



**USAID**  
FROM THE AMERICAN PEOPLE

Special Topic:

**What is a Pest? What is a Pesticide?**

**What are the Risks of Pesticides? . . . and**

**What is USAID's Response?**

GEMS Environmental Compliance/ESDM Training Workshops  
Africa –Asia-Latin America-Middle East 2012-2013

# Presentation Overview



- ❖ Definition of Pest & Pesticide
- ❖ Pesticides Past & Present
- ❖ Pesticide Risks
  - ❖ *Impacts on Humans & Exposure Pathways*
  - ❖ *Impacts on other organisms*
- ❖ USAID's response
  - ❖ *Policy: commitment to IPM*
  - ❖ *Regulatory: USAID's pesticide procedures*

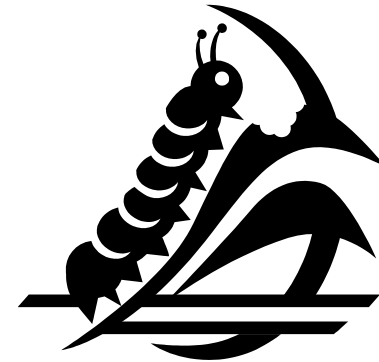


USAID follows the US EPA definition of pests

# Pests are. . .

living organisms that occur where they are not wanted or that cause damage to crops, animals, humans or other animals.

Examples include: insects, mites, ticks, rodents (and other animals), unwanted plants (weeds, invasives), fungi, bacteria and viruses.





USAID follows the US EPA definition of pesticides.

# A pesticide is. . .

Any substance or mixture of substances intended for:  
preventing,  
destroying,  
repelling, or  
mitigating any pest.

What about “natural” or “biological” pesticides?

Pesticides derived from natural sources (like **Pyrethrum**) are still pesticides.

What about disinfectants?

The purpose of disinfectants is to kill bacteria or viruses.

**Disinfectants are pesticides.**

(except household bleach, common cleaners)

What about drugs?

Drugs used to control human or animal diseases are NOT pesticides.

# Constituents and formulations

## A modern pesticide

can come in different formulations:

is a combination of:

**Active Ingredient (AI),**  
which kills the pest

+

**A surfactant** which makes the  
pesticide stick to the pest or plant

+

(Sometimes) a **synergist** which  
enhances the pesticide's action

+

**A carrier**  
(like water, oil, or a solvent)

A	Aerosol
B	Bait
D	Dust
ED	Emulsifiable Concentrate
F	Flowable
G	Granules
ULV	Ultra Low Volume
WDG	Wettable Dispersible Granule
WP	Wettable Powder

# The need for pesticides in agriculture. . .

. . . is as old as  
agriculture

## *The first pesticides: Inorganic metals*

4500 years ago

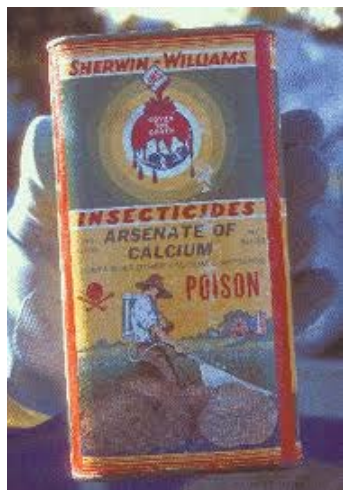
- ❖ Elemental Sulfur— **still used today**
- ❖ Sodium Chloride (salt) weed killer— **can still be used**

600 years ago

- ❖ Mercury
- ❖ Lead
- ❖ Arsenic

200 years ago for treated wood products,  
and as herbicides, insecticides and  
fungicides.

- ❖ Arsenates
- ❖ Copper, chromium
- ❖ Calcium, magnesium



# Late 1800s–Early 1900s

## Plant Extracts

- ❖ Pyrethrum — still used today
- ❖ Neem — still used today
- ❖ Rotenone — still used today
- ❖ Nicotine-Sulfur compounds
- ❖ Citronella — still used today

## Petroleum products

- ❖ Oils, Soaps — still used today
- ❖ Kerosene — still used today

## Gasses

- ❖ Cyanide — gone
- ❖ Methyl Bromide — phasing out

1800s Rotary Hand Dusters:



C-2

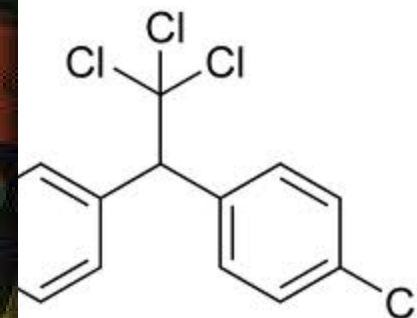
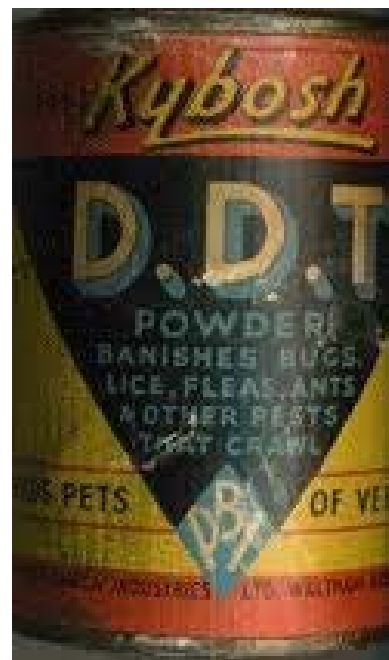
1920s



