected for "Use" by USAID Projects**

- fenamiphos (not EPA registered)
- oxamyl (RUP, Class I)
- terbufos (RUP, Class I)

Allowed Molluscicide AIs registered by Indonesia MOA

- iron phosphate
- metaldehyde

Rejected Molluscicide AIs registered by Indonesia MOA and considered but **Rejected for "Use" by USAID Projects**

NONE

Allowed Microbicide AIs registered by Indonesia MOA

- bromine
- chlorine dioxide
- copper (do careful calibration; overuse of copper increases toxicity in soil, and is toxic)
- copper ammonium complex (do careful calibration; overuse of copper increases toxicity in soil, and is toxic)
- didecyldimethyl ammonium chloride
- hydrogen peroxide
- iodine
- phenol
- sodium hypochlorite (corrosive, use with gloves, goggles, carbon-filter respirator and protective clothes)

Rejected Microbicide AI registered by Indonesia MOA and considered but **Rejected for "Use" by USAID Projects**

- alkyldimethylbenzyl ammonium chloride (not EPA registered)
- bromine chloride (Class I)
- formaldehyde (known carcinogen)
- quaternary ammonium (not EPA registered)
- sulfuric acid (RUP, Class I—too toxic)

Allowed Bird Repellant AI registered by Indonesia MOA

- methyl-anthraniliate

Allowed (when registered) **Nitrogen-Fixing Organism** AIs **proposed for registration** by Indonesia MOA

- *Rhizobium leguminosarum*
- *Bradyrhizobium japonica*

Allowed Wood Preservative Pesticide AIs registered by Indonesia MOA

- fipronil

Rejected Wood Preservative Pesticide AIs registered by Indonesia MOA and considered but **Rejected for "Use" by USAID Projects**

- chlorpyrifos-ethyl (no longer registered for this use by EPA)
- creosote (RUP)

4.3 USAID field monitoring requirement

For subject value chain projects or projects otherwise supporting field crop production, the COR, MEO and/or REA must at least two times annually, make inspection visits to several randomly selected farms receiving project assistance to check for compliance with the safer use measures summarized in section 4.4 below, and detailed in the mandatory compliance tracking and reporting template that follows.

4.4 Summary of Compliance Requirements (Safer Use Measures)

The above-listed allowed AIs can ONLY be used in compliance with the safer use measures and restrictions specified in the PER. These can be summarized as follows:

A. Only pesticides approved by this PERSUAP may be supported with USAID funds in USAID/Indonesia Sustainable Economic Growth activities. These pesticides are enumerated in section 4.2, above.

   Pesticide "support" = use of USAID funds to: purchase pesticides; directly fund the application of pesticides; recommend pesticides for use; or purposely facilitate or enable the application or purchase of pesticides via provision of application equipment, credit support, or other means.

B. In the case of value chain projects or projects otherwise supporting field crop production, pesticide support must be governed by a set of locally adapted, crop- and pest-specific IPM-based pest management plans and observe enumerated use restrictions. (The PERSUAP provides key information for IPs to develop these plans.)

C. Appropriate project staff & beneficiaries must be trained in safer pesticide use & pesticide first aid;

D. To the greatest degree practicable, projects must require use & assure maintenance of appropriate PPE and application equipment—as well as safe pesticide purchase, handling, storage and disposal practices;

E. Projects must be systematic in their pesticide-related record keeping and monitoring.

The PER and the annexes provide substantial resources to support compliance with these requirements, as detailed in the table below.

IPM/Safer Use Requirement	Key Resources Provided
Pesticide recommendations and use must be governed by a set of crop- and pest-specific IPM-based pest management plans. (IPs are responsible for developing these plans.)	**Annex 1:** sets out in table format crop-by-crop, pest-by-pest chemical and non-chemical management methods recommended by this PERSUAP. This is intended to serve as the basis for a crop-specific pest management plan. **Annex 7** provides toxicology information for each approved active ingredient, including human acute toxicities and chronic health issues, water pollution potential, as well as potential ecotoxicities to important non-target organisms like fish, honeybee pollinators, birds and several aquatic organisms.
Appropriate project staff & beneficiaries must be trained in safer pesticide use & pesticide first aid	**Annex 8 Training Topics** provides significant discussion of safer use training elements.
Projects must be systematic in their pesticide-related record-keeping and monitoring	**Annexes 10 & 11** provide record-keeping templates/aids

Annex 1: Matrix of Indonesia Crops with Primary Production Constraints, PERSUAP-Recommended Pest Prevention GAP/IPM Tactics & PERSUAP-Recommended Curative Tools and Tactics

Crop	Major Pests & Diseases	Preventive IPM Tactics	Curative IPM Tools: Pesticides
Crucifers (cabbage, broccoli)	Diamondback moth, *Plutella xylostella*,	• Parasitoid, *Diadegma semiclausum* • For monitoring, use light traps over soap dish to control adult stages and monitoring insect population's dynamics. • Sticky bright yellow or blue traps will help to trap and control adult stages. • Crop rotation with non-susceptible hosts. • Use of trap crops such as inter-planted or edge-planted mustards (but monitor and destroy plants before adults are produced). • Mating disruption with sex pheromones has been shown to be effective in reducing diamondback moth populations in Florida. • Sprinkle irrigation may reduce the number of caterpillars in the field; if it is applied at dusk, it may limit the activity of adults.	• Use of natural biological control with *Trichogramma* species, *Metharizium anisopliae*, *Beauveria bassiana*, *Bacillus thuringiensis* and neem applications. • Use the Insect Growth Regulator (IGR). • Rotate synthetic insecticides containing abamectin, imidacloprid, emamectin benzoate.
	Cluster caterpillar, *Crocidolomia pavonana*	• Natural enemies like ground beetles, spiders, damsel bugs, minute pirate bugs, assassin bugs, bigeyed bugs, and lacewing larvae naturally control armyworms. Parasitic wasp species *Trichogramma*, *Copidosoma*, *Apanteles*, *Diadegma*, and *Hyposoter* sting and parasitize eggs and larvae (some of these organisms are available for purchase commercially). • Use of nocturnal overhead sprinkler irrigation to dislodge and repel pests. • Use of pheromone misters and emitters to disrupt mating. • Use of floating row screen or mesh covers to exclude egg-laying moths.	• Use of natural biological control with *Trichogramma* species, *Metharizium anisopliae*, *Beauveria bassiana*, *Bacillus thuringiensis* and neem applications. • Use the Insect Growth Regulator (IGR). • Rotate synthetic insecticides containing abamectin, imidacloprid, emamectin benzoate.

	Cutworm, *Agrotis* sp.	• Natural enemies like ground beetles, spiders, damsel bugs, minute pirate bugs, assassin bugs, bigeyed bugs, and lacewing larvae naturally control armyworms. Parasitic wasp species *Trichogramma*, *Copidosoma*, *Apanteles*, *Diadegma*, and *Hyposoter* sting and parasitize eggs and larvae (some of these organisms are available for purchase commercially). • Use of nocturnal overhead sprinkler irrigation to dislodge and repel pests. • Use of pheromone misters and emitters to disrupt mating. • Use of floating row screen or mesh covers to exclude egg-laying moths. • Re-planting.	• Use of natural biological control with *Trichogramma* species, *Metharizium anisopliae*, *Beauveria bassiana*, *Bacillus thuringiensis* and neem applications. • Use the Insect Growth Regulator (IGR). • Rotate synthetic insecticides containing abamectin, imidacloprid, emamectin benzoate.
	Club root, *Plasmodiophora brassicae*	• Use lime to increase the pH if soil pH is lower than 7.2. • Use resistant varieties if available. • Use crop rotation to non-cole crops for several years. • Control brassicaceous weeds near field. • Manage drainage so soil does not water-log. • Use fresh soil for seed bed. • Elevated seed bed.	• Use *Trichoderma* sp.
	Weeds	• Hoe or hand weeding. • Plastic mulch.	• Herbicides are not recommended.
Tomato	Late blight, *Phytophthora infestans* Early blight, *Alternaria solani*	• Use tolerant varieties. • Drain the growing area adequately before planting. • Follow proper planting date; do not plant late. • Farmers use sticks and lines to raise tomato plants and fruit into the air to aerate the plant and raise the leaves and fruit away from the soil. • Pruning lower leaves • Bamboo stacking • Plastic mulch • *Trichoderma*	• Use synthetic fungicides containing azoxystrobin, copper sulfate, mancozeb, chlorothalonil, dimethomorph, pyraclostrobin.

		• *Bacillus subtilis* • *Psedomonas flourescens*	
	Tomato leaf curl virus transmitted by whiteflies	• Practice crop rotation • Destroy infected plants especially before flowering and fruit set. • Re solanaceous weeds • Control root-knot nematodes • Remove possible source of primary inoculums (infected seeds, weeds, tobacco products) Screening of seed beds • Plastic mulch • *Trichoderma* • *Bacillus subtilis* • *Pseudomonas flourescens*.	• Spray natural solutions of insecticidal soap, horticultural oil, neem oil or *Beauveria bassiana* if the infestation is heavy. • Treat soil with synthetic systemic insecticides containing imidacloprid or thiamethoxam. • Spray with synthetic insecticides containing acetamiprid.
	Fruitworm, *H. armigera*,	• Avoid planting crops successively that are hosts to tomato fruitworm like corn, cotton, sorghum, tobacco and soybean. • Two weeks before planting, remove weeds and grasses to destroy earworm larvae and adults harboring in those weeds and grasses. • Practice crop rotation. • Plow, disc and harrow fields at least 2 times before sowing seeds. This exposes pupae of tomato fruitworm (tomato fruitworm pupates in the soil) to chickens, birds, ants and other predators. • Make and use pheromone or light traps. • Begin sampling soon after fruit development. Eggs hatch in 5 to 7 days following egg-laying.	• Insecticidal control of tomato fruitworm is difficult and depends on proper timing and thorough coverage. Once larvae enter the tomato, control with insecticides is difficult. • Botanical and homemade water extracts include neem and ginger. • *Trichogramma* wasps from the biolaboratory provide some control of tomato fruitworm eggs. • Direct insecticidal control towards young larvae that are feeding on the fruit, before entering it. • Natural sprays of *Bacillus thuringiensis (BT)* and the Entrust formulation of spinosad.
	Weeds	• Hoe or hand weeding • Plastic mulch	• Herbicides are not recommended.
Onion (Green onion, shallot)	Beet armyworm, *Spodoptera exigua*	• Natural enemies like ground beetles, spiders, damsel bugs, minute pirate bugs, assassin bugs, bigeyed bugs, and lacewing larvae naturally control armyworms. Parasitic wasp species *Trichogramma*, *Copidosoma*, *Apanteles*, *Diadegma*, and *Hyposoter* sting and parasitize eggs and larvae (some of these organisms are	• Use of virus SeNPV. • Use of natural biological control with *Trichogramma* species, *Metharizium anisopliae*, *Beauveria bassiana*, *Bacillus thuringiensis* and neem applications. • Use the Insect Growth Regulator (IGR).

		available for purchase commercially). • Use of nocturnal overhead sprinkler irrigation to dislodge and repel pests. • Use of pheromone misters and emitters to disrupt mating. • Use of floating row screen or mesh covers to exclude egg-laying moths. • Larval hand picking. • Light trapping.	• Rotate synthetic insecticides containing abamectin, imidacloprid, emamectin benzoate.
	Leafminers, *Liriomyza* spp	• Weed and crop residues removal after harvest. • Crop rotation with corn, onions or other species not related with snow peas. • Use of plastic mulch with a reflectent color, silver grey will be one of the more effectives. • Use of yellow or blue sticky traps. • Parasitoids/predators • Botanical insecticides	• Use of synthetic insecticides containing abamectine or cyromazine.
	Purple blotch Alternaria porri	• Use certified disease-free seedlings. • Sanitation, clean up crop residues, burn. • Plastic mulch covering to avoid plant contact with soil and minimize weeds that enhance microclimate conditions favorable to disease dispersion. • Heat treatment of bulbs at 35 to 40 °C for 4 to 8h reduces the disease significantly. • Eliminate crop residues, plant during dry season, and avoid irrigation during heat of the day. • Use crop rotation. • Use certified seed and good drainage.	• Use of natural fungicides containing *Trichoderma, Pseudomonas fluorenscens, or Bacillus subtilus.*
	Downy mildew *Peronospora destructor*	• Plastic mulch covering to avoid plant contact with soil and minimize weeds that enhance microclimate conditions favorable to disease dispersion. • Heat treatment of bulbs at 35 to 40 °C for 4 to 8h reduces the disease significantly. • Eliminate crop residues, plant during dry season, and avoid irrigation during heat of the	

		day. • Use crop rotation. • Use certified seed and good drainage. • Sanitation, clean up crop residues, burn.	
	Weeds	• Hoe or hand weeding • Plastic mulch	• Herbicides are not recommended.
Chilies/peppers	Anthracnose, *Colletrotichum* sp.	• Use certified disease-free seed and transplants of resistant varieties[23]. • Seed can be disinfested with a 30-minute soak at 52°C. • Sanitize seedling flats if reusing them. • Rotate out of infested fields to other crops for 3 years. Avoid potato, soybean, tomato, eggplant, and cucurbits as rotation crops[24]. • If using overhead sprinkler irrigation, apply in early morning so plants can dry before night-fall. • Use mulch to reduce water splash onto leaves and fruit, and weed regularly without damaging fruit. • Harvest fruit as soon as it is ripe. • Sanitation: Remove and dispose of diseased plants throughout season and after harvest.	• At flowering, can use synthetic fungicides containing mancozeb or metiram.
	Leaf curl virus	• Practice crop rotation • Destroy infected plants especially before flowering and fruit set. • Re solanaceous weeds • Control root-knot nematodes • Remove possible source of primary inoculums (infected seeds, weeds, tobacco products) Screening of seed beds • Plastic mulch	• Spray natural solutions of insecticidal soap, horticultural oil, neem oil or *Beauveria bassiana* if the infestation is heavy. • Treat soil with synthetic systemic insecticides containing imidacloprid or thiamethoxam. • Spray with synthetic insecticides containing acetamiprid.
	Bacterial wilt	• Use of certified disease-free propagation	Spray with copper-containing compounds.

