



Advisory Panel Project on Water Management

المجلس الاستشارى المصرى الهولندى لإدارة المياه

Environmental impact of misusing pesticides

Dr. Magdy Salah El-Deen and Dr. Samia El Guindy
Advisory Panel Project/ APP
Ministry of Water Resources and Irrigation, Cairo, Egypt

1

Presentation Outline

1. Introduction and Objectives
2. Sources of misuse (national, Individual and technical dimensions)
3. Impact/effect of pesticides on the environment
4. Persistent Organic pesticides (POPs)
5. Integrated pest management (IPM)
6. Conclusion
7. Feed Back ?

2

Introduction

- **What are pesticides?**
 - Xenobiotics used to get rid of noxious pests.
 - Pesticides are not safe, they are produced specifically because they are toxic to something (EPA).
- **Advantages:** easy to apply, quick results, cost-effective, may be the only practical method of control in some situations.
- **Disadvantage:** Have negative effect on the environment and human health.

3

Objectives

- Highlight different dimensions of pesticides misuse and their impact on the environment,
- Discuss experience gained and lesson learned from other countries,
- How to focus and give more attention to the presented topic.

4

Pesticide classifications

Function:

- Herbicides, insecticides, molluscicides, bactericides, fungicides, etc.

Chemical structure:

- Organochlorines, organophosphates, carbamates, ureas, anilides, pyretheroids, etc.

5

Desirable characteristics in a pesticide

- Only a small amount is needed to kill targeted pests (specific),
- Has low toxicity to non-target species,
- Has a lifetime long enough to kill target Pests(does not persist in the environment),
- Degrade into benign products,
- Does not bio-accumulate ,
- Does not run off with water from application site,
- Pests are slow to develop resistance to it.

DREAMER!!!!!!!!!!!!!!!!!!!!!!

6

What is pesticide misuse

- Pesticide misuse occurs when a pesticide is used in a manner inconsistent with the label or purpose as described by the manufacturer.

7

Pesticide misuse(1)

1- Institutional dimension (National)

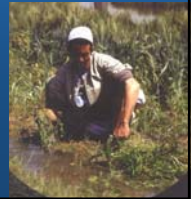
- Importation of toxic agricultural pesticides that have been banned or restricted in developed countries.
- Absence of stringent regulations and lack of enforcing the existing ones.
- Lack of providing enough information on methods of application and risk encounter.

8

Pesticide misuse(2.1)

2. Social dimension (Individual particularly farmers, related to habits, awareness, etc.)

- Use outdoor pesticides to control household pests.
- Farmers are most susceptible group to pesticide poisoning.
- Failure to follow label instructions and guidelines.
- Use of leaking equipment.



Pesticide misuse(2.2)

- Failure to wear Personal Protective Equipment (PPE).
- Storage of pesticides in family bedrooms and unlocked cabinet.
- Improper disposal of empty pesticides containers or use for domestic purposes(storing foodstuff or water).
- Repacking in smaller sizes.
- Farmers tend to overuse pesticides whenever there is a danger to their yields.

Table 2. sources of information to the Egyptian farmers (APP study, 2007)

NO	Information source	Remarks
1.	Ministry officials	Main source, reliable, not always available
2.	Other farmers	Available at any time
3.	Pesticide shops/sellers	Available at any time but not definitive, seek profit
4.	Cooperatives	Not always available
5.	Media (radio, TV,..)	Very good, only morning broadcasting
6.	Religious Centers (Mosques and churches)	Not regular, sometimes helpful
7.	University staff	Speak different language
8.	Farmers schools	Very good , newly introduced

11

Pesticide misuse(3)

3. Technical dimension (Pesticide monitoring in surface water/constraints)

Monitoring Data for pesticides are generally poor in much of the world specially in developing countries due to:

- The cost of analysis (financial)
- Inadequate facilities (laboratories, staff)
- Impure reagents (chemicals)
- Data interpretation
- Awareness(Authorities, users)
- Critical Times (time between pesticide use and detection)

12

Pesticides and the Environment

The soil

- Harming beneficial insect species, decrease biodiversity, nitrogen fixation bacteria

Wildlife

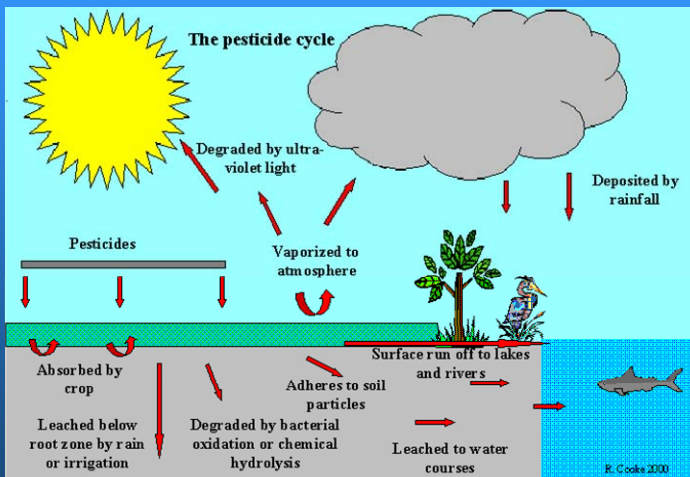
- Non-target terrestrial species, birds kill (e.g. Ibis)