G-2

# Then. . . Synthetic Organic Pesticides

- ❖ **When?** 1939 with DDT, followed by other “chlorinated hydrocarbons”
- ❖ **Why?** Originally, to kill malaria & yellow fever mosquitoes during World War II



**Chlorinated hydrocarbons** (DDT, Aldrin, Dieldren) 1940s

**Organophosphates** (Chlorpyrifos, Diazinon) 1950s

**Carbamates** (Carbaryl, Bendiocarb, Propoxur)



# As synthetic organic pesticides came into widespread use. . .

. . .unexpected things began to happen. . .

- ❖ Need more & more pesticide to kill pests—why?
- ❖ American Eagle populations declined rapidly—what happened?
- ❖ Blood samples from Eskimos in Arctic showed DDT contamination—what happened?

**The Modern Era of Pesticides brought the modern era of PESTICIDE RISKS.  
More on this in a moment. . .**

# And today we have. . .

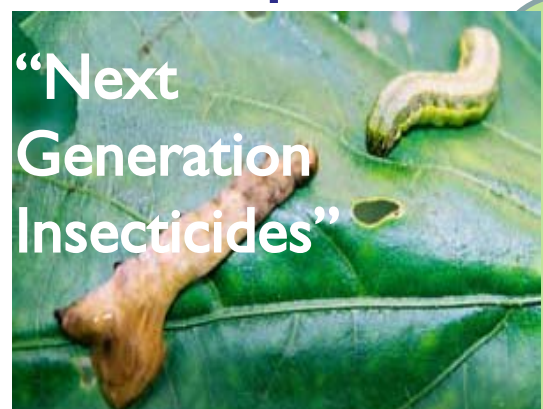
“Traditional” synthetic  
organic pesticides

+



**Plant extracted pyrethrum** (mix of pyrethrins) revived from the 1800s  
**Synthetic pyrethroids** (cypermethrin, deltamethrin, lambda-cyhalothrin)  
**Chloro-nicotinyl** (imidacloprid, thiacloprid)

+



- ❖ Microbes (bacteria, fungi, virus)
- ❖ Microbial extracts (BT, abamectin, sphinosad)
- ❖ Insect Growth Regulators—IGRs (diflubenzuron, hexythiazox, methoprene)

# Put it all together and . . .

*About **900** active ingredients in **20,700** products are currently sold in world markets*





# The need for extra scrutiny & concern

Pesticides are often essential.

But pesticides are potent killing agents. Their use has intrinsic dangers.

In developing areas, these dangers are worse because:

- *Quality control in manufacture, handling, labeling and packaging is often poor.*
- *Poor use practices are widespread.*


pesticide mis-use and mis-management can. . .

- Damage non-target ecosystems
- Affect non-target organisms (e.g., the “good bugs”)
- Cause chronic sickness, birth defects, cancers, & even death
- Persist/accumulate in the environment
- Lead to resistance and to resurgence of pests
- Result in loss of export markets

# Pesticide Impacts on Humans

- ❖ **Acute Toxicity:** Immediate (acute) poisoning leading to serious sickness or death.
- ❖ **Chronic Toxicity:** effects over the long term at lower total doses.  
For example, Cancer, Parkinson's Disease, Sterility, Organ Malfunction and Birth Defects.

How do  
people  
receive dangerous  
doses of  
pesticides?