[23] http://ohioline.osu.edu/hyg-fact/3000/3307.html
[24] http://www.avrdc.org/LC/pepper/anthracnose.pdf

		material. • Do weed control. • Use resistant or tolerant varieties. • Plant in well-drained soils, avoid over-irrigation. • Use deep well water for irrigation. • Remove and destroy diseased plants.	
	Helicoverpa armigera	• Avoid planting crops successively that are hosts to tomato fruitworm like corn, cotton, sorghum, tobacco and soybean. • Two weeks before planting, remove weeds and grasses to destroy earworm larvae and adults harboring in those weeds and grasses. • Practice crop rotation. • Plow, disc and harrow fields at least 2 times before sowing seeds. This exposes pupae of tomato fruitworm (tomato fruitworm pupates in the soil) to chickens, birds, ants and other predators. • Make and use pheromone or light traps. • Begin sampling soon after fruit development. Eggs hatch in 5 to 7 days following egg-laying. • Larval hand picking • Parasitoid *Trichogramma* sp. • Botanical insecticides	• Insecticidal control of tomato fruitworm is difficult and depends on proper timing and thorough coverage. Once larvae enter the tomato, control with insecticides is difficult. • Botanical and homemade water extracts include neem and ginger. • *Trichogramma* wasps from the biolaboratory provide some control of tomato fruitworm eggs. • Direct insecticidal control towards young larvae that are feeding on the fruit, before entering it. • Natural sprays of *Bacillus thuringiensis (BT)* and the Entrust formulation of spinosad.
	Fruitflies	• Sanitation: clean up crop residues. • Use traps baited with attractant (methyl eugenol)	• Natural sprays of *Bacillus thuringiensis (BT)* and the Entrust formulation of spinosad.
	Mites *Polyphagotarsonemus latus*	• Spider mites have many natural enemies that often limit populations; predacious mites and some insect feeds on spider mites, eg (*Phytoseiulus persimilis* and *Amblyseius andersoni*); the major predator mites commercially available for purchase and release are the western predatory mite and *Phytoseiulus.* • Do weed control in and around field. • Adequate irrigation is important because water-	• Broad-spectrum insecticide treatments for other pests frequently cause mite outbreaks, so avoid these when possible. • Natural insecticidal soaps or agricultural oils and neem extracts can be used for management (apply especially on the undersides of leaves). • Use of synthetic insecticides containing malathion or abamectin.

		stressed trees are most likely to be damaged.	
	Thrips T*hrips parvispinus*	• Use resistant varieties. • Practice crop rotation out of solanaceous and other host crops. • Use blue sticky traps for monitoring. • Use plastic mulch.	• Use insecticides containing thiamenthoxam, acetamiprid, imidacloprid, spinosad abamectin.
	Weeds	• Hoe or hand weeding. • Plastic mulch.	• Herbicides are not recommended.
Cacao	Cacao pod borer, *Conopomorpha cramerella*	• Water and fertilize seedlings to maintain vigor to resist mosquito bug. • Control weeds in and around plantation. • Enclosing cacao pods with a plastic sleeve. • Frequent and complete pod-harvesting. • Canopy thinning • Black ants, *Dolichoderus bituberculatus*	• Insecticides are not recommended.
	Tea mirid *Helopeltis* spp	• Water and fertilize seedlings to maintain vigor to resist mosquito bug. • Control weeds in and around plantation.	• Make and use natural artisanal neem oil, neem seed extract or soapy water. • Use synthetic insecticides containing deltamethrin or spinosad.
	Black pod disease, *Phytophthora palmivora*	• Maintain adequate shade using fruit and banana plants and allow cacao to be well aerated with some sun. • Sanitation: Remove and destroy diseased pods. • Control weeds. • Immediately after cacao harvest initiate pruning by carefully removing diseased branches and burning them.	• Fungicides are not recommended.
	Vascular streak dieback, *Oncobasidium theobromae*	• Maintain adequate shade using fruit and banana plants and allow cacao to be well aerated with some sun. • Sanitation: Remove and destroy diseased twigs. • Control weeds. • Eradication of infected plants. • Planting tolerant clones.	• Fungicides are not recommended.
Coffee	Coffee berry borer,	• Use homemade pheromone & alcohol traps,	• Control with *Beuaveria bassiana*.

	Hypothenemus hampei	removed 130 days after blooming. • Coffee plant pruning, de-suckering and aerating with some exposure to sun. • Pick berries at least fortnightly during fruiting peaks and at least monthly during other times. • Sanitation – make sure there are no unpicked infested beans left on the trees or laying on the ground. Burn or boil & compost infested cherry. • Use of hyperparasitoids (micro-hymenoptera), if made available, affordable and practical (especially on organic farms). • Frequent harvesting • Complete harvesting • Mass trapping with attractants •	
	Twig borer *Xylosandrus compactus* and *X. morigerus*	• Stem banding is effective against this pest. • Pruning off damaged pieces.	• Paint the coffee stems with synthetic insecticides containing chlorpyrifos.
	Coffee mealybug *Panococcus citri*	• Use proper shading.	• No insecticides are recommended.
	Coffee rust, *Hemileia vastatrix*	• Use of resistant varieties such as 'Ruiru 11' and 'K 7'. • Canopy management by pruning and opening the canopy to air and light. • Removal and destruction or composting of infected leaves. • Sanitation: remove and burn or compost old orchard coffee bushes that are infested, not maintained and no longer productive. • Crop density adequate to 4000 to 5000 pants per hectare. • Rational use of fertilizers only 2-3 applications per year. • In presence of the disease, the pruning cycles should be shortened to obtain good production.	• Fungicides are generally not used. • For emergencies use copper sprays at 21 days intervals starting just before flowering.
	Root nematode	• Eradication.	• No nematicides are recommended.

	Pratylenchus coffeae, Radopholus similis	• Resistant varieties	
Citrus	Huanglongbing	• Use of certified disease-free planting materials is essential to minimize spread. • Budwood sources and nursery production is carried out under psyllid-proof enclosures and are certified HLB free. • Weekly scouting for greening infected trees should be done routinely so that infected trees can be removed. • Diagnosis of HLB may be difficult since some nutrient deficiency symptoms and other problems are often confused with some of the symptoms associated with HLB. • Sanitation: Remove infected trees immediately upon discovery and diagnosis.	• Prior to tree removal, the infected tree should be treated with a foliar insecticide such as spinetoram (if it becomes registered) to eliminate the psyllid vector.
	Bark rot/Diplodia gummosis	• Promote good cultural practices to enhance tree vigor and reduce the amount of dead wood. • Harvesting by pulling rather than clipping can reduce the incidence of decay, because it removes at least some of the buttons, which harbor the pathogen. • Immediate cooling after packing effectively delays development of stem end rot; the decay is almost completely inhibited at 10°C.	• Can use synthetic fungicides containing difenoconazole applied to the trunk. • Postharvest application of imazalil fungicide provides good control of Diplodia stem-end rot. Treatments can be applied before degreening by drenching pallets of harvested fruit with fungicide suspensions or solutions.
	Fruiflies *Bactrocera* spp	• Sanitation: clean up crop residues. • Use traps baited with attractant (methyl eugenol). • Put bags over fruit.	• Natural sprays of *Bacillus thuringiensis (BT)* and the Entrust formulation of spinosad.
	Red mite *Brevipalpus* spp, *Tetranychus* spp	• Use adequate irrigation so that trees are not water-stressed. • Regularly monitor for outbreaks. • Use sanitation: Remove damaged and heavily infested plant parts. • Reduce orchard dust at regular intervals by applying water to pathways and other dusty areas.	• Miticides are not recommended.
	Thrips *Scirtothrips citri*	• Carefully and regularly monitor for thrips larvae	• Except in severe cases, treatment of young,

		and fruit scarring (especially toward the outside of the canopy) to determine if small and localized treatments are needed; if the fruit will be used for juice, tolerate the cosmetic scarring. • Carefully and regularly monitor for natural predators (especially predaceous mites) and parasites, which will (unless they are sprayed) control thrips populations. • Prune trees to allow sunlight and air flow to enter the canopy. • Avoid using straw mulch.	nonbearing trees with broad-spectrum insecticides is not recommended because healthy vigorous trees can withstand the damage and insecticide resistance will develop quickly. • Treatments with some broad-spectrum carbamates, organophosphates, pyrethroids and pyridaben stimulate thrips reproduction and kill beneficial predators and parasites, often leading to thrips population increases. • Sprays of the natural insecticide spinosad with some horticultural oils control thrips organically. • Sprays of natural insecticides containing spinetoram (if it becomes registered) in abait with sugar or molasses are relatively nontoxic to beneficial insects and mites.
	Weeds	• Hoe or hand weeding • Plastic mulch	• Herbicides are not recommended.
Papaya	Papaya mealybug, *Paracoccus marginatus*	• Field borders should be kept clean of weeds and debris that may support mealybugs between plantings. • Sanitation: Eliminate crop residues, weeds and grass roots. • Remove and destroy ant nests. • Use biostimulants to strengthen the plants against wilt mealybug.	• Use natural biocontrols such *three exotic papaya mealy bug parasitoids such as Acerophagus papayae, Pseudleptomastix mexicana and Anagyrus loecki.*
	Anthracnose	• Sanitation.	• Fungicides are generally not used.
	Dieback *Erwinia papayae*	• Sanitation: Eliminate crop residues, weeds and grass roots. • Eradication.	• Fungicides are generally not used.
	Weeds	• Hoe or hand weeding. • Plastic mulch.	• Herbicides are not recommended.
Cassava	Cassava mealybug, *Phenacoccus manihoti*	• Field borders should be kept clean of weeds and debris that may support mealybugs between plantings.	• Insecticides are not recommended.

		• Sanitation: Eliminate crop residues, weeds and grass roots. • Remove and destroy ant nests. • Use biostimulants to strengthen the plants against wilt mealybug. • Parasitoid *Apoanagyrus lopezi* (in the process of importation)	
	Red spider mite, *Tetranychus* sp.	• Use adequate irrigation so that trees are not water-stressed. • Regularly monitor for outbreaks. • Use sanitation: Remove damaged and heavily infested plant parts. • Reduce orchard dust at regular intervals by applying water to pathways and other dusty areas.	• Miticides are not recommended.
	White grub *Leucopholis rorida*	• Soil solarization and tillage. • Light trapping of adults. • Sanitation: Remove crop residues.	• Insecticides are not recommended.
	Weeds	• Hoe or hand weeding. • Plastic mulch.	• Herbicides are not recommended.

Annex 2. Guidelines for Pest Management Plans (PMPs) for Indonesia Crops and Beneficiaries

What is a PMP[25]?

Pest Management Plans or Guides provide field crop, livestock production or project decision-makers – farmers and farm managers – with best production practices recommendations, usually adapted by region, crop phenology and seasons. The aims of PMPs are to reduce the risks to production from pests by using a combination of best practices, including IPM, Integrated Vector Management (IVM) and Integrated Weed Management (IWM), that maximize crop or livestock health, and thus resilience to or tolerance of pests, and without an over-reliance on pesticides needed when best practices are not followed. Thus, prevention of pests plays a strongly pivotal role in the PMP, followed closely by management of pests when prevention alone is not adequate for the level of control needed or desired.

Who are the PMP's intended audiences and users?

- Farm land preparation and crop production decision-makers
- Farmers
- Farm managers

Why is a PMP being done?

PMP Objectives:

- Prevent or reduce pest damage risk to agricultural production or health
- Protect the health of farmers, farm family members, laborers and community members from pesticide risks
- Maintain economically sound practices
- Reduce environmental pollution and degradation risks
- Enhance the overall quality and quantity of biodiversity on the sustainable farm work environment
- Respond to foreign market demand for the use of agriculture sector best management practice standards, also called Good Agriculture Practices (GAPs) which include IPM measures, to achieve farm and produce certification
- Comply with local, regional, donor and international laws, conventions, and regulations

Organization of the PMP

The following pieces of crop- or livestock-specific background information are used to build a PMP base

- General information on the crop/livestock/sector
- Crop/livestock common/species names:
- Crop/livestock developmental stages:
- Production regions and how they differ by soil type, pH, fertility, etc
- Overall concerns and priorities for crop/livestock production
- Crop/livestock cultural best practices
- Crop/livestock Good Agriculture Practices (GAPs) including some IPM (see PERSUAP section on GAPS and IPM) recommendations

[25] PMPs or Year-Round (seasonal) IPM Programs are state of the art in many developed countries, and they help institutionalize IPM in planning and practice. PMPs provide agriculture managers and farmers with a tool to predict and prevent many crop pests of each crop throughout a season. See examples of PMPs at http://www.ipm.ucdavis.edu/PMG/crops-agriculture.html, upper left corner under "Year-Round IPM Programs".

