



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 Series

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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 and the PERSUAP



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 pests



A pesticide is...

Any substance or mixture of substances intended for:

- preventing,
- destroying,
- repelling, or
- mitigating any pest.



USAID follows the US EPA definition of pesticides.

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 pharmaceutical or veterinary 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

+

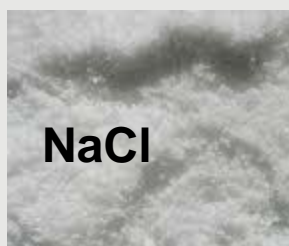
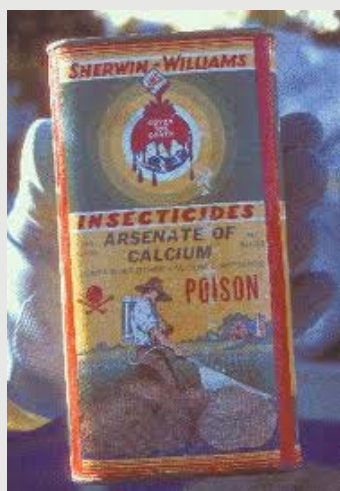
(Sometimes) a **synergist** which enhances
the pesticide's action

+

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 itself.



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**

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



+



Newer insecticides modeled after plant extracts

+



“Next Generation Insecticides”

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*



There were unexpected effects of pesticide use in agriculture

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

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 wide-spread.



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

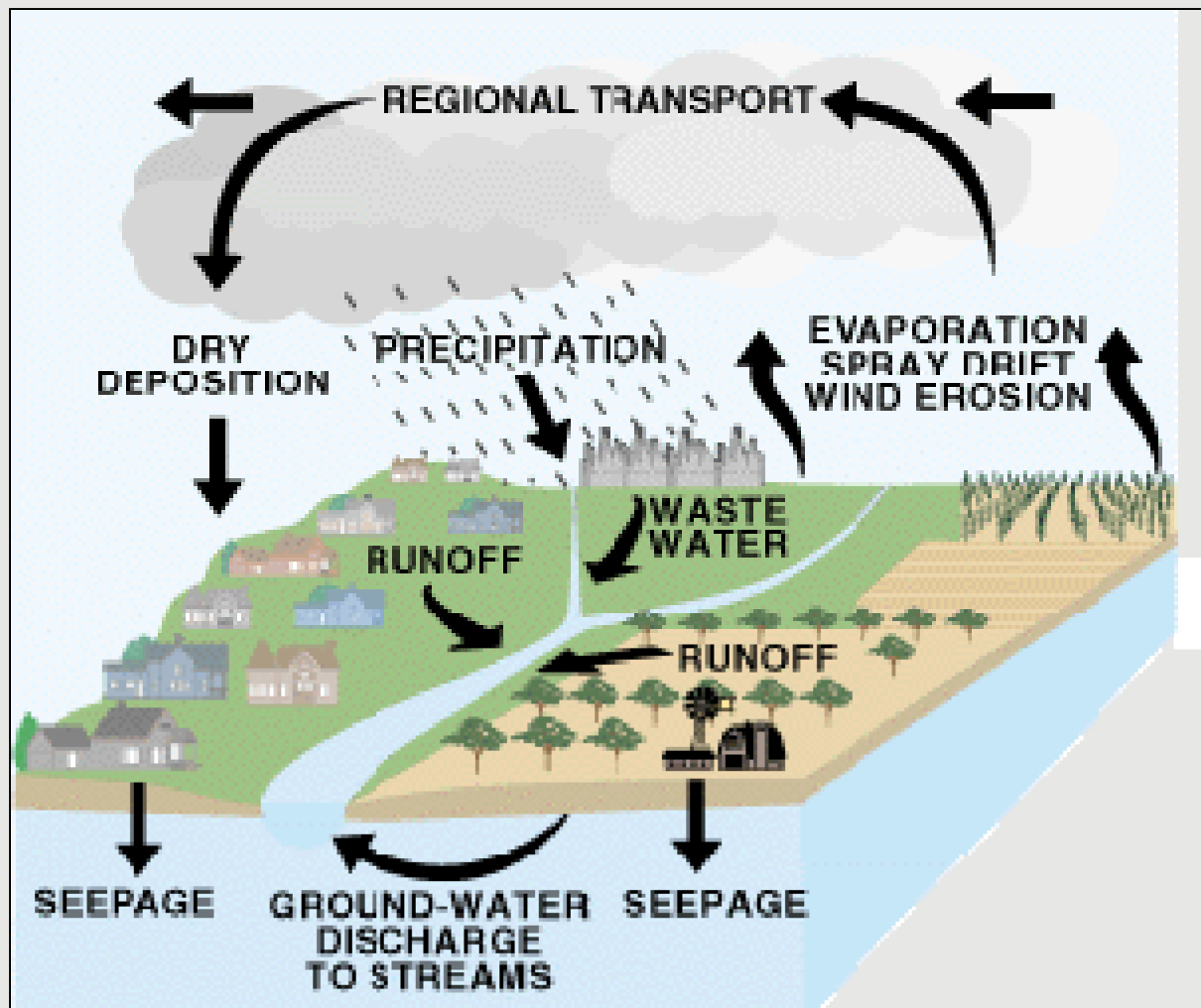
Pouring pesticide into
sprayer without
protection