# Human Exposure Route #1: Unsafe Application/Handling Practices

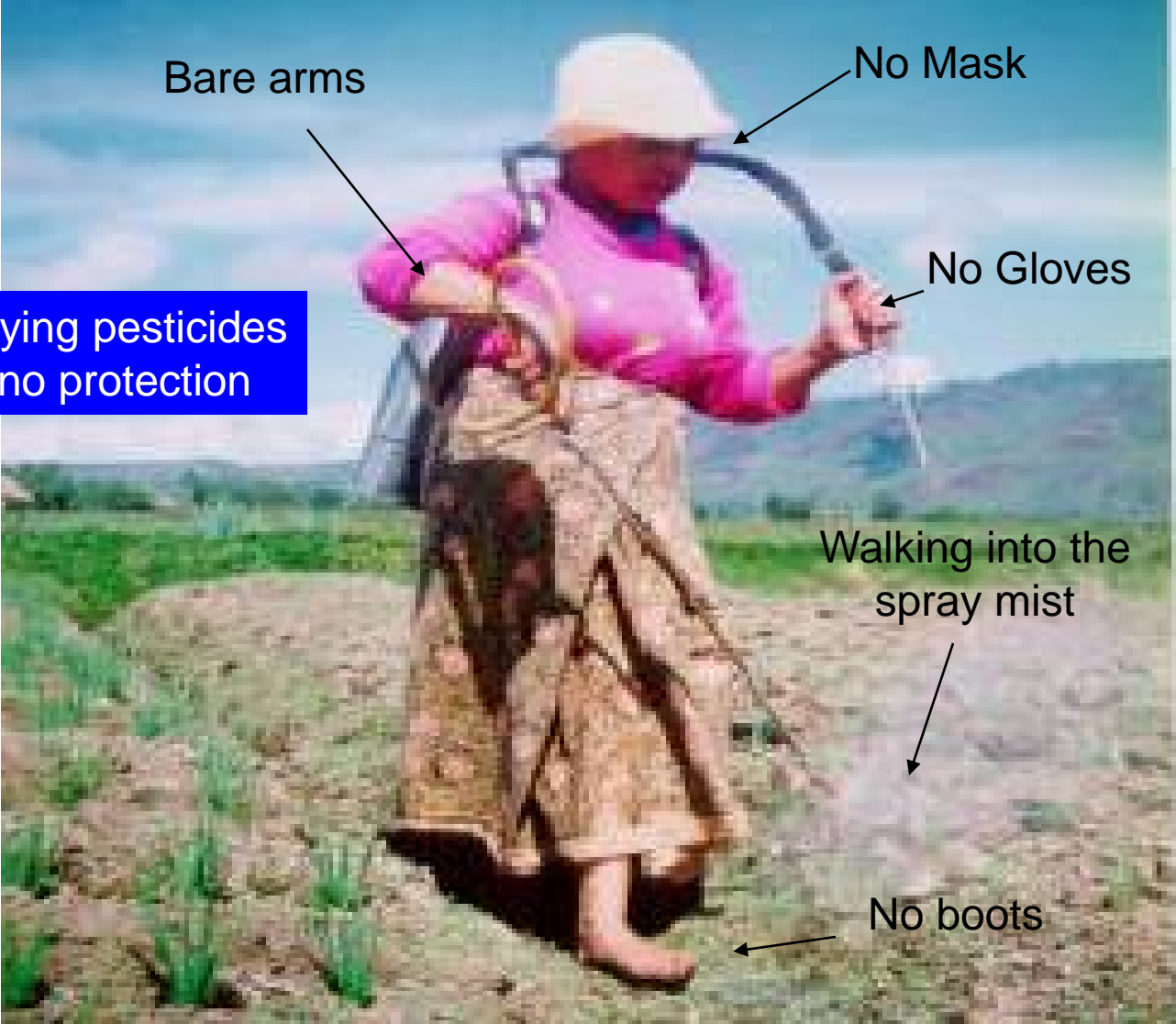


Mixing pesticides  
with bare hands



Pouring pesticide into  
sprayer without  
protection

# Pesticide Handling: What Not to Do



Spraying pesticides with no protection

# The result . . .



Skin lesions

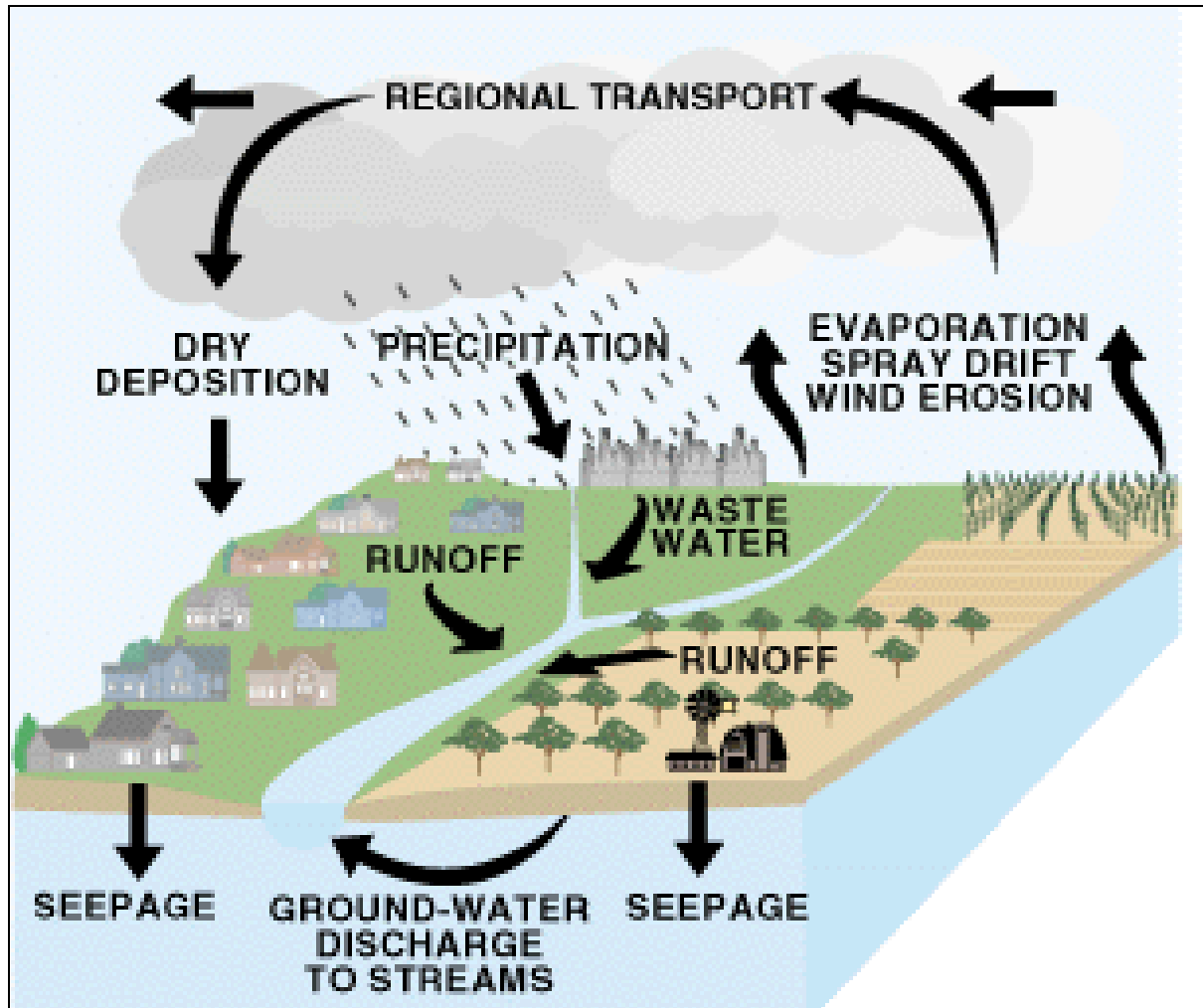


and unfocused vision

And far worse is possible (acute poisoning, cancers, birth defects, death. . . )



# Human Exposure Route #2: Drinking water



**Pesticides can enter surface & groundwater by...**

**Runoff, seepage, spray drift, dust from fields**

**Well and stream contamination from poor mixing, clean-up practices**

**Leakage from obsolete pesticide stocks**

# 30+ yr-old obsolete USAID-funded pesticides (found during 2003-2004 FAO Survey)



Expired pesticides & KOH (highly corrosive potassium hydroxide) jar

