Concepts and Principles of Pest Management

1. Understanding the Agricultural Ecosystem

- Agro ecosystem contains a lesser diversity of animal and plant species than forests.
- Intensively manipulated by humans and subject to sudden alteration -ploughing and treatment with pesticides.
- More susceptible to pest damage.

2. Planning the agroecosystem

- Applied agroecosystem planning should anticipate pest problems and ways to avoid them.
- Crop variety should not be grown if it is known to be unusually susceptible to pest attack, thereby intensifying the need for control activity.
- Ex:

1. **Soybean:** Pubescent type- resistant to potato leaf hopper, *Empoasca fabae.*
   Glabrous type - susceptible to potato leaf hopper.

2. **Cotton:** Pubescent type- resistant to potato leaf hopper, *Amrasca biguttula biguttula.*
   Glabrous type – susceptible to potato leaf hopper.

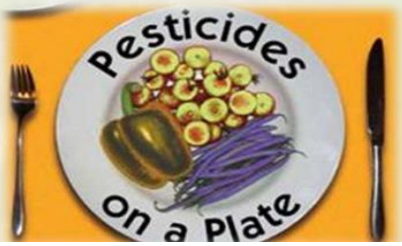
3. Cost/ benefit and Benefit/ Risk:

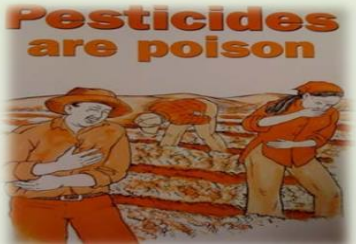
- **Farmers - more concern about Cost/benefit.**
- **Depends on the decisions-**

  Varies with the crop produce,
  method of production and
  geographical location of production unit.

i. Cost /benefit: **Should be >1.**

ii. Benefit/ Risk: **Provides a means for assessing the relevant economic benefits versus the risk in pesticide control.**



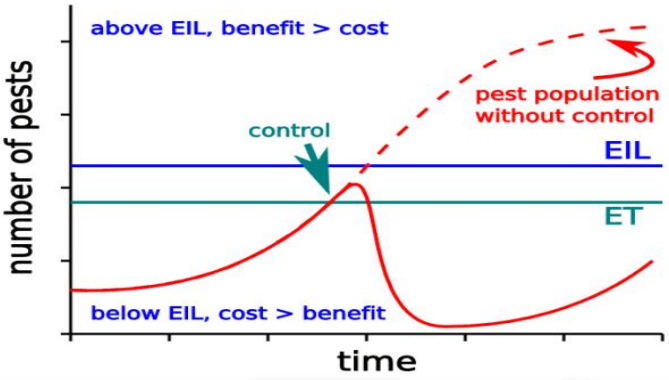


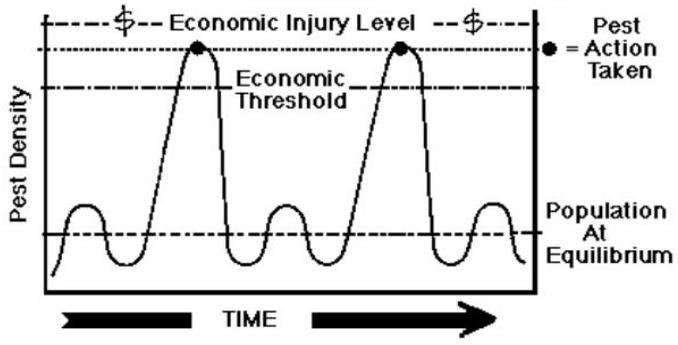
4. Tolerance of Pest Damage:

- **Economic threshold is probably the best known term and most widely used.**

- **Economic threshold level (ETL):**

  Population density at which control measures should be implemented to prevent an increasing pest population .





5. Leaving a pest residue

- **Important to leave a permanent pest residue, below the economic threshold.**
- **Concept is to suppress a pest but not annihilate the pest.**



6. Timing of the treatments

- **Crucial problem in successful pest management is the proper timing of insecticide treatment.**
- **Based on need and a single spray properly timed can often prevent excessive spraying.**
- **Ex: Use of pheromone traps for activity of adult.**

7. Public understanding and acceptance

- **Educating people about pest management is the most important way to deal with insect pest problem.**

- **No programme is any more successful than the degree of commitment made by the people involved.**

Eco-friendly methods of pest management

Mulches

Reduces the insect's ability to find the crop.