Individual Pest Prevention and Management Sections for each of the following pest types:

- Invertebrate (Insects, Mites, Slugs/Snails, Nematodes)
- Diseases (Fungi, Bacteria, Viruses, Other)
- Weeds (annual grasses, broadleaves, perennial grasses, broadleaves, sedges, others)
- Vertebrates (birds, rodents, other)

For each pest type, first, identify overall priorities for pest prevention and management in the target crop or livestock.

Next, identify individual pest species noting the type of damage incurred; part of plant damaged: roots/rhizomes/tubers, stems/stalks, leaves, florescence, or seeds (field or stored); or if livestock, part of animal affected.

To best understand how to manage a pest, one needs to understand how, where, when and on what parts of the plant or animal the pest feeds. For field pests and stored grain/food pests, many PMPs are designed and outlined as follows, *for each major species of pest (insects, mites, slugs/snails, nematodes)*:

- Photographs of each pest, life stages
- Photographs of plant or livestock damage
- Description of the pest, life cycle and survival strategies[26]:
- Description of damage symptoms
- Best Prevention Practices
    - Use any and all of the above GAPs including IPM
    - Country or region-specific information
- Best Management Practices
    - Focus on prevention (above)
    - Country or region-specific information

Information on PMP-recommended pesticides:

Information needed for each pesticide referenced in the above PMP, by pest (so the farmer/farm manager has the information at their fingertips and do not need to refer to other documents and tables to find it):

Pesticide essential information needed

- Active Ingredient (AI) name
- Product Trade names (with EPA and WHO Acute Toxicity Classifications in parenthesis)
- Amounts to use per hectare
- Price
- Pre-Harvest Interval (PHI)
- Special comments on best application methods and frequency
- Any resistance management strategies needed
- Pesticide application record sheet
- Guidelines for reducing spray drift
- Re-entry interval (REI): field safe re-entry period after spraying
- Maximum residue levels (MRL) permitted by markets
- Pesticide precautions with use including
- Reading the label

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[26] Survival strategies: All pests have survival strategies that allow them to live and breed in each crop's farming systems. Knowing the survival strategies, including overwintering habit and alternate host plants, that are employed by the pest can help with decision making at the farming systems-level (e.g. choice of rotation crops) and also can help to anticipate pest outbreaks.

- Legal responsibilities and permitted registration uses
- Permit requirements for possession and use
- Recommended and obligated use of PPE and best practices
- First aid and antidotes
- Transportation best practices
- Storage best practices
- Safe use best practices
- Container disposal best practices
- Leftover pesticide disposal best practices
- Protection of non-pest animals, plants, endangered species and water body quality
- Protect natural enemies & honeybees: http://www.ipm.ucdavis.edu/PMG/r584310111.html
- Posting signage in treated fields
- Some chemicals not permitted on processed crops
- Potential for phytotoxicity (crop injury) on some crops
- Documentation and record-keeping on farms

Information needed on Natural Enemies of Pests:

Common Names of Predators and Parasitoids effective against above pests: For a list of common natural enemies of crop pests, see http://www.ipm.ucdavis.edu/PMG/NE/index.html. Genera will likely be the same around the world, with different species in different continents, filling similar niches.

Additional Information Needed:

Will there be an IPM Coordinator, an IPM Advisory Committee, Education and Licensing for Applicators, Currency and Approval of the PMP?

Annex 3. Elements of Integrated Pest Management (IPM) Program

IPM[27]

Although farmers are likely using numerous IPM tactics, without really calling them that, IPM philosophy or planning is not generally an active part of crop production in Indonesia plots; thus, a basic understanding of the steps or elements needed in an IPM program are addressed below.

Step 1: Learn and value farmers' indigenous IPM tactics. Most farmers are already using their own forms of GAPs and IPM, many of which are novel, self-created, adapted for local conditions, and many of which work well. These local tools and tactics need to be well understood and taken into account when making PMPs. Accurate assessments of these farmer's GAP and IPM technologies, as well as an understanding of actual losses due to different constraints in farmers' fields are required before designing a crop production and pest management program. Standards and Certification (S&C) farmers will have records of historical pesticide use and trends, as well as information on current use of artisanal or local IPM tactics.

Step 2: Identify key pests for each target crop. Although perhaps up to ten species of pests may impact a crop and yields at different plant growth stages, generally only two or three are considered serious enough to spend money controlling. Farmers should be encouraged to monitor their population size, their life cycle, the kind of damage they cause and actual losses. Note that crop loss figures based on farmers' perceptions of damage and loss are often overestimated.

Step 3: Evaluate all management options. Use of best management practices, preventive measures, and "organic" options to control pest impacts may eliminate the need for synthetic pesticides.

Step 4: Choose IPM methods, identify Needs and Establish Priorities.

Continue dialog with project field staff, ministry extension staff and farmers when choosing methods to be used. Consider the feasibility of attractive methods, including the availability of resources needed, farmers' perceptions of pest problems, their abilities to identify pests, their predators, diseases and parasitoids, and to act upon their observations.

Step 5: Do effective activities and training to promote IPM.

Next, identify strategies and mechanisms for fostering the transfer of the needed IPM technology under various project and institutional arrangements, mechanisms, and funding levels. Define what is available for immediate transfer and what may require more adaptation and validation research. Set up an initial planning workshop (with a COP-supported and signed Action Plan) to help define and orient implementation activities, and begin to assign individual responsibilities.

Learning-by-doing/discovery training programs

The adoption of new techniques by small-, medium- and large-holder farmers occurs most readily when program participants acquire knowledge and skills through personal experience, observation, analysis, experimentation, decision-making and practice. At first, frequent (usually weekly) sessions are conducted for 10–20 farmers during the cropping season in farmers' fields by trained instructors or extension agents.

Smallholder support and discussion groups

Weekly meetings of smallholders, held during the cropping season, to discuss pest and related problems can be useful for sharing the success of various control methods. However, maintaining attendance is difficult except when there is a clear financial incentive (e.g., credit, advance knowledge of nearby infestations for early action leading to yield improvement).

[27] http://www.fao.org/docrep/006/ad487e/ad487e00.htm; http://www.fao.org/docrep/006/ad487e/ad487e02.htm; http://en.wikipedia.org/wiki/Farmer_Field_School; http://www.ipm.ucdavis.edu/PMG/crops-agriculture.html

Educational material

In many countries, basic written and photographic guides to pest identification and crop-specific management techniques are unavailable or out of date. Videos featuring graphic pictures of the effects of acute and chronic pesticide exposure, and interviews with poisoning victims can be particularly effective.

Youth education

Promoting and improving the quality of programs on IPM and the risks of synthetic pesticides has been effective at technical schools for rural youth. In addition to becoming future farmers, these students can bring informed views back to their communities.

Food market incentives (especially important in the last decade)

Promoting Organic, GlobalGAP, BRC, Fair Trade or other certification for access to the lucrative and rapidly growing S&C systems-driven international and regional food markets can be, and is, a strong incentive to adopt IPM.

Step 6: Partner successfully with other IPM implementers.

The following design steps are considered essential.

Articulate the partnership's vision of IPM

Organizations may forge partnerships based on a common commitment to "IPM" – only to discover too late that that their visions of IPM differ considerably. It is therefore highly important that partners articulate a common, detailed vision of IPM, centered on the crops and conditions the project will encounter.

Confirm partner institutions' commitment

The extent of commitment to IPM integration into project, design, and thus implementation depends strongly upon the following key variables:

IPM program integration into larger project. The IPM program is likely to be part of a larger "sustainable agriculture" project. The IPM program must fit into a partner's overall goals. The extent of this integration should be clearly expressed in the proposed annual work plan.

Cost sharing. The extent of funds (or in-kind resources) is a good measure of a genuine partner commitment.

Participation of key IPM personnel. Organizations should have staff with expertise in IPM. In strong partnerships, these staff members are actively involved in the partnership.

Step 7: Monitor the fields regularly.

At minimum twice a week, farmers should monitor their fields for pests, as some pest populations increase rapidly and unexpectedly; this increase is usually related closely to the stage of crop growth and weather conditions, but it is difficult to predict the severity of pest problems in advance.

Step 8: Select an appropriate blend of IPM tools.

A good IPM program draws from and integrates a variety of pest management techniques, like those presented in the above list. Flexibility to fit local needs is a key variable. Pesticides should be used only if no practical, effective, and economic non-chemical control methods are available. Once the pesticide has been carefully chosen for the pest, crop, and environment, it should be applied only to keep the pest population low, not necessarily eliminate it.

Step 9: Develop education, training, and demonstration programs for extension workers.

Implementation of IPM depends heavily on education, training, and demonstration to help farmers and extension workers develop and evaluate the IPM methods. Hands-on training conducted in farmers' fields (as opposed to a classroom) is a must. Special training for extension workers and educational programs for government officials and the public are also important.

Step 10: Monitoring, Record-Keeping and Evaluation (M&E).

Develop data collection forms and checklists, collect baseline GAP/IPM data at the beginning of the project, and set targets.

For the use and maintenance of Good Agriculture Practices (that include safe pesticide storage, use and disposal), maintain farm or project files of: farmer and farm employee training records certification; farm soil, water, biodiversity, cropping and pesticide use maps; pesticide purchase and stock records; price increases or decreases, chemical application instructions including target pest, type of chemical applied, dosage, time of spray, rates at which pesticides were applied, harvest interval days, application machinery, PPE required and used, and any special instructions on mixing, exposure to children or dangers. Further, for project staff, beneficiaries, produce processing facilities, food warehouses, seed multipliers, or farmers that store seed or food and deal with stored seed and food pests, there are warehouse BMPs and monitoring reports that incorporate some IPM tactics. These monitoring forms track, by location or warehouse, use of pallets, stacking, general hygiene and sanitation, damaged packages, actual infestations or signs of rodents, molds, insects, drainage, locks and security measures, use of IPM tactics including least toxic chemicals and strict BMPs, including restricted access, for use of common but hazardous fumigants like aluminum phosphide.

Annex 4. Botanical Active Ingredients in Pesticides, Repellents, and Baits Regulated by USEPA

Name	Other Names	Use	Toxicity	EPA Tracking Number
Allium sativum	Garlic	Repels insects	Low	128827
Allyl isothiocyanate	Oil of Mustard	Kills & repels insects	Questionable	004901
Anise Oil	Repels vertebrates	Low	004301	
4-allyl anisole	Estragole	Kills beetles	Low	062150
Azadirachtin	*Azadirachta indica* Neem tree extract	Kills & repels insects	Low, IV	121701
Bergamot		Repels vertebrates		129029
Canola Oil	*Brassica Napus B. Campestris*	Kills many insects	Low	011332
Capsaicin	*Capsicum frutescans*	Repels vertebrates	Low, III	070701
Castor Oil		Repels vertebrates	Low	031608
Cedarwood Oil		Repels moth larvae	Low	040505
Cinnamaldehyde	*Ceylon and Chinese* cinnamon oils	Kills insects, fungi & repels vertebrates*	Low	040506
Citronella Oil		Repels insects & vertebrates	Low	021901
Cloves, Crushed			Low	128895
Dihydroazadirachtin	Neem tree extract *Azadirachta indica*	Kills & repels insects	III-IV	121702
Eucalyptus Oil		Repels insects, mites fleas & mosquitoes	Low	040503
Eugenol	Oil of cloves	Kills insects**	Low	102701
Geraniol	Oil of rose isomeric w/ linalool	Repels vertebrates**	Low	597501
Geranium Oil			Low	597500
Indole	from all plants	Trap bait: corn rootworm beetles	Low	25000-
Jasmine Oil			Low	040501
Jojoba Oil		Kills & repels whitefly kills powdery mildew	Low	067200
Lavandin Oil		Repels clothes moth	Low	040500
Lemongrass		Repels vertebrates	Low	040502
Linalool	Oil of Ceylon isomeric w/geraniol	Repels insects, ticks, mites & spiders	Low	128838
Maple lactone		Roach trap bait	Low	004049
Methyl salicylate	Oil of wintergreen	Repels moths, beetle & vertebrates	May be Toxic in large quantity	76601-
Mint	Herb	Kills aphids	Low	128892
Mint Oil		Kills aphids	Low	128800
Mustard Oil		Repels insects, spiders & vertebrates	Low	004901

Name	Other Names	Use	Toxicity	EPA Tracking Number
Neem Oil		Kills whitefly, aphids	Low	025006
1-Octen-3-ol	From clover, alfalfa	Trap bait: mosquitoes	Low	69037-
Orange		Repels vertebrates	Low	040517
p-Methane-3,8 diol	*Eucalyptus sp.*	Repels biting flies, mosquitoes	Low	
2-Phenylethyl-propionate	From peanuts	Kills insects, ticks, mites & spiders	Low	102601
Pyrethrum	*Chrysanthemum sp.*	Stored products use	III	
Red pepper	Chilli	Repels insects	Low	070703
Rosemary	Herb		Low	128893
Rotenone	*Derris sp., Tephrosia*	Controls ticks	III	
Ryania	*Ryania speciosa*	Kills thrips, codling moth, corn borers		
Sabadilla	*Schoenocaulon sp.*		III	
Sesame Oil	*Sesamum indicum*	Pyrethroid synergist	Low	
Soybean Oil	Soja	Kills insects, mites	Low	031605
Thyme	Herb	Controls aphids	Low	128894
1,2,4 Trimethoxy-benzene	From squash	Trap bait: corn rootworm, cucumber beetles	Low	40515-
Verbenone	From pine trees	Repels bark beetles	Low	128986

* attracts corn rootworm beetles, ** attracts Japanese beetles. Not all plant extracts are listed. More detailed information available for most oils: http://www.epa.gov/pesticides/reregistration/status.htm. Natural Source: Only one or a few sources are listed. Most of these chemicals are found in many different plants.