- Proper disposal starts at \$3,000 to \$5,000 per ton, depending on which pesticides are found. Highly toxic ones are much higher.
- Costly site cleanup also needed after the barrels are removed



FERBAM (C<sub>9</sub>H<sub>18</sub>FeN<sub>3</sub>S<sub>6</sub>)  
fungicide oral LD50 of  
4,000 mg/kg



# Human Exposure Route #3: Food

Pesticide is sprayed on plants...

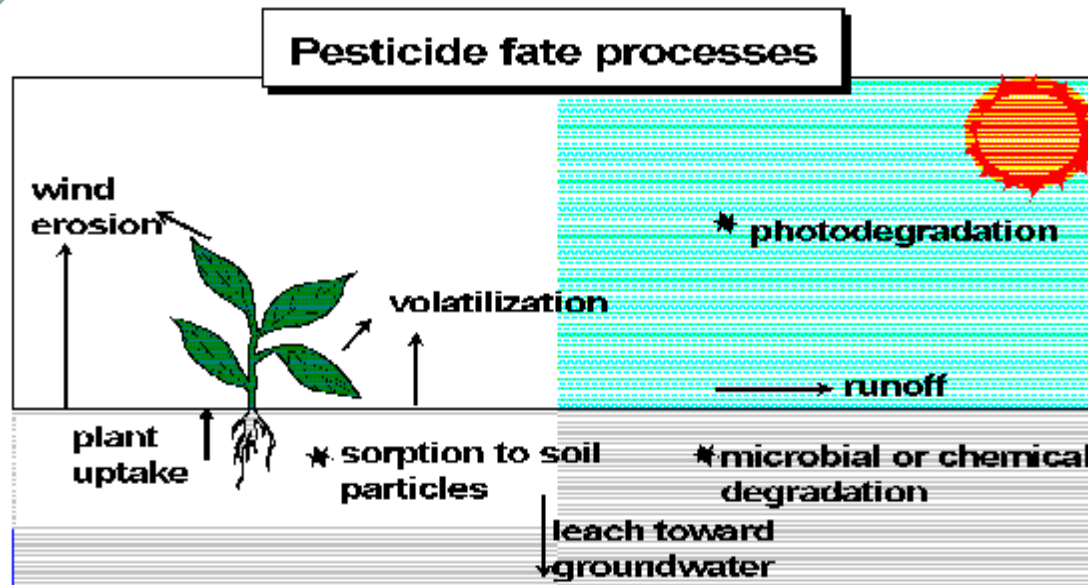
Spraying too close to harvest

Using the wrong pesticide

Using too much

Excess levels of pesticide in soil

...can all lead to harmful pesticide residues on/in food



*Only a portion of pesticide ends up on/in food. But this portion can be dangerous (residues), can lead to loss of export markets AND impact non-target organisms.*

