# Agricultural Pollution: Mitigating the Effects of Pesticides

Universidad Tecnológica Nacional – Facultad Regional Paraná

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English II - 2023

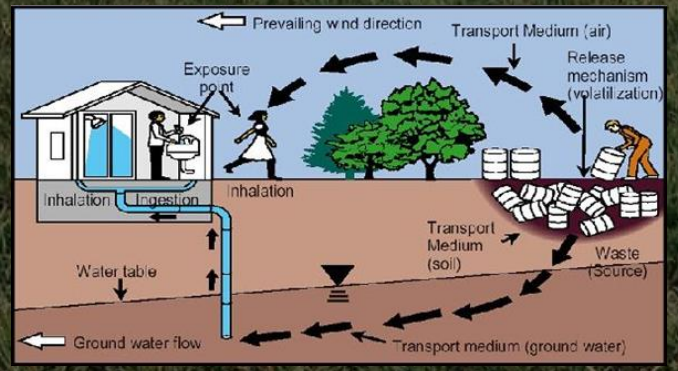
# Introduction:

- Traditional agriculture was sustainable for thousands of years without harming the land.
- Modern agriculture, with the use of pesticides, has caused agricultural pollution, degraded the land and harmed the environment.
- Sustainable agriculture is crucial, as highlighted in the United Nations' Sustainable Development Goal No. 2, "Zero Hunger."

# Introduction:

## Contextualization

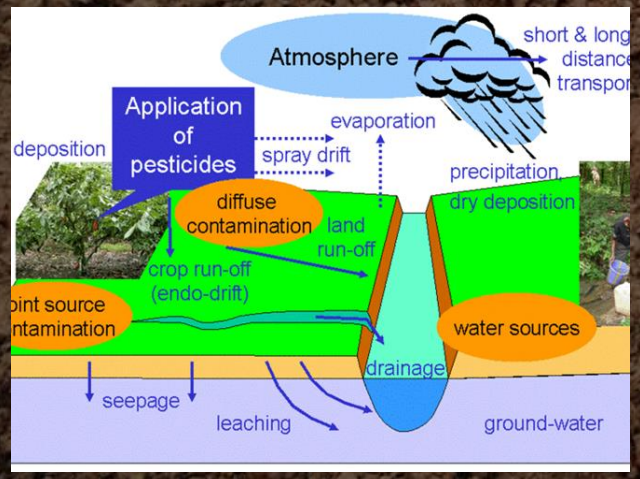
- Pesticides are substances used to control or eradicate pests.
- Pesticides can cause land degradation.
- The degradation of the land affects three aspects:
  - The harvest (crops)
  - The environment (animals, natural resources, etc.)
  - The people (indirect or direct ways)

# Introduction:

## Thesis Statement

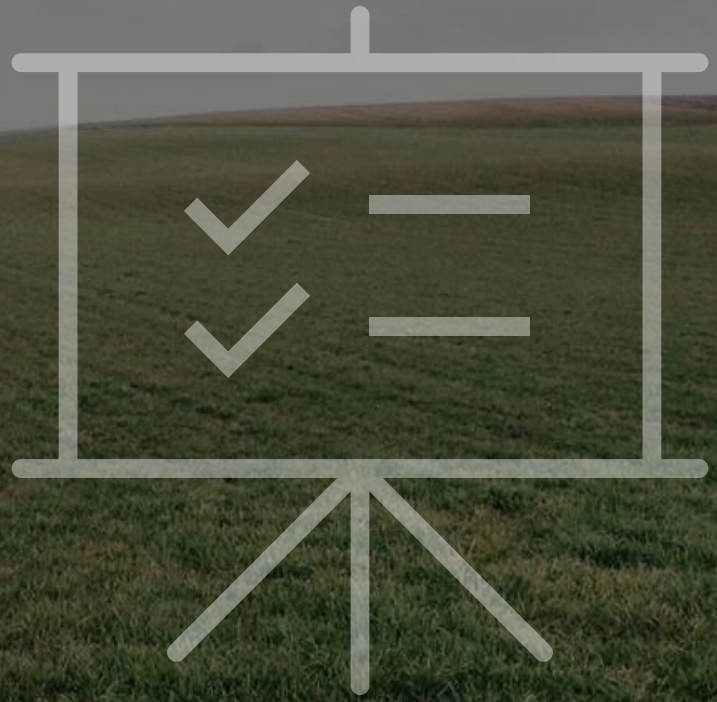
- The focus will be on:
  - ➢ The issue of pesticide use in agriculture.
  - ➢ The exploration of mitigating strategies for pesticides effects.
  - ➢ The severity of pesticide pollution in cultivated areas and its environmental implications.