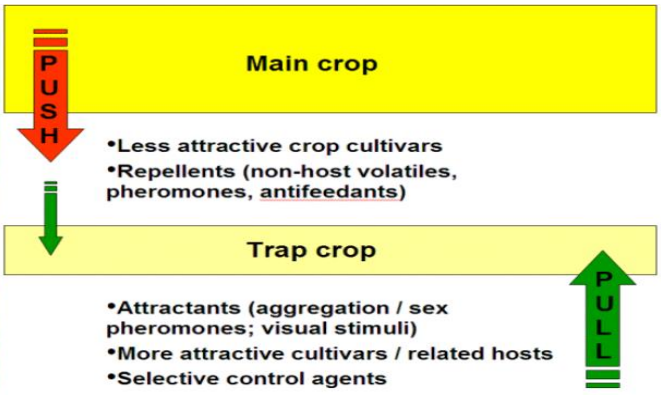
Inert ground covers such as plastics, sawdust, straw and rice husk mulches interfere with visual host-finding or suicidal attraction to the sun-heated mulch.

Push-pull polycropping

Combination of behavior-modifying stimuli to manipulate the distribution and abundance of pest or beneficial insects in pest management with the goal of pest reduction on the protected host

Pests are simultaneously attracted (pull) using highly apparent and attractive stumuli such as trap crops, where they are concentrated, facilitating their elimination.

Developed for subsistence farmers in east Africa. Maize and sorghum are attacked by stem borers, mainly *Chilo partellus and the parasitic weed, Striga hermonthica. Stem borers are repelled from the maize and sorghum by non-hosts such as Greenleaf Desmodium, Desmodium intortum and molasses grass, Melinis minutiflora, which are the intercrops.*



Intercropping maize with a repellent plant - desmodium, *D. uncinatum , : PUSH*

•Planting an attractive trap plant - Napier grass, *Pennisetum purpureum as a border crop around this intercrop (as a trap crop) : PULL*

•Stemborer females are repelled from the main crop and are simultaneously attracted to the trap crop (*Khan et al.,2000,2001;Cook et al., 2007).*

Eco-Friendly

Cultural practices

Alterations / Changes in cultivation Practices

- Habitat mgt.
- Tillage
- Inter cropping
- Trap cropping
- Border cropping
- Banker cropping
- Eco-feast / scarifice cropping
- Push-Pull poly cropping
- Vegetative trap
- Crop rotation
- Plant nutrition
- Water mgt.
- Sanitation
- Closed season
- Mulching

Crop rotation

- Rotation of host by non host plants
- Effective against narrow host range
- Cotton – Groundnut, ragi, maize, cowpea, soybean (decrease insects pests)
- Groundnut – non leguminous crops (suppress leaf miner)

Plant Nutrition

- **Organic manure rich in essential nutrients induces tolerance to pest attack.**

- **Slow release of Nitrogen from Organic manure induces antixenosis.**

Water Management

- **Flooding of fields – suppress cutworms, armyworms and root grubs**

- **Over head irrigation washes out life stages (Groundnut leaf miner eggs, DBM)**

- **Reduces Sugarcane Woolly Aphid**

Irrigation and Water Management

Sprinkler irrigation has been found to be effective in suppressing foliage feeding insects like potato tuber moth, *Pthorimaea operculella and Plutella xylostella in cabbage by deterring their mating process, egg laying and causing mortality of their neonatal stages.*

Sanitation

- **Clean cultivation – age old practice**
- **Removal / destruction – crop residues, volunteer plants, near by host plants**
- **Removal of cotton stalks decreases PBW**
- **Removal of alternate hosts reduces head bug in sorghum**
- **Removal of stalks and stubbles – shoot fly, stem borer in sorghum and paddy**

Closed season

- **Crop holiday**
- **Break food supply-SWA**
- **Best for monophagous pest**
- **Effective when combined with sanitation**