# Bioaccumulation makes exposures worse

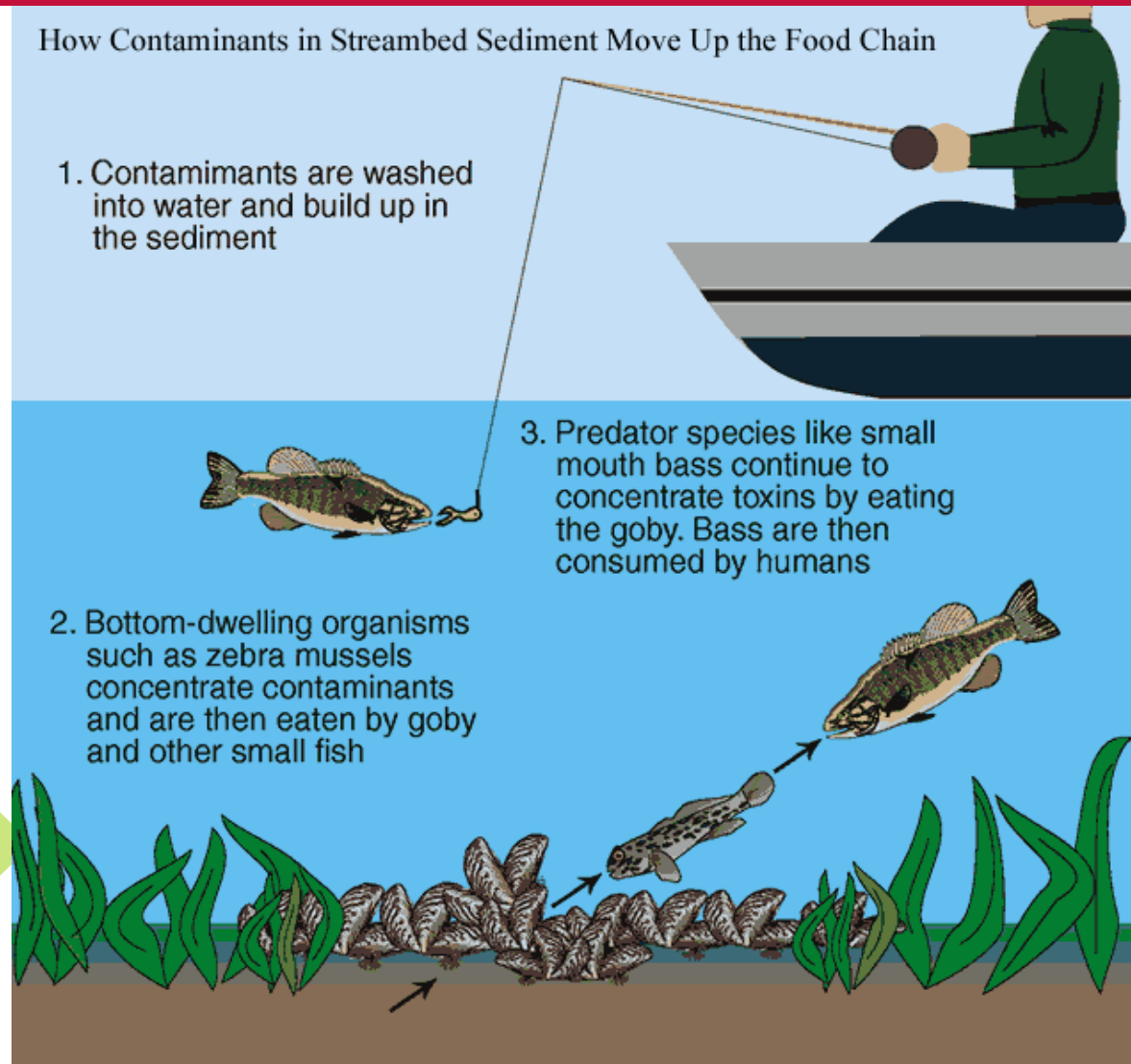
**Some pesticides are PBTs—persistent, bioaccumulative toxins.**

**They degrade very slowly and accumulate in body tissues. Thus, the amount of pesticide in the body (the “load”) increases with every exposure.**

**Adverse effects include damage to the nervous system and interference with reproduction & development.**

**PBTs accumulate in food chains—predators at the top of the chain (including people!) accumulate the heaviest loads.**

How Contaminants in Streambed Sediment Move Up the Food Chain





# PBT Pesticides

- Aldrin
- Chlordane
- Dichlorodiphenyl trichloroethane (DDT)
- Dieldrin
- Hexachlorobenzene
- Mercury-based pesticides including, but not limited to, mercurous chloride and mercuric chloride
- Mirex
- Toxaphene
- Heptachlor
- 2,4,5-Trichlorophenol (2,4,5-T)