# Introduction:

Map of the presentation

- First Part: Problem Description
  - ✓Account of the pollution by means of pesticides
  - ✓ Identification of the severity of the problem
  - ✓ Implications in the contamination of the environment
- Second Part: Solutions
  - ✓Mitigation Strategies for pesticides
- Third Part: Advantages and Disadvantages
- Final Part: Conclusion



# Problem Description:

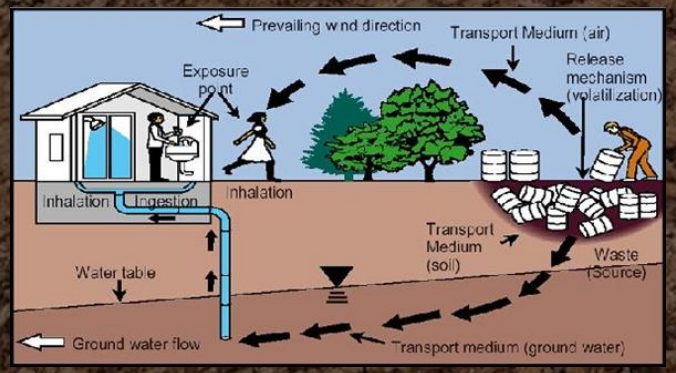
## Concept of pesticides

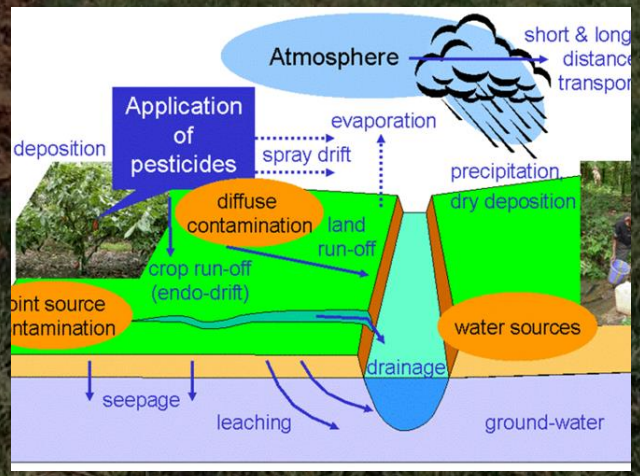
- Pesticides are substances used to control pests, diseases, undesirable plants, and animals that affect food production, storage, and transportation.
- Pesticides are intended to target specific pests, but they can contain various compounds like fungicides, herbicides, rodenticides, etc., which may affect non-target organisms.

# Problem Description:

Solution with a cost

- Pesticides offer quick and efficient solutions.
- Excessive use can affect the agricultural environment and the food product.
- The use of pesticides generates various types of contamination (contamination of food, air, water, land and animals).



# Problem Description:

Pesticides are efficient at controlling pests, but they cause these problems:

- They make people and animals sick
- They contaminate water, air and soil
- They put ecosystems at risk
- They contaminate food

# Solutions:

## A) Degradation of Pesticides by ultraviolet light

Ultraviolet (UV) light can be used to degrade pesticides, primarily through a process known as photodegradation.

It is based on:

- Its exposure to chemicals
- Decomposition of its molecules

UV light can be used in:

- Production chains
- Field
- Potabilization plants

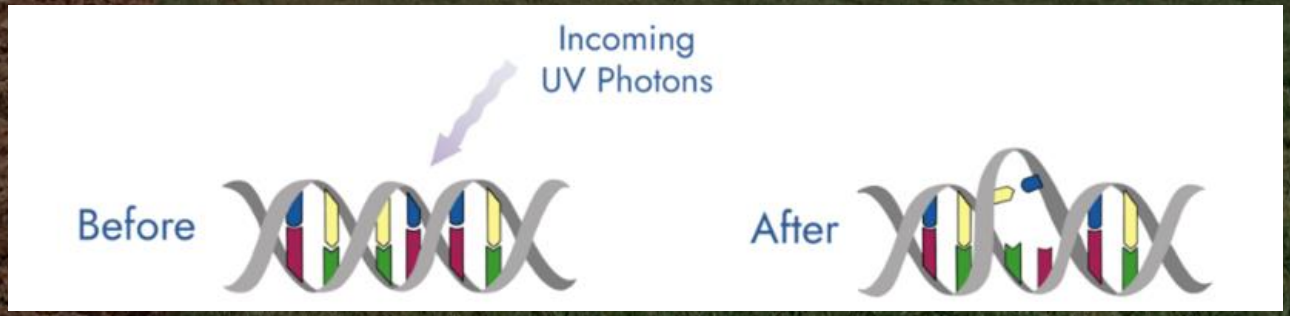



Figure 1: UV Disinfection Process [1]

# Solutions:

## B) Degradation of pesticides by microorganisms

Pesticides can be degraded through biodegradation, which is a process that involves the complete breakdown of an organic compound into its inorganic constituents.

