

Factors reducing Crop productivity

Three factors that reduce crop productivity.

1. **Weeds** compete with crop plants
2. **Pests** damage crop plants
3. **Diseases** damage crop plants

Weeds

1. **Annual weeds**
Weeds complete their life cycle in one year
2. **Perennial weeds**
Weeds persist form year to year.

Annual Vs Perennial Weeds

Property	Annual Weeds	Perennial Weeds
Rapid Growth	✓	
High seed output	✓	
Short life cycle	✓	
Long-term seed viability	✓	
Storage organs		✓
Vegetative propagation		✓

Factors Reducing crop productivity

Pests

There are 3 main types of pests

1. Insects
2. Nematodes (worms)
3. Molluscs (snails/slugs)

Disease

Plant disease are caused by parasitic microbes such as

1. Fungus
2. Bacteria
3. Virus



They are often transmitted by pests which act as vectors transmitting the parasite from primary to secondary host.

Cultural Control methods

There are 3 main methods of controlling pests and disease.

1. Cultural - Traditional simplistic methods such as
 - a) Weeding
 - b) Ploughing
 - c) Crop rotation

Chemical control

2. Chemical Control methods

Use of 5 different chemical pesticides to kill pests, weeds or prevent disease,

Type of Pesticide	Function
Herbicide (glyphosphate)	Kills weeds
Fungicide	Controls fungal disease. <u>Application of fungicide</u> Apply based on fungal forecast which predicts times when fungal disease is high. It is <u>more effective to try to prevent spread</u> than treat fungal diseased crops.
Insecticide (DDT/DDD)	Kills insects pests.
Molluscicides	Kills mollusc (snails) pests.
Nematicides	Kills nematode (worms) pests.

Types of Herbicides/Pesticides

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1. Selective Herbicide
2. Systemic herbicide/pesticide

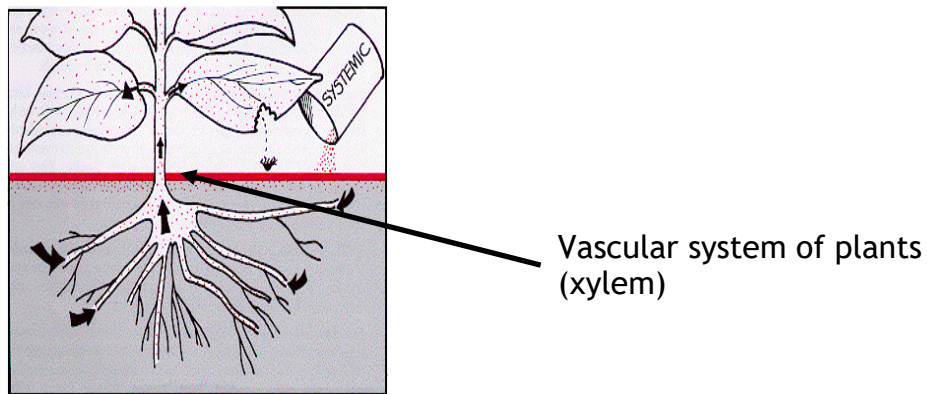
Selective Herbicide

Greater effect on certain plant species (kills weeds NOT crops).

Only kill **broad leaves** weeds & crops unaffected.

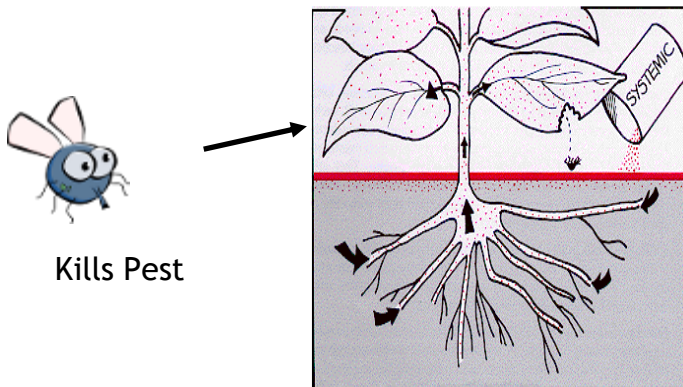
Systemic herbicides

Spreads through vascular system of weed and **prevents re-growth** of weed.