Pesticide Application: What Not to Do



Human Exposure Route #2: Drinking water



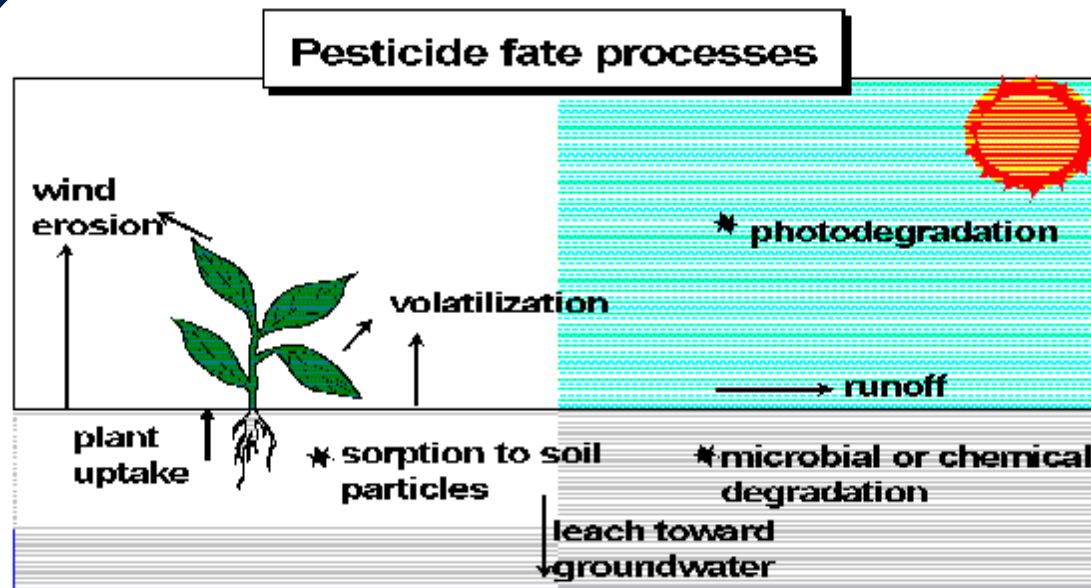
Pesticides can enter surface & groundwater by...

Runoff, seepage, spray drift, dust from fields

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

Leakage from obsolete pesticide stocks

Human Exposure Route #3: 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.

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

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



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



- **2010 Pesticide Action Network Study:** interviews with 1300 peasant farmers in China, Cambodia, Sri Lanka, the Philippines, Vietnam, India, Indonesia and Malaysia
- $\frac{2}{3}$ ^{rds} 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 (IPM) 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 of pesticides.

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.*

**CGIAR policy statement on IPM*

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.

USAID 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 | ✓ Target vs. non-target species |
| ✓ Basis for selection | ✓ Environmental conditions at the location of proposed use |
| ✓ Extent to which IPM is used | ✓ Availability of alternatives |
| ✓ Application methods and safety equipment | ✓ Country's ability to control and regulate pesticides |
| ✓ Toxicology and mitigation measures | ✓ User training |
| ✓ Efficacy | ✓ Monitoring provisions |

Pesticide Procedures: 22 CFR 216.3(b)

- ❖ This analysis is a 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”?

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...

- Pesticides 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.**

Useful Web Sites

- www.epa.gov/pesticides/reregistration/status.htm
- www.pmep.cce.cornell.edu/profiles/extoxnet
- www.pesticideinfo.org
- 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.