Since the time in the late 1990s when EPA did register biological ingredients listed above, it has since developed a list of botanical extracts (mostly essential oils) under "Minimum Risk Pesticides Exempted under FIFRA Section 25(b)[28]". Some of the very same ingredients are in both lists. However, most US states and USAID consider botanical extracts and essential oils used to kill, destroy, mitigate, or repel pests to be analyzed and treated as pesticides.

[28] http://www.epa.gov/oppbppd1/biopesticides/regtools/25b_list.htm

Annex 5. Natural Pesticides That Have Been Commercialized

Insecticides

azadirachtin—component in neem oil	botanical extract
Bacillus thuringiensis-BT	microbial
Beauveria basiana	microbial
cartap hydrochloride	marine worm (*Lumbriconereis heterodopa*) extract
chili pepper extract	botanical (spice)
emamectin benzoate	botanical extract
garlic extract/allicin	botanical extract (spice)
harpin protein	plant induced resistance elicitor
kaolin clay	inorganic mineral
d-limonene	citrus extract (spice)
Metarhizium anisopliae	microbial
narrow range dormant oil	paraffin oil
neem oil	botanical extract
nuclear polyhedrosis virus (NPV)	microbial
Paecilomyces lilacinus	microbial
Paecilomyces fumosoroseus	microbial
pyrethrin	botanical extract
pyriproxyfen	IGR (Juvenile Hormone mimic)
ryania	botanical extract
soap (insecticidal)	fatty acids
spinosad	microbial extract
buprofezin	IGR (Chitin Synthesis inhibitor)

Fungicides

Bacillus subtilis	microbial
Bordeaux mix	inorganic (Bordeaux ingredients EPA registered)
copper	inorganic
copper hydroxide	inorganic
copper oxychloride	inorganic
copper sulfate	inorganic
harpin protein	plant induced resistance elicitor
sulfur	inorganic
Trichoderma species	microbial

Nematocides

Myrothecium verrucaria	microbial
tomatillo oil + thyme oil extracts (Promax[29])	botanical + spice extracts—soil biopesticide

Molluscicide

iron phosphate	inorganic

[29] http://www.bhn.name/humagro/biopesticides.html

Annex 6. Acute Toxicity of Pesticides: EPA and WHO Classifications

General Toxicity

Pesticides, by necessity, are poisons, but the toxicity and hazards of different compounds vary greatly. Toxicity refers to the inherent intoxicating ability of a compound whereas hazard refers to the risk or danger of poisoning when the pesticide is used or applied. Pesticide hazard depends not only on toxicity but also on the chance of exposure to toxic amounts of the pesticide. Pesticides can enter the body through oral ingestion, through the skin or through inhalation. Once inside the body, they may produce poisoning symptoms, which are either acute (from a single exposure) or chronic (from repeated exposures or absorption of smaller amounts of toxicant).

EPA and WHO Toxicity Classifications

Basically, there are two systems of pesticide toxicity classification. These are the USEPA and the WHO systems of classification. It is important to note that the WHO classification is based on the active ingredient only, whereas USEPA uses product formulations to determine the toxicity class of pesticides. So, WHO classification shows relative toxicities of all pesticide active (or technical) ingredients, whereas EPA classification shows actual toxicity of the formulated products, which can be more or less toxic than the active ingredient alone and are more representative of actual dangers encountered in the field. The tables below show classification of pesticides according to the two systems.

a) USEPA classification (based on formulated product = active ingredient plus inert and other ingredients)

Class	Descriptive term	Mammalian LD_{50}		Mammalian Inhalation LC_{50}	Irritation		Aquatic invert/fish (LC_{50} or EC_{50})[2]	Honey bee acute oral (LD_{50})
		Oral	Dermal		Eye[1]	Skin		
I	Extremely toxic	≤50	≤200	≤0.2	Corrosive	Corrosive	< 0.1	
II	Highly toxic	50-500	200-2000	0.2-2.0	Severe	Severe	0.11-1.0	< 2 µg/bee
III	Moderately toxic	500-5000	2000-20000	2.0-20	No corneal opacity	Moderate	1.1-10.0	2.1-11 µg/bee
IV	Slightly toxic	≥5000	≥20000	≥20	None	Moderate or slight	10.1-100	
	Relatively non-toxic						101-1000	
	Practically non-toxic						1001-10,000	> 11 µg/bee
	Non-toxic						> 10,000	

[1] Corneal opacity not reversible within 7 days for Class I pesticides; corneal opacity reversible within 7 days but irritation persists during that period for Class II pesticides; no corneal opacity and irritation is reversible within 7 days for Class III pesticides; and Class IV pesticides cause no irritation

[2] Expressed in ppm or mg/l of water

b) WHO classification (based only on active or 'technical' ingredient)

Class	Descriptive term	Oral LD_{50} for the rat (mg/kg body wt)		Dermal LD_{50} for the rat (mg/kg body wt)	
		Solids	**Liquids**	**Solids**	**Liquids**
Ia	Extremely hazardous	≤5	≤20	≤10	≤40
Ib	Highly hazardous	5-50	20-200	10-100	40-400
II	Moderately hazardous	50-500	20-2000	100-1000	400-4000
III	Slightly hazardous	≥501	≥2001	≥1001	≥4001
U	Unlikely to present acute hazard in normal use	≥2000	≥3000	-	-

Annex 7: PERSUAP Analyses of Active Ingredients in Pesticides Registered in Indonesia

Introduction to Annex 7

Annex 7 below compiles all of the AIs in pesticides (natural and synthetic) registered for use in Indonesia, and proposed for imminent registration. Project decision-makers—especially those who interface at the field level with beneficiary farmers—are encouraged to look at the label of potential pesticide choices to determine the AIs contained in them and then use this Annex as a quick reference guide to attributes and issues with each chemical.

The pesticide attributes include pesticide class (to manage resistance by rotating chemicals from different classes), EPA registration and Restricted Use Pesticide (RUP) status (to comply with Regulation 216) and acute toxicity (judged by this document to be safe, or not, for smallholder farmers—most Class I chemicals are not considered safe for smallholder farmers to use). Annex 7 also presents chronic health issues, water pollution potential, and potential toxicities to important non-target organisms like fish, honeybee pollinators, birds and several aquatic organisms.

Further, Annex 7 contains basic pieces of human safety and environmental data needed for the various analyses required throughout the PER; ergo it is referred to throughout this document. And it provides data used to produce the project-critical information contained in Annexes 8 and 9. Thus, this PERSUAP provides useful tools for evaluating and choosing among IPM options, including natural and synthetic pesticides, while adhering to 22 CFR 216, as well as aiming at the market-driven best practices found in Standards and Certification (S&C) systems—the highest international standards available.

See Annex 7 Matrix, below.

Key to matrix:

Red shading: Do not promote products containing AIs shaded in red strikethrough color on USAID-supported farms or wood processing

Green shading: Can be promoted on USAID-supported farms

Yellow shading color: Some products accepted; some products rejected

RUP: Few = one or two products; Some = a third of products; Most/All = most or all products

WHO Acute Toxicity Classes: O = Obsolete; Ia = Extremely Hazardous; Ib = Highly Hazardous; II = Moderately Hazardous; III = Slightly Hazardous; U = Unlikely to present acute hazard in normal use

EPA Acute Toxicity Classes: I = Extremely Toxic; II = Highly Toxic; III = Moderately Toxic; IV = Slightly Toxic

Chronic Human Toxicity: KC = Known Carcinogen; PC = Possible Carcinogen; LC = Likely Carcinogen; ED = Potential Endocrine Disruptor; RD = Potential Reproductive & Development Toxin; P = Risk of Parkinson's

Ecotoxicity: NAT = Not Acutely Toxic; PNT = Practically Not Toxic; ST = Slightly Toxic; MT = Moderately Toxic; HT = Highly Toxic; VHT = Very Highly Toxic

References used to find pieces of data contained in Annex 7: See references at the end of the report.

Annex 7: Indonesia Pesticide Active Ingredients in Products Registered

Active Ingredients	Class	EPA Registered	Restricted Use Pesticide	WHO Acute Toxicity Class	EPA Acute Toxicity Classes	Chronic Toxicity	Groundwater contaminant	Ecotoxicity								
								fish	bees	birds	amphibians	worms	Mollusks	Crustaceans	Aquatic Insects	Plankton
Miticides/Acaricides																
abamectin/avermectin	microbial	yes	**some**	none	II, III	RD	no data	ST	HT	PNT				HT	VHT	VHT
amitraz	formamdine	yes	no	III	II	PC, RD	no data	MT	PNT	ST	ST			NAT		ST
tetradifon	bridged diphenyl	**no**	no	U	III	none	no data	MT	MT	NAT	MT	NAT	ST	ST		MT
Insecticides																
abamectin	microbial	yes	**some**	none	II, III	RD	no data	ST	HT	PNT				HT	VHT	VHT
acetamiprid	neonicotinoid	yes	no	none	III	none	no data	NAT	MT	HT				NAT		
acrinathrin	pyrethroid	**no**	no	U	IV	ED	no data	MT	ST	MT		MT		MT		
alphacypermethrin	pyrethroid	**no**	no	none	II, III	PC	no data	HT	HT	PNT			MT	VHT	VHT	VHT
aluminum phosphide	inorganic	yes	**all**	none	**I**	none	no data	HT	HT	HT				MT		
bendiocarb/benthiocarb	carbamate	**no**	**some**	II	II, III	RD	no data	MT	HT	HT				MT	HT	VHT
carbofuran	carbamate	yes	**most**	**Ib**	**I**, II	ED	potential	MT	HT	HT	ST	MT	MT	HT	HT	VHT
cartap hydrochloride	nereistoxin	**no**	no	II	II	none	no data	MT	MT							
chlorfenvinphos	organophosphate	**no**	no	**Ib**	**I**, II	ED	no data	HT	HT	HT	MT	MT		HT		
chlorpyrifos (ethyl)	organophospate	yes	**some**	II	II, III	ED	no data	HT	HT	HT	MT	PNT	MT	VHT	HT	MT
cyfluthrin	synthetic pyrethroid	yes	**some**	II	II, III	ED	no data	VHT	HT	PNT			ST		VHT	VHT
cypermethrin	pyrethroid	yes	**some**	none	II, III	PC	no data	HT	HT	PNT			MT	VHT	VHT	VHT
deltamethrin	pyrethroid	yes	**cotton**	II	II, III	none	no data	HT	MT		VHT		NAT		VHT	VHT
dichlorvos/DDVP	organophospate	yes	no	**Ib**	**I,** II, III	PC, ED	no data	MT	HT	HT				HT		
dimethoate	organophospate	yes	no	II	II	PC	potential	ST	VHT	VHT	HT	MT	VHT	HT	VHT	MT
endosulfan	organochlorine (POPs)	yes	**most**	II	**I**, II	ED	no data	VHT	MT	MT	MT	MT	MT	HT	HT	MT
ethofenprox	pyrethroid	yes	no	U	III	PC, RD	no data	HT	HT	MT		MT		HT		
fenamiphos	organophosphate	**no**	**some**	**Ib**	**I**	none	potential	HT	HT	HT		MT		VHT		MT
fenitrothion	organophosphate	yes	no	II	II, III	ED	no data	MT	HT	MT	MT	MT	MT	VHT	HT	MT
imidacloprid	neonicotinoid	yes	no	II	II, III	none	potential	NAT		MT					VHT	
lambda cyhalothrin	pyrethroid	yes	**some**	II	II, III	ED	no data	VHT	HT	PNT		VHT	VHT	VHT	VHT	
methamidophos	organophospate	**no**	no	**Ib**	**I**	none	potential	ST			ST			VHT		MT
methomyl	carbamate	yes	**few**	**Ib**	**I**, II, III	ED	potential	MT	HT	HT	ST	HT	ST	HT	VHT	HT
monocrotophos	organophosphate	**no**	no	**Ib**	**I**	none	no data	ST	HT	HT		MT	MT	MT		HT
permethrin	pyrethroid	yes	no	II	III	PC, ED	no data	VHT	VHT	PNT	ST	ST	ST	VHT	MT	MT
pirimiphos-methyl	organophospate	yes	no	III	III	none	no data	MT	HT	MT						
profenofos	organophosphate	yes	**all**	II	III	none	potential	HT						VHT	VHT	VHT
propoxur	carbamate	yes	no	II	II, III	PC	no data	MT	HT	VHT	ST	NAT	ST	HT	ST	MT
terbufos	organophosphate	yes	**most**	**Ia**	**I**	none	no data	VHT	MT	MT		HT		VHT		VHT
triflumuron	insect growth regulator	**no**	no	U	none	none	no data	VHT	ST	MT				MT	MT	MT