Aquatic environment

- Fish (bioaccumulation, biomagnification). Large fish is not always the best

13

Dissemination pathways of pesticides in the environment



14



15

Table 1. Pesticides residues in some Egyptian lakes(adapted from Mansour 2004)

Lake	Pesticide	Water (ppb)	Sediment (ppm)	Tilapia sp.(ppm)	Mugil sp.(ppm)	Solea sp.(ppm)	ADI (mg/Kg/day)
Lake Qarun	HCB	13.28	2.04	0.02	0.15	0.003	NA
	Lindane	6.24	0.21	0.09	0.15	0.087	0.01
	Heptachlor	2.8	0.10	0.014	0.105	0.086	0.0005
	Aldrin	2.22	1.65	0.001	0.104	ND	0.0-001
	Dieldrin	8.75	ND	0.001	0.141	0.026	
	∑DDT	0.71	0.73	0.003	0.054	0.068	0.02
	Malathion	14.1	ND	ND	0.016	0.178	0.02
Wadi El Rayan	Lindane	ND	0.1	ND	ND		
	∑DDT	ND	ND	28.0	300		
	Malathion	ND	2.0	300.0	ND		

N.B.: Pesticide residues in fish are calculated on whole body weight basis.

NA: not available

ND: not detected

ADI: Acceptable daily intake

16

Impact on health

Acute poisoning (short-term exposure)

- **ranges from** headaches, dizziness, nausea, fatigue, diarrhea, vomiting, **to** nerve, skin damage or eye irritation. Sometimes dramatic and fatal.

Chronic Exposure (long-term, mainly occupational)

- Affect on many biological systems: development and reproduction, immunity, neurotoxicity, cytogenetic damage, endocrine disruption and carcinogenesis.

17

Public health risks

Depends on:

- How toxic various compounds are?
- How many people are exposed?
- What kind of pesticides?
- Extent and routes of exposure
- Risk -related demographic, socioeconomic and health profile

18

Persistent Organic Pesticides /POPs(1)

- POPs are chemicals that persist in the environment, accumulate in high concentrations in fatty tissues and bio-magnified through the food-chain.
- They constitute a serious long-term environmental hazard to individual species, ecosystem and human health.
- Exposure to even low doses of certain POPs can lead to cancer, damage to central and peripheral nervous systems, diseases of the immune system, reproductive disorders, and interference with the normal infants and child development.

19

Persistent Organic Pesticides /POPs(2)

- UNEP prepared an legally binding instrument for implementing international action on certain POPs.
- The Dirty dozen: DDT, aldrin, dieldrin, endrin, chlordane, heptachlore, toxaphene, hexachlorobenzene, mirex, polychlorinated biphenyls (PCBs), dioxins and furans.
- Problem is evident in developing countries (How to get rid of their stock ?)

20

Integrated Pest Management/ IPM(1)

- IPM is a multidisciplinary effort based on the use of cultural, biological, and chemical techniques to control pest populations in acceptable environmentally managed techniques.
- IPM emphasized that pest problems arise when there is a disharmony of the total agro-ecosystem and that not all levels of pest abundance required treatment with pesticides
- IPM provides the framework to accommodate transition from singular reliance on broad-spectrum, long-residual pesticides to the use of highly selective, short-residual compounds without an increase in losses to pests

21

Integrated Pest Management/ IPM(2)

Constraints

- Adoption of programs has been slow,
- Pesticides still predominate in many programs,
- Overall use of pesticides has not declined, and successful interdisciplinary programs are few.

22

Integrated Pest Management/ IPM(3)

Constraints related to IPM in Egypt:

- **There is no standardized system for collecting and recording of the available data.**
- **Many of the farmers are poorly educated and learning in the different methods application is often of poor quality.**
- **Most of application equipment used is poor and supplies are inadequate.**
- **Chemical pesticides are economically reliable and saved labors, therefore farmers become increasingly dependent upon pesticides.**
- **Interface between summer and fall plantation causes migration of diseases from cotton to tomato and other crops.**

23

Conclusion(1)

- **The history of pesticide abuse is legend.**
- **Environmental, water quality and public health problems are well known.**
- **There are many programs to reduce pesticide use but still misuse of agrochemicals remains a major problem in many countries.**
- **Farmer's perception on pesticide use should deeply investigated.**

24

Conclusion(2)

- It is necessary to develop and implement water resource monitoring systems with a prior definition of indicators, parameters, tolerance limits, frequency and sampling points, combining this information with quantity data.
- Developing countries need to develop action plan which include : problem assessment, education, demonstration, chemical replacement, storage, and destruction.
- Training on integrated pest management, reduced pesticide use can achieve both ecological (including water quality) and economic advantage at the local level.

25

Conclusion(3)

- Reduction or eliminations of price subsidies can have significant beneficial effects through reduced pesticide use.
- There is an urgent need to assess the impact of pesticides on human health and determine the level of pesticides in soil, water and air in developing countries.
- Financial support and technical assistance could be major problems.
- Finally, sharing experience and lesson learned between countries on pesticide use , how to develop a monitoring programs and mitigation measures should be deeply considered in order to promote exchange of information and experiences.

26

Feed Back

- Do you think that the presented topic need more attention from our group?
- What are the available experiences and lessons learned on : pesticide misuse, mitigation measures, law enforcement, POPs, IPM?
- What type of pesticide monitoring program could be applied in developing countries? what are the criteria and measures that should be included in such program?
- What about low cost monitoring program (e.g. Biological indicators, simple analytical techniques)?

27



Thank you

28