**CHLORDANE CONQUERS CRABGRASS**  
IMPROVES LAWNS TWO WAYS

**1** stops crabgrass before it starts!

**2** kills lawn insects!

**ONE EASY APPLICATION KEEPS LAWNS CRABGRASS-FREE ALL SUMMER!**

**APPLY CHLORDANE NOW!**  
Deep, cool, resilient grass. A carpet of green that complements your home, and makes outdoor living more enjoyable. This is the kind of lawn you can develop this summer if you use Chlordane now. Chlordane prevents crabgrass growth, and kills insects too. This does enable your lawn to grow more vigorously. With bugs and crabgrass, desirable grasses can make full use of nutrients and moisture. The result is heavy, thick growth that crowds out weeds and hot, dry spells. This year, be happy with your lawn, and have to enjoy it. Use Chlordane now!

**TIMING IS IMPORTANT! SEE YOUR DEALER TODAY FOR CHLORDANE.**

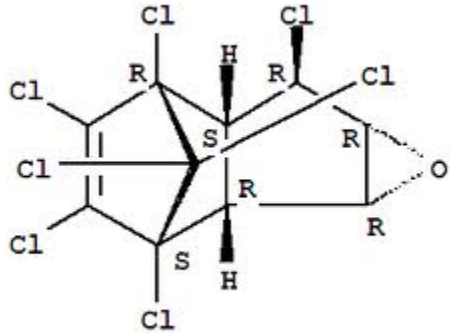
Mail coupon today for special free booklet!

**VELSICOL CHEMICAL CORPORATION**  
130 East Grand Avenue, Chicago 11, IL

Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
City: \_\_\_\_\_ Zone: \_\_\_\_\_ State: \_\_\_\_\_

*spray or spread*  
**CHLORDANE**

\*CHLORDANE is the active ingredient in trade name products sold by all firms that carry garden supplies. Technical Chlordane is manufactured exclusively by Velsicol Chemical Corporation, Chicago 11, Illinois.



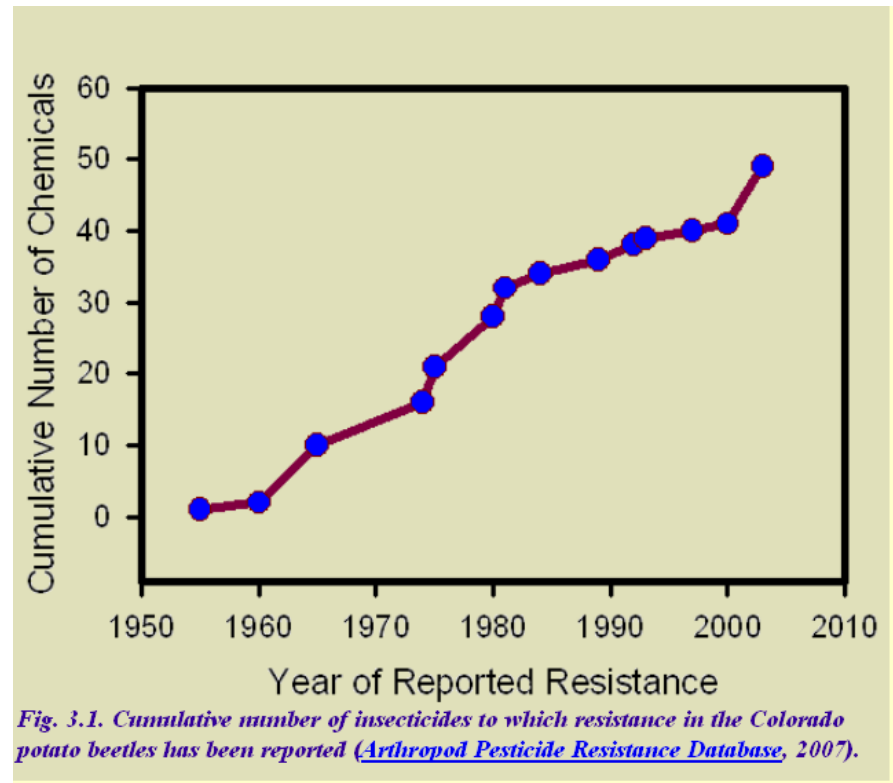
# Pesticides in the environment affect many organisms, not just humans.

They can. . .