Indonesia Pesticide Active Ingredients in Products Registered

Bacillus thuringiensis-BT	microbial	yes	no	none	III	none	no data		PNT	NAT	NAT		ST	ST		
Beauveria bassiana	microbial	yes	no	none	III	none	no data	NAT	NAT	NAT		NAT		NAT		
cyromazine	triazine	yes	no	U	III	ED	**known**	MT	ST	MT		MT		MT	NAT	
fipronil	pyrazole	yes	**few**	II	II, III	PC, ED	potential	HT	HT	HT					HT	HT
lufenuron	benzoyl urea	yes	no	NL	III	NL	no data	MT	ST	MT		MT		HT	ST	
malathion/mercaptothion	organophosphate	yes	no	III	II	PC, ED	potential	MT	HT	MT	HT	ST	VHT	MT	VHT	HT
pyrethrins (Marigold extract)	botanical	yes	no	II	III	PC	no data	HT	HT	ST		MT		HT		
spinosad	microbial	yes	no	U	III	NL	no data	MT	HT	PNT		ST			HT	MT
thiamethoxam	neonicotinoid	yes	**few**	NL	III	PC	no data	PNT	HT	PNT		PNT	PNT	PNT	PNT	
Fungicides																
benomyl (benlate)	benzimidazole	**no**	no	U	III	PC, ED, RD	no data	HT	PNT	MT	ST	HT		NAT		ST
boscalid (nicobifen)	carboximide (anilide)	yes	no	none	II, III	PC	no data	MT	MT	MT		MT		MT		
carbendazim	benzimidazole	yes	no	U	III	PC, ED	no data	MT	NAT	ST	ST			ST		HT
chlorothalonil	chloronitrile	yes	no	none	**I**, II	PC	potential	VHT			HT		ST	VHT	MT	MT
copper ammonium complex	inorganic	yes	no	none	III	none	no data	HT				MT				
copper (cuprous) oxide	inorganic	yes	no	none	I, III	none	no data	NAT								
copper oxychloride	inorganic	yes	no	none	II, III	none	no data	MT	MT	MT		MT				
copper sulfate	inorganic	yes	no	II	**I**, III	none	no data	MT	HT	PNT	HT	HT	VHT	ST		ST
difenoconazole	azole	yes	no	III	III	PC	no data	MT	MT	ST		MT		MT		HT
fenamidone	unclassified	yes	no	none	II, III	none	no data	MT	MT	MT		MT		MT		
folpet	thiophthalimide	yes	no	U	II, III	PC	no data	HT	PNT	ST	HT	MT	ST	HT		MT
fosetyl aluminum	unclassified	yes	no	none	III	none	potential	NAT	ST	ST		MT		NAT		MT
iprovalicarb	unclassified	**no**	no	U	none	**LC**	no data	MT	ST	MT		MT				
kresoxim-methyl	strobin	yes	no	U	III	PC	potential	ST	ST	ST		MT		MT		VHT
mancozeb/maneb-zinc	dithiocarbamate	yes	no	U	III	PC, ED, RD	no data	MT	MT	ST	HT					NAT
phosphorous acid	inorganic	yes	no	U	III	none	no data	ST								
propamocarb HCl	carbamate	yes	no	none	III	none	no data	MT	MT	MT		MT		MT		
propiconazole	azole	yes	no	II	II, III	PC, RD	potential	MT					MT	ST	MT	MT
propineb	dithiocarbamate Zn	**no**	no	U		RD	no data	MT	PNT	PNT			MT	MT	MT	MT
sodium metabisulfite	inorganic	yes	no	none	III	none	no data	ST								
tebuconazole	azole	yes	no	III	II, III	PC	potential	MT	MT	MT		MT		MT	MT	HT
thiram	dithiocarbamate	yes	no	III	III	ED, RD	no data	HT	NAT	PNT	VHT	HT		NAT	HT	HT
triadimefon	triazole	yes	no	III	II, III	PC, ED, RD	potential	MT	MT	PNT		MT		NAT		

Indonesia Pesticide Active Ingredients in Products Registered

Active Ingredients	Class	EPA Registered	Restricted Use Pesticide	WHO Acute Toxicity Class	EPA Acute Toxicity Classes	Chronic Toxicity	Groundwater contaminant	Ecotoxicity								
								fish	bees	birds	amphibians	worms	Mollusks	Crustaceans	Aquatic Insects	Plankton
alkyldimethylbenzyl ammonium chlorid	quaternary ammonium	**no**	no	none	**I**	none	no data	HT				MT	MT	HT	MT	HT
copper hydroxide	inorganic	yes	no	II	II, III	none	no data	HT	MT	MT		MT	HT	NAT	HT	HT
cymoxanil	unclassified	yes	no	III	III	none	no data	MT	MT	ST		MT		MT	MT	ST
dichlorophen	chlorinated phenol	**no**	no	III	III	PC, RD	no data	HT		NAT			MT	MT		
epoxiconazole	triazole	**no**	no	none	none	PC	no data	MT	MT	MT		MT				
famoxadone	oxazole	yes	no	U	III	none	no data	HT	MT	ST				HT		
flusilazole	azole	**no**	no	III	III	none	no data	MT	MT	MT		MT		MT		
flutriafol	triazole	**no**	no	III	NL	ED	potential	MT	MT	LT		MT		MT		
metalaxyl	benzanoid	yes	no	III	II, III	NL	potential	ST	PNT	PNT						ST
penconazole	azole	**no**	no	U	NL	ED	no data	MT	MT	MT		MT		MT		
pyraclostrobin	strobin	yes	no	none	II, III	none	no data	ST	MT	MT		MT		HT		
triadimenol	triazole	yes	no	III	II, III	PC, ED	no data	MT	ST	MT		MT				
Trichoderma species	microbial	yes	no	none	III	none	no data									
Herbicides																
2 4 DB acid	chlorophenoxy acid	yes	no	III	III	PC, ED, RD	no data	ST							ST	
2 4 D isooctyl ester	chlorophenoxy ester	yes	no	none	III	PC	potential	ST								MT
acetochlor	chloroacetanilide	yes	**most**	III	II, IIII	PC, ED	potential	MT	MT	ST		MT				MT
ametryne	triazine	yes	no	III	III	ED	potential	ST	MT	NAT	MT		MT			ST
atrazine	triazine	yes	**most**	U	III	PC, ED	**known**	ST	NAT	PNT	ST	ST	ST	ST	ST	ST
chlorimuron (ethyl)	sulfonyl urea	**no**	no	U	III	none	no data	NAT	ST	NAT		MT		NAT		MT
clethodim	cyclohexenone	yes	no	none	II, III	none	potential	MT	MT	MT		MT		MT		
fluazifop-p-butyl	propionic acid	yes	no	III	II, III	none	no data	MT	ST	PNT					ST	
fomesafen	diphehyl ether	yes	no	III	**I**, II, III	PC	no data	NAT	MT	NAT		MT		NAT		ST
glyphosate	phosphonoglycine	yes	no	U	II, III	none	potential	ST	ST	NAT		PNT		MT		ST
hydramethylnon	unclassified	yes	no	III	III	PC, RD	no data	HT	MT	MT				MT		
imazethapyr	amidazolinone	yes	no	U	II, III	none	potential	NAT	HT	NAT		NAT		NAT		
mepiquat chloride	quaternary ammonium	yes	no	III	II, III	none	potential	ST	MT	MT		MT		HT		VHT
metolachlor/S-metolochlor	chloroacetamide	yes	no	III	III	PC, ED	**known**	MT	ST	MT		MT		MT		
metribuzin	triazinone	yes	no	II	II, III	ED	potential	MT	NAT	MT		MT		ST		ST
metsulfuron-methyl	sulfonyl urea	yes	no	U	III	none	potential	NAT	MT	NAT		MT		NAT		
nicosulfuron	sulfonylurea	yes	no	U	II, III	none	potential	MT	MT	MT		MT		MT		
paraquat	bipyridylium	yes	**most**	II	**I**	P	potential	ST	NAT	MT	ST		ST	ST	NAT	ST
pendimethalin	dinitroanaline	yes	no	III	III	PC, ED	no data	MT	NAT	ST				MT	MT	
propaquizafop	a propionic acid	**no**	no	U	none	none	no data	MT	MT	MT		MT		MT		
pyrothiobac-sodium	pyrimidinyloxybenz.	yes	no	U	II	PC	potential	NAT	MT	NAT				NAT		
sulcotrione	unclassified	**no**	no	none	none	none	no data									
terbuthylazine	triazine	yes	no	U	III	none	no data	MT	MT	MT		MT		MT		HT

Indonesia Pesticide Active Ingredients in Products Registered

Active Ingredients	Class	EPA Registered	Restricted Use Pesticide	WHO Acute Toxicity Class	EPA Acute Toxicity Classes	Chronic Toxicity	Groundwater contaminant	Ecotoxicity								
								fish	bees	birds	amphibians	worms	Mollusks	Crustaceans	Aquatic Insects	Plankton
bentazon	benzothiazinone	yes	no	III	III	none	no data	NAT	MT	MT		MT	ST	MT		
bromoxynil	hydroxybenzonitrile	yes	no	II	II	PC, RD	no data	ST	MT	MT		MT	MT			VHT
clomazone	isoxazolidinone	yes	no	II	II, III	NL	potential	MT	MT	NAT		MT		MT		HT
cyanazine	triazine	**no**	no	II	II, III	PC, ED, RD	**known**	ST	MT	MT		MT	ST	MT		HT
DCPA/dacthal	alkyl phthalate	yes	no	U	III	PC	**known**	ST				NAT				ST
diuron	urea	yes	no	U	III	LC, ED, RD	**known**	ST			ST		ST	ST	MT	ST
fluometuron	urea	yes	no	U	III	PC	potential	ST					ST			MT
halosulfuron (methyl)	pyrazole	yes	no	U	III	none	potential	ST	MT	ST		ST		ST		NAT
linuron	urea	yes	no	U	III	PC, ED, RD	potential	MT	NAT	MT		MT	ST	MT	ST	MT
MCPA	chlorophenoxy acid	yes	no	II	II, IIII	PC	no data	ST	PNT	NAT	ST		ST	NAT	NAT	ST
mesotrione	unclassified	yes	no	none	II, IIII	none	no data	NAT	MT	MT		MT		NAT		
metam sodium	dithiocarbamate	yes	**half**	II	**I**	PC, RD		MT	MT	MT		VHT		VHT		HT
nicosulfuron (methyl)	sulfonylurea	yes	no	U	II, III	none	potential	MT	MT	MT		MT		MT		
oxyfluorfen	diphehyl ether	yes	no	U	II, III	PC	no data	HT	PNT	PNT			HT		HT	HT
prometryn	triazine	yes	no	U	III	ED, RD	potential	MT	NAT	PNT	ST	NAT		NAT	ST	ST
propachlor	chloroacetanilide	yes	no	III	I, II	LC, RD	no data	HT	ST	HT	MT	MT		MT		
propanil	analide	yes	no	III	II, III	PC	potential	MT	NAT	MT	ST		NAT	ST	ST	ST
quizalofop-p-tefuryl	aryloxyphenoxypropionate	yes	no	II	III	none	no data	MT	MT	NAT		MT		MT		
thiobencarb(e)/benthiocarb	thiocarbamate	yes	no	II	III	none	potential	MT	ST	NAT	MT		MT	MT	MT	HT
trifluralin	dinitroanaline	yes	no	U	II, III	PC, ED	no data	HT	PNT	PNT	MT	HT	ST	ST	ST	MT
Rodenticides																
bromadiolone	coumarin	yes	no	**Ia**	III	none	no data	MT		MT				MT		
coumatetralyl	coumarin	**no**		**Ib**	**I**	none	no data	MT		MT						
difethialone	coumarin	yes	no	**Ia**	II, III	none	no data	VHT		HT		MT		HT		
zinc phosphide	inorganic	yes	**some**	**Ib**	**I**, II, III	RD	no data	HT	VHT	HT				MT		
Nematicides																
fenamiphos	organophosphate	**no**	**some**	**Ib**	**I**	none	potential	HT	HT	HT		MT		VHT		MT
oxamyl	carbamate	yes	**most**	**Ib**	**I**	none	no data	ST	HT	VHT		HT		ST		MT
terbufos	organophosphate	yes	**most**	**Ia**	**I**	none	no data	VHT	MT	MT		HT		VHT		VHT
Paecilomyces lilacinus Strain 251	microbial egg parasite	yes	no	none	III	none	no data									

Indonesia Pesticide Active Ingredients in Products Registered

Active Ingredients	Class	EPA Registered	Restricted Use Pesticide	WHO Acute Toxicity Class	EPA Acute Toxicity Classes	Chronic Toxicity	Groundwater contaminant	Ecotoxicity								
								fish	bees	birds	amphibians	worms	Mollusks	Crustaceans	Aquatic Insects	Plankton
Microbicides																
alkyldimethylbenzyl ammonium chloride	quaternary ammonium	no	no	none	**I**	none	no data	HT				MT	MT	HT	MT	HT
bromine	inorganic	yes	no	NL	II	NL	no data	HT								MT
bromine chloride	inorganic	yes	no	NL	**I**	NL	no data	HT					HT	MT		HT
chlorine dioxide	inorganic	yes	no	NL	III	NL	no data	NAT					NAT	NAT		
copper	inorganic	yes	no	NL	**I**, II, III	NL	no data	MT			VHT	HT	HT	MT	MT	HT
copper ammonium complex	inorganic	yes	no	none	III	none	no data	HT				MT				
didecyldimethyl ammonium chloride	quaternary ammonium	yes	no	NL	I	NL	no data	HT				MT	MT	HT	MT	HT
formaldehyde	organic	yes	no	NL	**I**	**KC**	no data	NAT					NAT	NAT		ST
hydrogen peroxide	inorganic	yes	no	NL	**I**, III	NL	no data	MT		NAT	ST			HT		
iodine	inorganic	yes	no	NL	**I**, III	NL	no data	MT								HT
phenol	benzene	yes	no	NL	II, III	NL	no data	ST			ST	NAT	NAT	ST	NAT	ST
quaternary ammonium	inorganic	**no**	no	NL	NL	NL	no data									
sodium hypochlorite (Clorox)	inorganic	yes	no	NL	**I**, II, III	NL	no data	HT		ST		MT	MT	MT	HT	MT
sulfuric acid	acid	yes	**few**	NL	**I**	NL	no data	ST						ST		