It can be achieved by exposing agrochemicals to:

- Fungus
- Microbes
- Enzymes

| Enzyme | Organism | Pesticide |
|---|---|---|
| Oxidoreductases (Gox) | *Pseudomonas* sp. LBr | Glyphosate |
| | *Agrobacterium* strain T10 | |
| Monooxygenases: | | |
| ESd | *Mycobacterium* sp. | Endosulphan and Endosulphato |
| Ese | *Arthrobacter* sp. | Endosulphan, Aldrin, Malation, DDDT and Endosulphato |
| Cyp1A1/1ª2 | Rats | Atrazine, Norflurazon and Isoproturon |
| Cyp76B1 | *Helianthus tuberosus* | Linuron, Chlortoluron and Isoproturon |
| P450 | *Pseudomonas putida* | Hexachlorobenzene and Pentachlorobenzene |
| Dioxygenases (TOD) | *Pseudomonas putida* | Herbicides Trifluralin |
| E3 | *Lucilia cuprina* | Synthetic pyrethroids and insecticides phosphotriester |

| Enzyme | Organism | Pesticide |
|---|---|---|
| Phosphotriesterases: | Agrobacterium radiobacter | Insecticides phosphotriester |
| OPH/OpdA | Pseudomonas diminuta | |
| | Flavobacterium sp. | |
| Haloalkane Dehalogenases: | *Sphingobium* sp. | Hexachlorocyclohexane (β and δ isomers) |
| LinB | *Shingomonas* sp. | |
| AtzA | *Pseudomonas* sp. ADP | Herbicides chloro-s-trazina |
| TrzN | *Nocardioides* sp. | Herbicides chloro-s-trazina |
| LinA | *Sphingobium* sp. | Hexachlorocyclohexane (γ isomers) |
| | Shingomonas sp. | |
| TfdA | *Ralstonia eutropha* | 2,4 - dichlorophenoxyacetic acid and pyridyl-oxyacetic |
| DMO | *Pseudomonas maltophilia* | Dicamba |

Table 1: UV Disinfection Process [2]

# Solutions:

## C) Replacement of insecticides by biological control

Integrated pest management (IPM) focuses on:

- Reduce pest populations using natural enemies.
- Emphasize biological control of insects, weeds and plant diseases.
- Identify suitable natural enemies.
- Ensure that they do not harm non-target organisms.
- Produce them in large quantities and find methods for their long-term preservation.

# Advantages and Disadvantages:

A) Pesticide Degradation by Ultraviolet Light:

- ✓ Advantages: Environmentally friendly, compact, durable and configurable
- Disadvantages: Only for few unwelcomed microbial beings

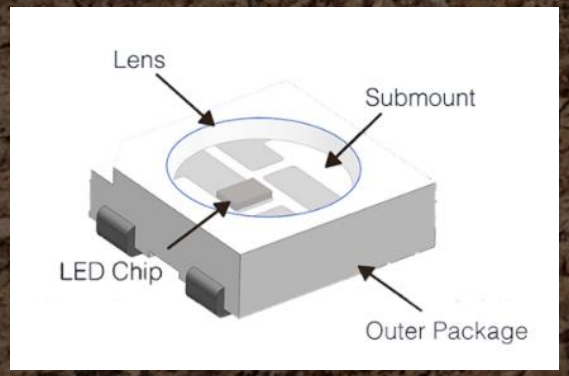



Figure 2: UV-C LED Structure [1]