- ❖ kill pollinating insects necessary for crop production
- ❖ kill predator bugs and birds that keep pests in check
- ❖ kill organisms necessary for soil health
- ❖ kill fish, crustaceans, amphibians, aquatic insects & beneficial microbes



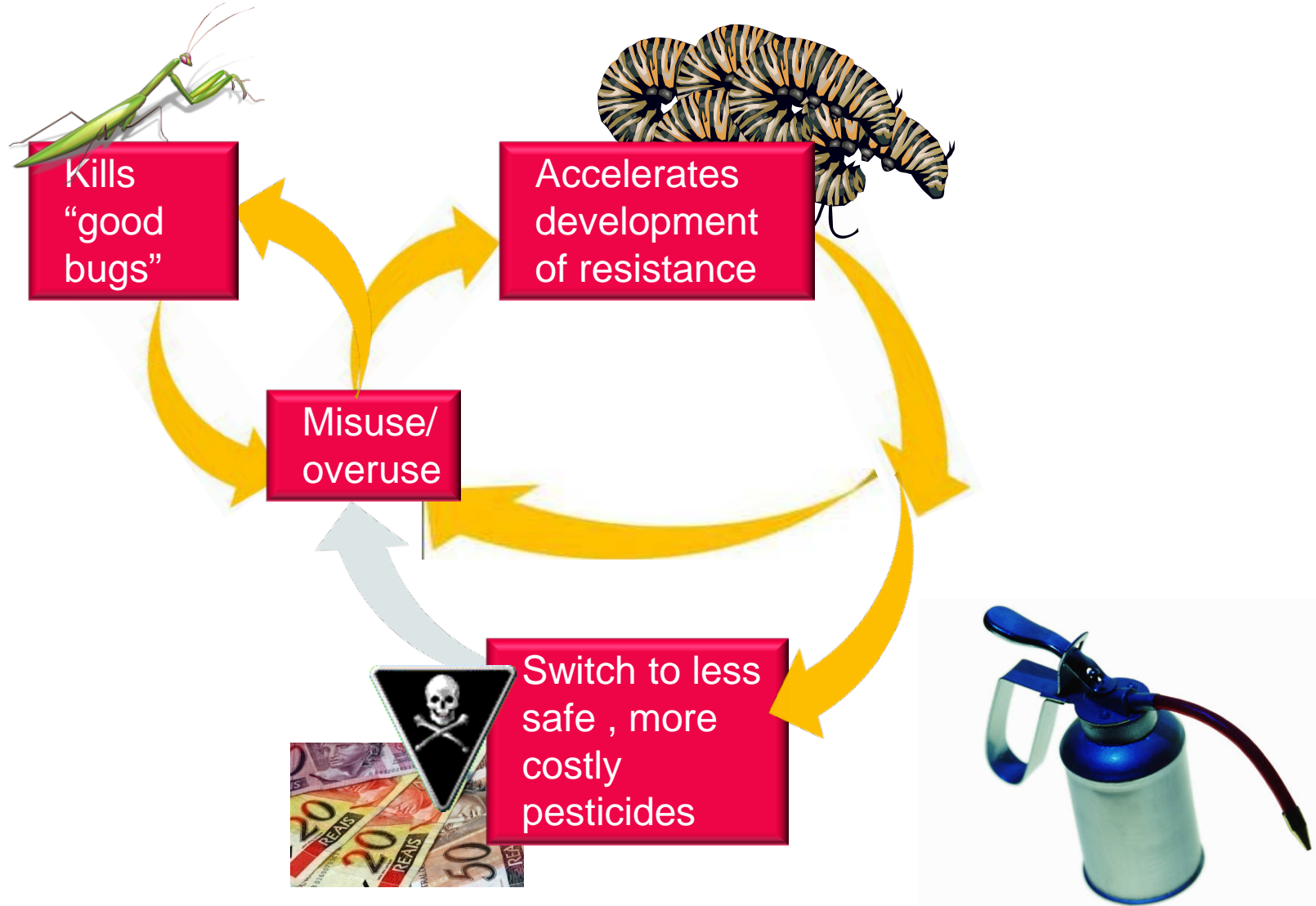
**. . .and pesticide misuse (and sometimes even responsible use) breeds pesticide resistance.**



<http://resistance.potatobeetle.org>

# Dangers of mis-use:

## Commonly observed “vicious circles”







# In Asia & Worldwide, the Risks are Real. Pesticide Challenges are Cross-cutting



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## 2010 Pesticide Action Network Study:

interviews with 1300 peasant farmers in China, Cambodia, Sri Lanka, the Philippines, Vietnam, India, Indonesia and Malaysia

2/3<sup>rds</sup> of crop pesticide active ingredients highly hazardous, but use of proper PPE rare, even in middle-income countries

**Bangladesh:** pesticide poisoning a leading cause of death in official statistics, and the 2nd-highest cause of death among 15-49 age group

**Cambodia:** At least 88% of farmers surveyed had experienced symptoms of acute pesticide poisoning.

**Indonesia:** widespread use of pesticides as mosquito repellants

Etc.

# USAID's response to these dangers. . .

1

Agency-level policy commitment to Integrated Pest Management and SAFER USE more broadly

2

The “Pesticide Procedures” (Special and additional environmental review requirements under the agency's mandatory environmental procedures.)