Annex 8. Training Topics and Safe Pesticide Use Web Resources

GAP/IPM

- Pest identification: How to recognize common important pests and diseases
- Monitoring: The importance of frequent crop monitoring for pests, diseases and weeds
- GAP and IPM concepts, tactics and tools found in Annex 1 that can reduce pesticide use and associated risks on specific pests of Indonesia IP target crops
- PMPs—Pest Management Plans: Creating and using these farm crop-management tools

Pesticides

- Understanding pesticides: Quality, types, classes and acute toxicities of common pesticides
- Regulations: US, EU and Indonesia laws that guide pesticide registration and use
- Natural pesticides: Raise awareness of and promote the use of natural pesticides found in Annexes 1, 4, 5 and 7 as well as green-label synthetic pesticides with relatively low risks
- Spot Treatments: The importance of spot treatments if needed (instead of crop-wide treatments)
- MSDS: How to use MSDSs for pesticide-specific information on risks and risk reduction measures
- REI—Re-Entry Intervals: Pesticide-specific risks associated with entering a sprayed field too soon after the spray operation
- PHI—Pre-Harvest Interval: Pesticide-specific risks associated with harvesting a crop before pesticides have had a chance to break down
- MRL—Maximum Residue Level: Risks associated with pesticide residues on human food
- Vulnerable individuals: The importance of keeping children, pregnant women, elderly and infirm away from the field while spraying and kept out after spraying
- Human and environmental risks: Risks associated with more commonly-used pesticides (use information from MSDSs and Annex 7)
- When to spray: Early in the morning, late in the afternoon, or night without wind or rain
- Use of recommended PPE: Why it is used (see product MSDSs, product labels and web reference below)
- Proper use and maintenance of sprayers, including proper sprayer calibration and spray nozzle choice
- Proper clean-up & post spray hygiene
- Safe Use: How to purchase, transport, store and use pesticides safely ("safe purchase" requires quality, brand-name products)
- Maintenance: of PPE and sprayers
- Monitoring for the development of pesticide resistance
- Proper collection and disposal of pesticide rinseate and packaging (see disposal web reference below and MSDSs)
- The use of pesticide spray buffer zones near schools, water resources, organic crop production, apiaries, bird sanctuaries, biodiversity enclaves, national parks or other sensitive areas.
- How to reduce and mitigate risks to critical environmental resources and biodiversity (found in PER Factors E and G)
- Honeybees: Ensuring pesticide applicators notify beekeepers about spray activities, and spray early morning or late afternoon when no heavy winds or rain are present
- Water Pollution: Raise awareness of pesticides (especially some herbicides) with high ground water contamination potential where water tables are high or easy to reach (use Annex 7 and MSDSs)
- Exposure routes: Ways pesticides enter the body and ways to mitigate entry
- Basic first aid: Understanding how to treat pesticide poisonings (see first aid web reference and MSDSs)

- Record-keeping: Pesticide used, when used, which crop, how applied, who applied

Web Safe Pesticide Use Training Resources

General Mitigation of Potential Pesticide Dangers General Measures to Ensure Safe Use:
http://pdf.usaid.gov/pdf_docs/PNADK154.pdf, Chapter 13

EPA Recommended Worker Protection Standards: http://www.epa.gov/oppfead1/safety/workers/equip.htm (all types of PPE)
http://www.cdc.gov/nasd/docs/d001701-d001800/d001797/d001797.html (respiratory PPE)

Routes of Pesticide Exposure and Mitigation of Risks:
http://pdf.usaid.gov/pdf_docs/PNADK154.pdf, Chapter 13

Basic First Aid for Pesticide Overexposure:
http://pdf.usaid.gov/pdf_docs/PNADK154.pdf, Chapter 13

International PIC & POPs Lists:
PIC Pesticides and Industrial Chemicals (http://www.pic.int)
POPs Pesticides and Chemicals (http://www.pops.int)

Pesticide Disposal Options:
http://www.epa.gov/oppfead1/labeling/lrm/chap-13.htm

Annex 9. Field Monitoring Form for Farmer Best Practices including GAP and IPM options

Name of USAID Staff Responsible for Monitoring Demonstration Farms:

Name of Demonstration Farmer: Crop: Date:

What are the major pests encountered by the farmer?:

Which of the *attached* Preventive and Curative GAP and IPM tools and tactics are used by farmer?

Are pesticides used by demo farmer? Yes__ No__

How are pesticides applied? backpack sprayer__ other__

What are the names of the pesticides used?:

Which PPE does farmer have and use? gloves___ overalls___ boots___

respirator___ goggles___

Has the farmer had IPM and Safe Pesticide Use training? Yes__ No__

Are there any empty pesticide containers scattered in the field? Yes__ No__

Are there signs that the backpack sprayer has leaks? Yes__ No__

Does the farmer understand the pesticide label information? Yes__ No__

Is the pesticide stored safely out of the house or away from kids? Yes__ No__

Does the farmer use gloves for mixing the pesticide with water? Yes__ No__

What times of the day are the pesticides applied? _____

Are pesticides applied during rain or windy conditions? Yes__ No__

Are women or children permitted to apply pesticides? Yes__ No__

Are empty pesticide containers are used to store water? Yes__ No__

Does the farmer rinse equipment away from streams and open water? Yes__ No__

Does the farmer wash clothes after applying pesticides? Yes__ No__

How does the farmer dispose of empty pesticide containers? puncture/bury__ burn__

Is there any evidence that pesticides are becoming less effective? Yes__ No__

Preventive and Curative GAP and IPM options:

Preventive	Preventive	Curative
Soil nutrient, texture and pH testing	Farmer ability to correctly identify pest predators, parasitoids and diseases	Mechanical insect control by hand picking
Pest resistant/tolerant seed/plant variety	Weekly field scouting to assess pest levels/damage	Farmers make & apply local artisanal plant extracts (neem, pyrethroid, garlic, chili, other)
Early/late plantings or harvestings to avoid pests	Use of trap crops to trap and destroy pests	Weed control by machine cultivation, hoe or hand
Seed treatment with pesticides	Removal/pruning of diseased or heavily infested plants/tree branches	Purchase and release of predators or parasitoids to control major pests
Soil moisture testing	Planting parasite-attracting plants on field margins	Use of pheromone traps to reduce overall pest levels
Raised-bed production or mounding	Put baits and use other practices to encourage predator/parasite build-up	Use of pheromone inundation to confuse pest mating
Irrigation and drip irrigation	Use of pheromone traps to monitor pest levels	Spot treatment of pest hotspots with insecticides, miticides or fungicides
Use of natural fertilizers (manure, compost)	Inter-planting crops with aromatic herbs (celery, cilantro, parsley, dill or local plants) that repel pests	Area spraying (complete field coverage) using synthetic and natural insecticides, miticides or nematocides
Use of purchased mineral fertilizers	Mulching with organic materials or plastic to control weeds	Use of synthetic and natural fungicides or bactericides
Combinations of organic and mineral fertilizers	Plant living barriers or bamboo/tree barriers on windward edge of field	Use of herbicides for weed control
Crop rotation	Exclude insect pests by using vegetable tunnels and micro-tunnels	Farm use of a locked storage building for pesticides
Use of green manure crops	Use of biodiversity or energy conservation practices	Farmer use of pesticide in-ground compost trap for depositing and capturing spilled or leftover pesticides
Farmer ability to correctly identify pests and their damage	Crop stalks, residue and dropped fruit destruction/composting season end	Farmer use of receptacle for empty pesticide bottle disposal

Annex 10: Farm and Project Record Keeping Associated with Pesticide Use

CHEMICAL STOCK RECORD

FARM NAME

PACKED

Kg / Lit

TRADE NAME OF CHEMICAL

MANUFACTURER

REGISTRATION DETAILS

ACTIVE CHEMICAL INGREDIENTS

CONCENTRATIONS - %

PLEASE NOTE

Only trained staff members allowed to issue and handle CHEMICALS

Inventory must be checked and updated at least once every week and documented

Please use one form per chemical type and packed weight

Date	New Stock Delivered Litre / KG	Opening Stock Litre / KG	Stock Issued Litre / KG	Reason for Issue (Indicate Land Number and Product chemical will be applied to)	Closing Stock Litre / KG	Issued By (Name)	Signature	Received By (Name)	Signature	Empty Containers on Hand (Outers included)	Method of Disposal	Expiry Date	Disposed By (Name)

Approved by : A Hines

Chemical Stock Record - E 6.8.15, NC 1.13
Version 2

Issue Date : 04 Oct 2007
Page 1 of 1

CHEMICAL APPLICATION INSTRUCTIONS - JOVAC

DATE | PRODUCT

LAND NUMBER | BLOCK NUMBER

CHEMI CHEMICAL PRODUCT(S) TO BE APPLIED	ACTUAL DOSAGE PER LAND	Water Vol.	Har. Int. day	Target	INSTRUCTIONS FOR APPLICATION

APPLICATION MACHINERY TO BE USED | Foliar Application

INSTRUCTION GIVEN BY (NAME) | SIGNATURE

WHO EXECUTED THE INSTRUCTION

NAME | SIGNATURE

Time of Spray | Start | Finish

SUITABLE AND CLEAN PROTECTIVE CLOTHING

Gloves | Boots | Raincoa | Overall | Nose/ Mouth | Respirator | Eye Pro.

SPECIAL INSTRUCTIONS WHEN HANDLING CHEMICALS

Handling Dry Concentate | Handling Liquid Conc. | Water After Use | Keep Locked No Children | Chemical Are Dangero.

PROTECTIVE CLOTHING ISSUED TO

Name		Name		Name	
Signature		Signature		Signature	
Name		Name		Name	
Signature		Signature		Signature	

WAS THERE EXCESS SPRAY MIX? | YES | NO

APPROXIMATE QUANTITY | Liters

WHAT HAVE YOU DONE WITH THE EXCESS SPRAY MIX? | EXECUTED BY (NAME)

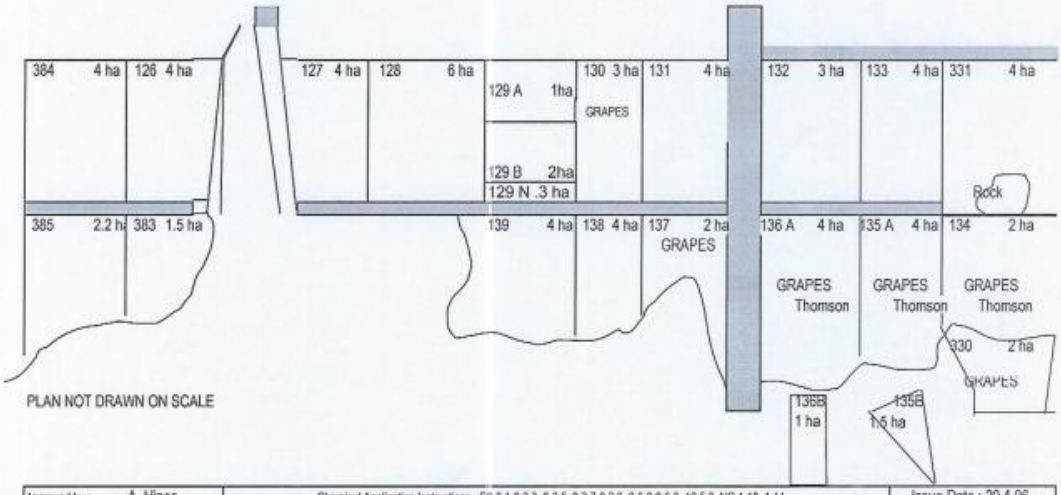
Spray Washing | YES / NO

Lit of water

Location | Washing Disposal Area

Weather Conditions

Rain	Dry	Clody	Tempture	Sunny	Wind YES / NO



PLAN NOT DRAWN ON SCALE

Approved by : A .Hines Pepared by : E .Nair	Chemical Application Instructions - E8.3.1-8.3.3, 8.3.5, 8.3.7-8.3.9, 8.6.2-8.6.3, 12.5.3, NC 1.10, 1.11 Version 9	Issue Date : 20.4.06 Page 1 of 1

1.- Control Card for Pesticides Use.- This card will stay with farmer, to keep a record on the use of pesticide by crop.