Systemic Insecticides/molluscicide/nematocide (pesticide)

Spreads through vascular system of crop & **kills pests** feeding on crop plant.



Problems of Chemical Control Pesticides

4 problems with pesticide use

4. Toxic to non target species.
2. Persists in the environment
3. Production of resistant populations of pest
4. Bioaccumulation/Bio magnification in food chains.

Bioaccumulation

Build up of chemical in a single organism

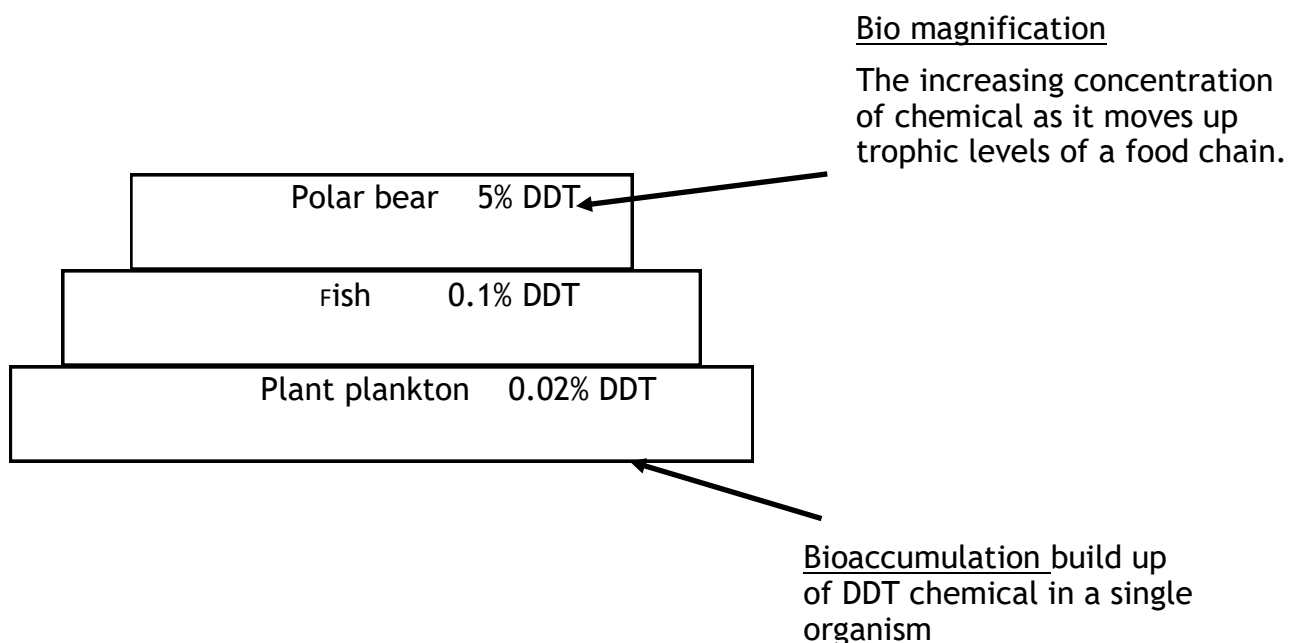
E.g. DDT/DDD insectide concentration in a single fish

Biomagnification

Increasing concentration of toxic chemical as it moves up trophic levels of a food chain.

Lethal to top predator

E.g. DDD/DDT in polar bear in example below)



Biological Control, IPM & GM Crops

3. Biological Control methods

The control agent is a NATURAL Predator/Pathogen/Parasite of the pest.

Advantage

No need for pesticides

Disadvantage

May become an invasive species itself.

Integrated Pest Management (IPM)

This involves a combination of all 3 control methods.

1. Cultural + Chemical
2. Cultural + Biological
3. Chemical + Biological
4. Cultural + Chemical + Biological

GM Crops

Offer an alternative solution to issues with chemical control via recombinant DNA technology. Crops have added features.

1. Crops better absorb fertilisers from soil so less fertiliser is needed
2. Bt toxin gene inserted so plant is toxic and less pesticides are needed
3. Drought resistance crops
4. Weedkiller (glyphosphate) resistance gene inserted into crop plants so crops are not targeted by glyphosphate only weeds.