# USAID & Integrated Pest Management (IPM)

USAID policy: rely on Integrated Pest Management (IPM) as the framework for every activity (agricultural, health or other) that involves pesticide procurement or use

IPM...

Is **ecologically-based pest management** that promotes the health of crops and animals, and **makes full use of natural and cultural control processes and methods**, including host resistance and biological control.

**Uses chemical pesticides only where and when the above measures fail to keep pests below damaging levels.**

All interventions are need-based and applied in ways that **minimize undesirable side effects.\***

*\*CGIAR policy statement on IPM*

*If a pesticide is used, it is the “least toxic” one to do the job.*

# Safer Pesticide Use: 3 Basic Elements

## 1. Integrated Pest Management

- *Reduce the volume & toxicity of pesticides used*

## 2. Safer storage, application and disposal

- *Minimize human exposure and environmental contamination from the pesticide that is used.*

## 3. Safe Purchase/ Quality assurance

- *Make sure the bottle contains what the label says.*

HAZARD CLASSIFICATIONS	
GROUP Ia	VERY TOXIC
GROUP Ib	VERY TOXIC
GROUP II	HARMFUL
GROUP III	CAUTION
GROUP IV	

aak CropLife KENYA



# Pesticide Procedures:

## 22 CFR 216.3(b)

- ❖ Apply to every project that will **procure, use, or recommend for use** one or more pesticides (certain emergency conditions exempted)
- ❖ The environmental review required for all project or sector programs must assess the proposed pesticide use in terms of the following 12 factors;
  - ✓ US EPA registration status
  - ✓ Basis for selection
  - ✓ Extent to which IPM is used
  - ✓ Application methods and safety equipment
  - ✓ Toxicology and mitigation measures
  - ✓ Efficacy
  - ✓ Target vs. nontarget species
  - ✓ Environmental conditions at the location of proposed use
  - ✓ Availability of alternatives
  - ✓ Country's ability to control and regulate pesticides
  - ✓ User training
  - ✓ Monitoring provisions

# Pesticide Procedures:

## 22 CFR 216.3(b)

- ❖ This analysis is specialized IEE, sometimes called a **PESTICIDE EVALUATION REPORT & SAFER USE ACTION PLAN (PERSUAP)**
- ❖ The SUAP sets out the conditions that would govern pesticide use to assure safety.
- ❖ Based on the PERSUAP, use of the pesticide(s) is granted or denied, or more detailed study required.
- ❖ Conditions specified in the SUAP must then be implemented.

**NOTE:** Sometimes, a full Environmental Assessment is called for (e.g., for pesticides that are not registered by USEPA but are judged essential)

# What is “pesticide procurement or use”?



*Be aware. . .*

***USAID interprets  
“pesticide procurement  
or use” very broadly.***

***Specifically. . .***

# What is “pesticide procurement or use”?

## *Procurement includes . .*

- 1. Direct purchase of pesticides*
- 2. Payment in kind, donations, provision of free samples and other forms of subsidies*
- 3. Provision of credit to borrowers could be procurement*
- 4. Guarantee of credit to banks or other credit providers could be procurement*

## *Use includes . .*

- 1. Sale*
- 2. Handling, transport, storage,*
- 3. Mixing, loading, application*
- 4. Disposal*
- 5. Provision of fuel to transport pesticides*
- 6. Technical assistance in pesticide management*



# The definition of “procurement or use” does NOT include...

- ❖ Pesticide used in **evaluation plots** & other research, IF the following requirements are met:
  - *Surface area of under 4 ha,*
  - *Supervised by researchers,*
  - *Application by trained individuals*
  - *The treated products are not consumed by people or livestock,*
- ❖ Technical assistance for development of host country pesticide regulatory capabilities
- ❖ Support for training in safer pesticide use, **not involving actual application or use of pesticides.**



# Why is EPA registration status important?

**Under US law, US EPA “registers” particular pesticides to particular uses.**

When the proposed pesticide is NOT approved for a similar use by USEPA,

**more detailed study is required in the form of a full Environmental Assessment**

When the proposed pesticide IS approved for a similar use by US EPA, BUT the proposed use is RESTRICTED by US EPA on the basis of USER HAZARD,

**The PERSUAP must also contain a user hazard evaluation.**



**Why? Pesticides restricted by or not approved by US EPA are considered high-risk!**

# Useful Web Sites

- [www.epa.gov/pesticides/reregistration/status.htm](http://www.epa.gov/pesticides/reregistration/status.htm)
- [www.pmep.cce.cornell.edu/profiles/extoxnet](http://www.pmep.cce.cornell.edu/profiles/extoxnet)
- [www.pesticideinfo.org](http://www.pesticideinfo.org)
- [www.epa.gov/pesticides/safety/healthcare/handbook/handbook.htm](http://www.epa.gov/pesticides/safety/healthcare/handbook/handbook.htm) (English and Spanish versions of pesticide poisoning recognition handbook)

Note: The information in these websites is useful for development professionals but does not substitute for an expert to apply it correctly