Save the Children

CONTROL FORM FOR THE USE OF PERTICIDES

GENERAL DATA			
FARMERS NAME			
Community:	**Municipality:**	**Province:**	**Altitude:**
USE OF PESTICIDES - 1st TREATMENT			
CROP:		**SURFACE:**	
Pest to be treated	Name of material	Date and time of application	Quantity used
Environmental conditions:			
Justification for use			
Other recommended control measures			
Result of application			
NAME AND SIGNATURE OF IG AND NRM SUPERVISOR:			
USE OF PESTICIDES - 2nd TREATMENT			
CROP:		**SURFACE:**	
Pest to be treated	Name of material	Date and time of application	Quantity used
Environmental conditions:			
Justification for use			
Other recommended control measures			
Result of application			
NAME AND SIGNATURE OF IG AND NRM SUPERVISOR:			

Annex 11: 2013 Indonesia Umbrella PERSUAP Country Visit Schedule and Contacts

Date	Institution	Project	Meeting Participants	Title/Position
3-Jun	USAID Mission	USG Agency Jakarta	USAID Mission and Weidemann Team	
3-Jun	MOA:Pesticide Sub Division	GOI Agency - Jakarta	Yulia Purwanti	Head of Pesticide Sub Division
4-Jun	Agriculture Biotech Support Project (ABSP) II	USAID Grantee - Bogor	Dr. M. Herman	Head of ABSP II , ICABIOGRAD
4-Jun	Sayogyo Institute (SAINS)	USAID Grantee - Bogor	Devi Anggreni	Program Manager
5-Jun	Crop Life	Private sectors- Jakarta	Deddy Djuniadi	Executive Director
6-Jun	Amarta 2 Project	USAID - Cocoa VC Pinrang South Sulawesi	Farmers at cocoa demo plot of Batu Lappa	Farmers
7-Jun	Jaya Mandiri Women farmer group	USAID - Cocoa VC Pinrang South Sulawesi	Farmer Rosmini	Head of Jaya Mandiri Group (woman group)
8-Jun	Syngenta	Private Sector : Input Producer - Makassar	Bahtiar Manadjeng	Regional Sales Manager of Syngenta
8-Jun	PT. Armajaro	Private Sector :Trading coffee/cocoa - Makassar	David Ngu Tai Keng - Pither Sutardji	General Manager; Development and Sustainability
8-Jun	PT. Olam	Private Sector :Trading coffee/cocoa - Makassar	Nikhil Chandan	Regional Manager
8-Jun	Rain Forest Alliance	Certification Body - Makassar	Agra Rivay	Sulawesi Cocoa Project Coordinator
9-Jun	ICBDA	USAID - NCBA Cassava/Vanilla-Papua	Dominggus, Decky	Members of Cassva, Vanilla farmer group
10-Jun	ICBDA	USAID - NCBA Cassava/Vanilla-Papua	Moses Wader	Head of Cassava farmer group
10-Jun	Nimbura Kencana Cooperative	USAID - NCBA Cassava/Vanilla-Papua	Father Agus Bali	Head of Cooperative
12-Jun	IPM ICRSP	USAID Grantee : IPM-ICRSP Bogor	Aunu Rauf, Phd	Professor of Agriculture Entomology
12-Jun	MOA: Pesticide Committee	GOI Agency/across sectors agency	Dr. Dadang	Head of Technical Expert / Professor of Entomology
13-Jun	IPM ICRSP	USAID Grantee : IPM-ICRSP - Bogor	Ujang	Head of farmer group
13-Jun	FAO : Clean and Disinfection Program/AI	USAID Grantee - Jakarta	Rajali Yahya and Mitra Astari	Program Managers
14-Jun	Field	NGO - Jakarta	Cahyana	Executive Director
14-Jun	USAID Mission	USAID Mission Jakarta	Dr. Andrew Sisson	Mission Director
14-Jun	USAID Mission	USAID Mission Jakarta	USAID Team	Program Managers

ANNEX 12: PERSUAP References

Baker EL, Zack M, Miles JW, Alderman L, Warren M, Dobbins RD, Miller S, Teeters WR (1978) Epidemic malathion poisoning in Pakistan malaria workers. The Lancet, January: 31–33.

Websites: Website references used to develop the PERSUAP
International Treaties and Conventions:

POPs website: http://www.pops.int

PIC Website: http://www.pic.int

Basel Convention: http://www.basel.int/

Montreal Protocol: http://www.unep.org/OZONE/pdfs/Montreal-Protocol2000.pdf

Pakistan malaria poisonings: http://pdf.usaid.gov/pdf_docs/PNACQ047.pdf.

Pesticide poisonings:

http://www.panna.org/resources/panups/panup_20080403

http://magazine.panna.org/spring2006/inDepthGlobalPoisoning.html

IPM and PMP websites:

http://www.ipm.ucdavis.edu/

http://edis.ifas.ufl.edu/pg058

http://www.ipmcenters.org/pmsp/index.cfm

http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0005/154769/Cotton-pest-management-guide-1.pdf

Pesticide Research Websites:

http://extoxnet.orst.edu/pips/ghindex.html (Extoxnet Oregon State database with ecotox)

http://www.agf.gov.bc.ca/pesticides/f_2.htm (all types of application equipment)

http://www.greenbook.net/Search/AdvancedSearch (pesticide Material Safety Data Sheets)

http://www.epa.gov/pesticides/reregistration/status.htm (EPA Registration Eligibility Decisions)

Ecotoxicity:

http://www.ohioline.osu.edu/hyg-fact/2000/2161.html (pesticide toxicity to honeybees)

http://wihort.uwex.edu/turf/Earthworms.htm (pesticide toxicity to earthworms)

Safety:

http://www.epa.gov/oppbppd1/biopesticides/ingredients/index.htm (EPA regulated biopesticides)

http://www.ipm.ucdavis.edu/index.html (IPM, PMPs and pesticide recommendations)

http://edis.ifas.ufl.edu/pdffiles/PI/PI07300.pdf (Restricted Use Pesticides)

http://www.epa.gov/pesticides/health/ (EPA Health & Safety)

http://www.epa.gov/opppmsd1/PPISdata/index.html (EPA pesticide product information)

Personal Protection Equipment (PPE):

http://www.epa.gov/oppfead1/safety/workers/equip.htm (all types of PPE)

http://www.cdc.gov/nasd/docs/d001701-d001800/d001797/d001797.html (respiratory PPE)

Annex 13: Detailed 2013 Indonesia Umbrella PERSUAP Work Plan

WORK PLAN/ITINERARY: PERSUAP STUDY
As of May 22, 2013

Date/Time	Institution/Location	Contact	Description
May 1-31	DC	A. Schroeder, D. Rahim	Collect Indonesia & USAID projects background information, registered pesticides information, IPM information. Analyze pesticide and IPM information.
May 31-June 2	DC-Jakarta	A. Schroeder	Travel DC to Indonesia
Monday, June 3 09.00-10.00 Confirmed	USAID Mission Gedung Sarana Jaya Jl. Budi Kemuliaan I/1 - Jak	Donald Tambunan dtambunan@usaid.gov	In-brief Meeting
Monday, June 3 12.00-14.00 To be reconfirmed	BPOM Indonesia National Agency of Drug and Food Control, Gedung F lantai 2 Jl.Percetakan Negara 23 – Jak 10560	Ibu Tetty Manurung	Deputy for Therapeutic Products and Drugs Supervision – Deputy Monitoring Products and Hazardous Materials
Monday, June 3 15.00-16.00	FAO? World Bank? Being consulted		Donors
Tuesday, June 4 10.00-11.00 Confirmed	MOA Jl. Harsono RM No. 3 Ragunan Jakarta Selatan 12550	Ibu Suprapti Director of Fertilizer and Pesticide - Director General of Agriculture Bina Sarana	GOI Agency
Tuesday, June 4 11.00-12.00 To be reconfirmed –	Pesticide Committee – MOA Building D, Fl 8 - Jakarta	Possibly to meet together with Ibu Suprapti or separately	GOI Agency
Tuesday, June 4 15.00-16.00 To be reconfirmed	The National Pesticide Society (http://www.hmpn.org)	Mardiyono Supriyadi Rusmanto	Private Sector/National Producers/Distributors (35 company members)
Wed, June 5 10.00-11.00 Confirmed	Scientific Certification System (SCS) Gedung Mayapada Lantai 11 – Jl, Jend	Thesis Budiarto atau Todd Frank tfrank@scglobalservice.com	Private Sector - Certification Body (Auditor of Starbucks-Aceh)

Wed, June 5 12.00-13.30 To be reconfirmed	Sudirman 28 Jakarta Sajogyo Institute Jl. Malabar No. 22, Babakan Village, Central Bogor Sub District, +622518374048151	Devi Anggreni Team Leader SAINS	USAID Grantee/cocoa Central Sulawesi Invited to Jakarta
Wed, June 5 14.00-16.00 Confirmed	Crop Life Indonesia Jl. Letjen MT Haryono Kav. 17 Wisma Pede Kebon Baru – Tebet Jakarta 12830 +62218281365	Deddy Djuniadi (Director) deddydjuniadi@yahoo.com	Private Sector/MNCs
Thurs, June 6	Off to Makassar (South Sulawesi)	Bapak Hasrun Hafid – Cocoa Value Chain Leader - AMARTA II	Kab. Pinrang/cocoa Stay in Pinrang-Makassar
Sun, June 9-10	Off to Jayapura	ICBDA	Jayapura cassava
Tues, June 11	BACK TO JAK/Am		
Wed, June 12	Off to Garut	Ibu Anita VC Team Leader Amarta 2 IUWASH-Avian Flu Program sites?	Garut-Cigedug, Sukaresmi, Cisurupan Stay in Bandung
Thurs, June 13	Off to Bogor – Stop in Puncak	IPM-ICRP - Puncak	USAID Grantee Stay in Bogor
Thurs, June 13	Biological Control Laboratory, Dept. of Pest and Plant Disease, IPB	Damayanti Buchori (Head) dami@indo.net.id	Bogor
Thurs, June 13	IPM	Prof. Aunu Rauf/IPB - Bogor	USAID Grantee - Bogor Off to Jakarta
Fri, June 14	USAID Mission	Donald Tambunan dtambunan@usaid.gov	Out Brief Meeting
June 15-16	Jakarta-DC	A. Schroeder	Travel Jakarta to DC
June 17-25	DC	A. Schroeder	Analyze findings, write draft PERSUAP
June 26-July 3	DC	A. Schroeder	Respond to feedback, write final PERSUAP

ANNEX 14: SCOPE OF WORK

Programmatic Evaluation Report and Safer Use Action Plan for USAID Funded Program and Projects in Indonesia in accordance with 22 CFR 216.3(b) and 22 CFR 216(d)

I. Introduction

The U. S. Agency for International Development (USAID) Indonesia Mission is seeking the services of an International Consultant (IC) working with a Local Consultant (LC) to produce one PPERSUAP report for USAID-funded programs and projects in Indonesia, as stipulated for by Initial Environmental Examinations (IEEs) approved by the Asia Bureau Environmental Officer (BEO/Asia). The PPERSUAP will be applicable to and referenced in IEEs for all USAID projects dealing with the use, procurement of and or recommendation for use of pesticides in various sectors, including agriculture, water and sanitation, health, construction, hospitality (mosquitoes fumigation in hotels,), in Indonesia within approved Life of Project (LOP). The services described herein will enable all USAID/Indonesia current and future programs/projects to comply with the requirements of USAID Regulation 22CFR 216.3(b), and efficiently and effectively achieve programs' and projects' goals in a timely fashion while comprehensively contributing to environmental and human health safety.

Objectives

The PERSUAP will:

a) Ensure compliance with USAID's pesticide procedures (Regulation 216. 3(b));
b) Ensure compliance with the Government of Indonesia's pesticide regulations, laws, policies or procedures on importation, testing, storage, use and disposal;
c) Ensure compliance with the Government of Indonesia's list of registered pesticides, permitted uses and availability;
d) Identify and address key pesticide use issues, particularly those impacting pesticide utilization by small-scale producers, laborers, and surrounding communities.
e) Analyze the Active Ingredients (AIs) in all registered pesticides for chemical class, EPA registration for same or similar purposes, Restricted Use Pesticide (RUP) status, WHO and EPA acute human toxicity classifications, chronic human health issues, groundwater pollution potential, and toxicity to birds, honeybees, earthworms, fish, amphibians, mollusks, crustaceans, aquatic insects and plankton;
f) Identify IPM technologies currently in use in Indonesia for each target crop as well as additional IPM technologies used in more developed market countries that may be adopted and used in Indonesia for the same crops/cropping systems;
g) Create a risk profile for Indonesia by identifying and analyzing the agrochemical system for risk, using indicators that both increase and decrease chances for risks;
h) Identify and recommend appropriate pesticide sector BMPs and mitigating actions for incorporation into the projects' activities;
i) Identify and recommend alternative actions and/or pesticides, as appropriate; and
j) Identify and address key pesticide use issues, particularly those that impact on pesticide utilization by small-scale farm laborers and farmers;

This SOW requires the PERSUAP produce:

a) Documentation on the specific uses of pesticides that will comply with 22 CFR 216.3(b)(1)(i)(a through l) for each activity concerned with procurement or use of pesticides, including promoting the adoption of particular pesticides and pesticide use technologies supported by USAID;
b) Mechanisms for capacity building of the various partners. This should specifically include design of the Safe Use Action Plan (SUAP) part of the PERSUAP, including mitigation and training to ensure procedures required under 22 CFR 216.3 (b)(1) are disseminated and understood by all partners.

Background

In the past, USAID/Indonesia has not had the technical guidance or support to conduct its own PERSUAPs, and programs were asked simply not to use or provide technical assistance for working with or procuring pesticides. However, with the new Country Development Cooperation Strategy (CDCS) in planning and the Mission's portfolio of new, current and intended programs, USAID/Indonesia recognizes the need for an "umbrella-type" Programmatic PERSUAP which would cover activities in all sectors, including and especially those involved in agriculture.

USAID/Indonesia will have at least 3 projects in 2012-2017 which would potentially provide technical assistance (TA) related to the use and procurement of pesticides. Below is a partial list of the current (September 2012) list of ongoing and expected programs. This list will be fully developed in conversation with the Consultant.