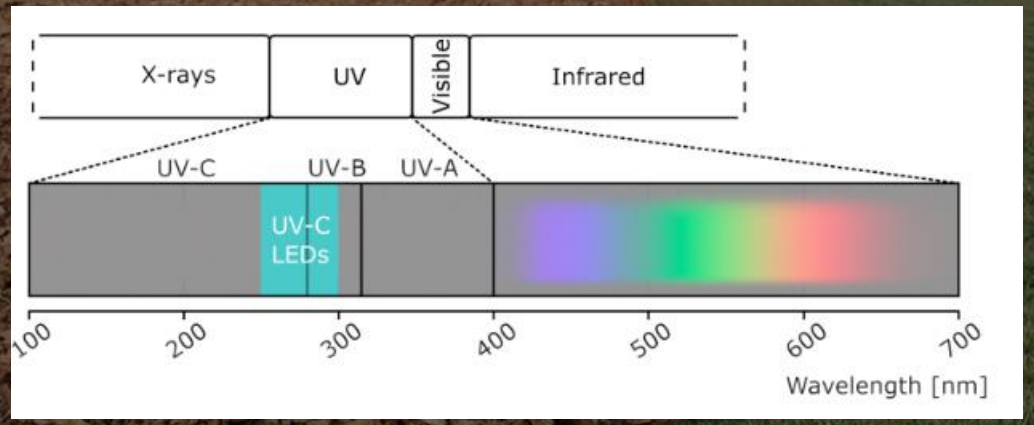



Figure 3: Range of configurable wavelength [1]

# Advantages and Disadvantages:

B) Pesticide Degradation by Microorganisms:

- ✓ Advantage: Effective solution without the drawbacks of chemical pesticides.
- Disadvantage: Knowledge of pesticide composition for ideal catalytic method selection.

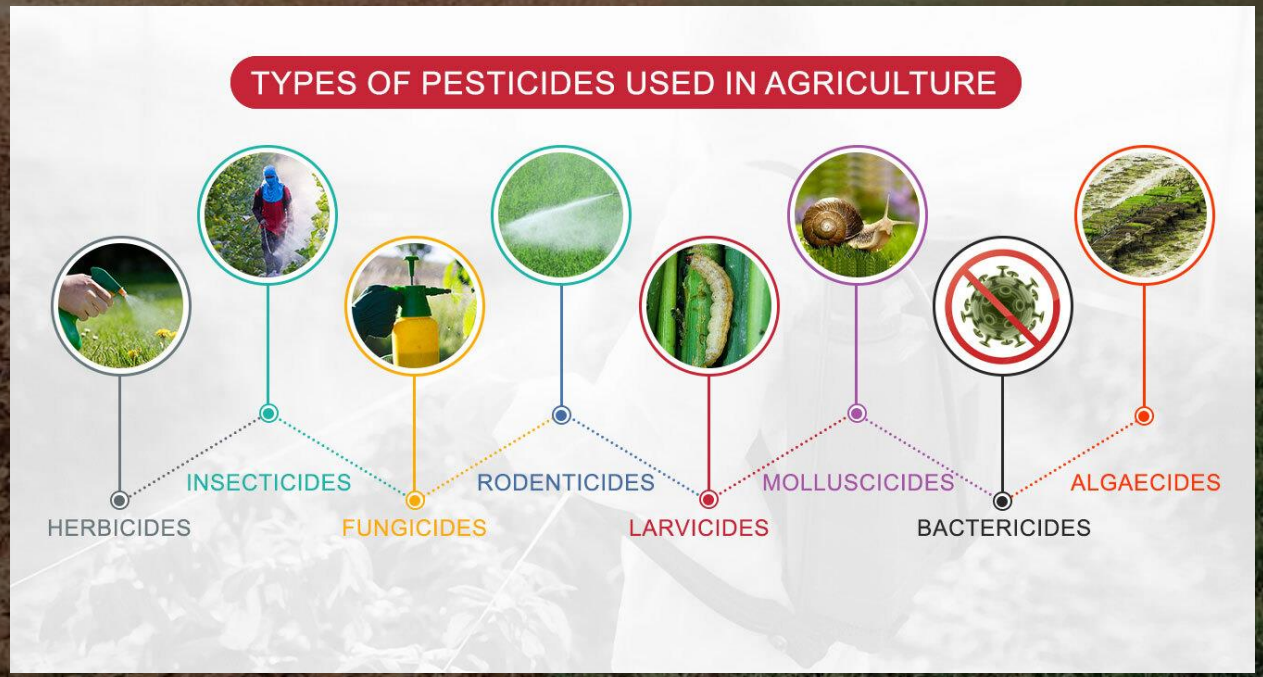



Figure 4: Types of pesticides used in agriculture [3]

# Advantages and Disadvantages:

C) Replacement of Insecticides with Biological Control:

- ✓ Advantages: Reduces chemical pesticide use, minimizes environmental pollution, and enhances crop quality
- ✓ Has specific targeting.
- Disadvantages: Not always effective, particularly against native pests; natural enemies can become pests.

# Conclusion:

In conclusion, it can be said that:

- The use of agrochemicals poses risks to human and animal health and the environment.
- The solutions presented include alternatives to agrochemicals, which are favorable.
- The transformation towards a world with more sustainable agricultural practices depends on market demand, which emphasizes the importance of consumer support for such transformations.

# The End
# Thanks for your attention

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