Agriculture

- Activities initially covered under the IEE for the Agricultural Development and Growth Program as approved on June 25, 2010:
    - Agribusiness Market and Support Activity (AMARTA II)
    - Integrated Pest Management Collaborative Research Support Program (IPMCRSP)
    - Indonesia Cooperative Business Development Alliance (ICBDA)
- Cocoa Added Value Chain and Cottage Industry in Central Sulawesi, Development Grant Program (DGP-Agriculture), IEE approved on October 1, 2010 (reference Asia 11-02)
- Development Credit Authority with Bank Andara. IEE approved January 19, 2011
- Development Credit Authority with Bank Danamon. IEE approved March 20, 2012

Environment

- Indonesia Urban Water, Sanitation and Hygiene Program (IUWASH). IEE approved May 20, 2009 (reference: Asia 09-86) and IEE Amendment#1 approved on June 8, 2012 (reference: Asia 12-113)

Health

- Avian Influenza Program

These programs and projects vary in size and scope. Some are multimillion dollar programs which provide direct and indirect technical assistance of pesticides (AMARTA II, NCBA, DGP). Disinfectants used with our Avian Influenza program. While these are already approved by the EPA, it would be good to have them covered under one PERSUAP. The IUWASH program provides technical assistance to increase access to water and sanitation services, of which the water treatment of the water utilities may include the use of chlorine for water disinfectant. Others programs of interest are the Development Credit Authorities (DCA), which provide loan guarantees to banks to encourage them to lend to farmers, often with the intent to support purchases of pesticides and other inputs. Finally, there are in-between programs, with no direct expectation of pesticide use, but whose activities may increase interest in investing in improved inputs, which may include agrochemicals. All of this work should be done in accordance with USAID 22 CFR. 216.3 (b) and approved conditions in respective IEEs, which state that no USAID activity involving assistance in procurement, use or recommendation for use of pesticides or activities involving procurement, transport, use, storage, or disposal of toxic materials, should take place until a PERSUAP for the activity is prepared by a BEO-approved PERSUAP Professional and approved by BEO.

Overview of PERSUAP Requirements

Pesticides are synthetic or natural products (plant, microbe) or derived chemical products intended to kill, control, and repel insects, plant diseases, weeds, and other pest organisms. Pesticides and related chemicals, if not used properly, present numerous risks to both acute and chronic human health, natural resources and the environment. A PERSUAP is USAID's tool to reduce risks inherent in pesticide use, and provide mitigation and amelioration support in the event of pesticide misuse. The PERSUAP will focus on gauging and mitigating these risks using a systems approach, from both the regulatory, codes of conduct as well as market-driven standards and certification (S&C) approach. S&C systems, such as GlobalGAP and Rainforest Alliance, focus strongly on Integrated Pest Management (IPM), as does USAID, which requires IPM integration by policy.

PERSUAP consists of two parts, a "PER" and a "SUAP." The Pesticide Evaluation Report (PER) portion addresses the specific pesticide factors stipulated in the Agency's Pesticide Procedures. The Safer Use Action Plan (SUAP) puts the conclusions and recommendations reached in the PER into a plan of action, including a timeline and assignment of responsibility to appropriate parties connected with the program. The document must also contain a background portion, providing the systems analysis of risks and opportunities for risk mitigation in the country's agriculture production and pesticide systems, with special emphasis on agricultural standards and certification systems and natural resources conservation. Annexes to the PERSUAP will contain international Best Management Practices (BMP) on pesticide use, exposure mitigation, personal protection equipment (PPE), first aid, disposal and record-keeping to be used for training purposes for implementing partner staff, farm managers, food storage managers and farmers to attain a better understanding of pesticide safety.

The present analysis will cover those pesticides proposed for use by USAID's programs/projects that are:

- Registered by US EPA for the same or similar uses without restrictions;
- Also registered by the Government of Indonesia; and
- Readily available in Indonesia

USAID/Indonesia has already compiled an initial list of suggested pesticides, as proposed by the value chain managers of the AMARTA II program. Each pesticide active ingredient will be analyzed in the PERSUAP for pesticide class (for resistance management), EPA registration status, Restricted Use Pesticide (RUP) status, WHO and EPA acute human toxicity ratings, chronic human health issues, water pollution potential, residue issues, as well as terrestrial toxicities to birds, honeybees and earthworms, and aquatic toxicities to fish, amphibians, mollusks, crustaceans, aquatic insects and planktons.

The PERSUAP will cover activities under the Mission's current and intended programs and projects in all sectors which may involve assistance for the procurement or use of pesticides. Under this SOW, assistance for the procurement or use of pesticides is defined broadly and includes recommending the conduct of training programs in pesticide handling/use, field agriculture production demonstrations, and food storages treatment pesticides.

The PERSUAP shall include appendices evaluating the economic, social, and environmental risks and benefits of the planned pesticide use by crop commodity to determine whether the use may result in significant environmental impact. If the PERSUAP analysis determines a specific pesticide will significantly affect the environment and/or human health, that pesticide will be considered as unapproved for future use, provided a safer alternative can be identified. If no safer alternative can be identified, an Environmental Assessment (EA) in accordance with §216.3(b)(l) requirements, in addition to the PERSUAP, will be conducted (separate from this TOR). This EA will include, but not be limited to, an analysis of the factors identified in §216.3(b)(l)(i) and be subject to an amendment to this PERSUAP contract.

To ensure the actual implementation of PERSUAP recommendations by implementing partners and beneficiaries, the PERSUAP will involve the Implementing Partners (IP) in the development plan for the "Safer Use Action Plan". This Action Plan will be implemented by USAID Implementing Partners (IPs) through their contractors and grantees. The conditions and recommendations in the SUAP would be written by the IP into contracts/agreements/grants to local partners. Monitoring and reporting of the implementation and impact of the recommendations would rest with the USAID IPs, or delegated to their contractors/grantees.

II. Roles and Responsibilities

USAID/Indonesia input:

The Mission Point of Contact (POC), currently designated as Marika Olson, Economic Growth Office, will, along with the Mission Environmental Officer (MEO), provide the IC with the following inputs:

- Electronic copies of the current approved and BEO signed IEEs for each target project.
- Assistance, if necessary, locating a translator.

- Information on each target project activities that entail any pesticide use, including training and field demonstrations and discuss any particular circumstances of the pesticide system in the country with PERSUAP drafter, as well as any additional expectations.
- Summaries from all target USAID Program/Project Implementers of target crops, primary pests; production constraints that farmers encounter, and methods and pesticides that farmers use to deal with pests on each crop. The Program/Project implementer should list any pesticides that it would like to promote, provide to farmers or discuss during training, field demonstrations and other activities, prior to the study.
- Identify a knowledgeable (on crops-pests-IPM-pesticides) contact person for each Program/Project Implementer a project contact person or persons to work with the International Consultant when applicable.
- CORs/AORs/Activity Managers of the respective projects covered under PPERSUAP, along with MEO will review the draft PERSUAP, provide comments and suggestions. Review the resulting EMMP and/or PMP for the following: mitigation measures, monitoring indicators, monitoring and reporting frequency, and parties responsible.

Responsibilities and Tasks of the International Consultant:
Overall, the IC will:

- Contact Mission Point of Contact, CORs/AORs/Activity Managers of the respective projects covered under PPERSUAP along with Mission Environmental officer (MEO), implementing program/projects chiefs, donors, appropriate ministries, private sector representatives and beneficiary farmers
- Acquire and synthesize information on Indonesia's ways, means and capacity to regulate or control the acquisition, distribution, use, storage and disposal of pesticides;
- Examine US EPA and local restrictions on use of pesticides;
- Examine, by site visits to key targeted project areas and clients, the types of activities and conditions under which various pesticides will be used (ex., climate, flora, fauna, geography, hydrology, soils, proximity to water bodies, types of food storages, seed storages, etc.); and
- Acquire information from each USAID project on the extent to which pesticide use is and could be part of their program; and part of integrated pest management (IPM) program. An initial list of pesticides requested from the programs has been compiled. The IC will need to analyze this list and update it as necessary for the full PERSUAP.

Specifically, the IC will:

- Work with USAID program/project implementers to compile the list of crop commodities and activities that require PERSUAP analysis. The list will include, but not be limited to, the following agricultural crops: 1) High-value horticultural crops (including chili, cabbage, carrots and tomatoes); 2) Coffee; and 3) Cocoa.
- Review the list of potential pesticides to be procured and used by crop commodity and review US EPA status of the pesticides. An initial list of pesticides requested from the agricultural programs has been compiled. The IC will need to analyze this list and update it as necessary for the full PERSUAP. Other sectors to be considered will include health, water and sanitation, and construction.

- Contact the Mission MEO, appropriate national ministries, departments and agencies to review compliance requirements and pest management options to develop an agreed upon definition of "assistance for procurement or use of pesticides".
- Assess the overall capabilities and limitations of each USAID project's pesticide management relative to the more common pesticide use problems affecting the targeted users and implementers.
- Outline "Off the Shelf" IPM and Good Agriculture Practices (GAP) measures that could be tried and used by the project's clients for each production or commodity constraint.
- Recommend and outline a training program, including a plan to train participants who will be implementing the recommendations of the analysis.
- Recommend mitigation measures for project activities (in addition to training), identified in concert with project personnel, which involve pesticide use.
- Develop a Mitigation and Monitoring Plan consistent with the requirements of applicable IEEs.
- Make recommendations for training of project field staff and beneficiary farmers, and for the provision of Personal Protection Equipment (PPE) for pesticide users;
- Draft the PERSUAP; respond to comments from the Mission Point of Contact, CORs/AORs/Activity Managers of the respective projects covered under PPERSUAP along with MEO, REA, BEO and, for food security and OTI activities, the DCHA BEO.

Following a description of the proposed usage and expected benefits of the targeted pesticides by crop commodity, the International Consultant will address each of the following factors listed under 22 CFR 216.3(b)(1)(i):

- The US EPA and Local registration status of the requested pesticides, as well as take into consideration any obligations under environmental and applicable international and regional conventions and agreements
- Extent to which the proposed pesticide is part of an integrated pest management approach.
- The proposed method of application, including availability of appropriate application and safety equipment.
- Any acute or long term toxicological hazards, either human or environmental, associated with the proposed use, and measures available to minimize such hazards.
- Status of the pesticide on the watchlists of Rainforest Alliance, UTZ, Pesticide Action Network and any other relevant certification process.
- The effectiveness of the pesticide for the proposed use.
- Compatibility of the proposed pesticide with target and non-target ecosystems.
- The availability and effectiveness of other pesticides or non-chemical control methods.
- Provisions made for monitoring the use and effectiveness of the pesticide.
- Indonesia's ability to regulate or control the distribution, storage, use, and disposal of the pesticide; including review of the Country Regulatory Acts on pesticide registration and application.
- Provisions made for training users and applicators, and outline a training plan for participants and extension officers.

Responsibilities of the Local Consultant

The Local Consultant will serve as the ground support for the IC, gathering and analyzing information, arranging the site visits, and generally reducing the time the IC needs to spend in Indonesia, allowing for a quicker turn around on the completed PPERSUAP. Specific actions can be determined between the IC, LC, and Mission POC, but the following is an initial expectation.

Overall, the LC will:

- Serve as the on-the-ground point of contact for the PPERSUAP evaluation
- Establish relationships with CORs/AORs/Activity Managers of the respective projects covered under PPERSUAP along with Mission Environmental officer (MEO), project managers, implementing program/projects chiefs, donors, appropriate ministries, private sector representatives and beneficiary farmers.
- Provide on the ground support for the initial acquisition and synthesis of information on Indonesia's ways, means and capacity to regulate or control the acquisition, distribution, use, storage and disposal of pesticides;
- Gather information on local pesticide use restrictions;
- Provide additional expertise on the site visits on local pesticide use practices.
- Begin the acquisition of information from each USAID project on the extent to which pesticide use is and could be part of their program; and part of integrated pest management (IPM) program.

Deliverables and Implementation Schedule

The major deliverable of this contract is two final reports with intermediate deliverables such as preliminary work plan, draft report, and final draft report.

1st Deliverable. The contractor will submit a work plan and draft Table of Contents (TOC) for the PPERSUAP for Indonesia no later than 5 working days after contract signature. The work plan will include a brief description of the approach, working hypotheses, and a timeline of expected activities, including travel, plus the proposed completion dates for subsequent deliverables.

2rd Deliverable. The Contractor will write a draft PERSUAP, including a Safe Use Action Plan, and an Action Plan Matrix which identifies actions, actors and timelines, on the basis of dialogue with the partners involved. The draft will be submitted to the POC with copy to MEO electronically no later than 45 working days after contract signing. The POC will promptly distribute the drafts to CORs/AORs/Activity Managers of the respective projects covered under PPERSUAP along with their implementing partners and other key stakeholders for comment/reaction within 10 working days.

3rd Deliverable Based on feedback received, IC will rectify the draft within no longer than 5 working days. The final draft PERSUAPs will contain a short (3-5 page) PERSUAP summary with key recommendations, and conditions for "use", and partner feedback. The MEO will then send the final draft PERSUAPs for BEO/Asia review and approval. The Contractor will incorporate feedback from BEO/Asia, if any, prior to circulating the approved PERSUAP report to relevant stakeholders in Indonesia. This assures consistency with the Payment Schedule.

Service Timeline

1	Week 1 (**May 1-8, 2013)**	P.O signature, Project initiation, Review current IEE and others documents, develop a work plan, and target list.
2	Week 2&3 (**May 10-24, 2013**)	Data collection, resources and risks identification, data analysis and findings
3	Week 4-5 (**May 28- June 7, 2013)**	Fields visit to evaluate PERSUAP implementation, challenges, findings, training and research for future recommendation and consultation with MEO
4	Week 6-8 **(June 10- 25, 2013)**	Data analysis and first Draft of Programmatic PPERSUAP report to be submitted for USAID review and recommendation.
5	Week 9 (**June 26- July 3, 2013)**	A Final report submission and project closure after incorporation of clients feedback

III. Cognizant Technical Officer (CTO)

The COR for these services is Mr. Donald Tambunan, The Agriculture Specialist of USAID/EG office, and Mr. John Thurow is the alternate COR.