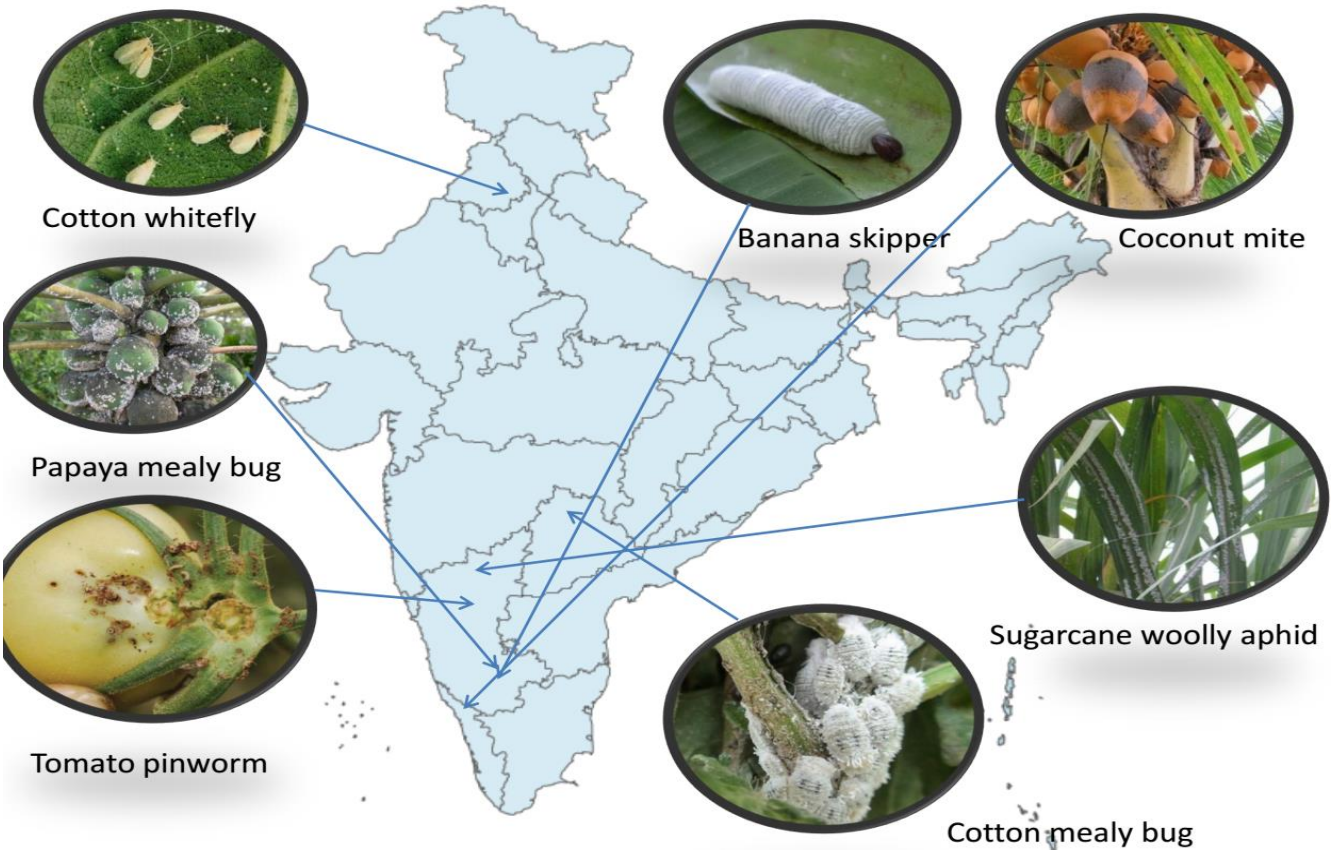
PEST SURVEY, SURVEILLANCE, FORECASTING, SAMPLING METHODS



Pest survey:

An official procedure conducted over a defined period of time to determine the characteristics of a pest population or to determine which pest species occur in an area

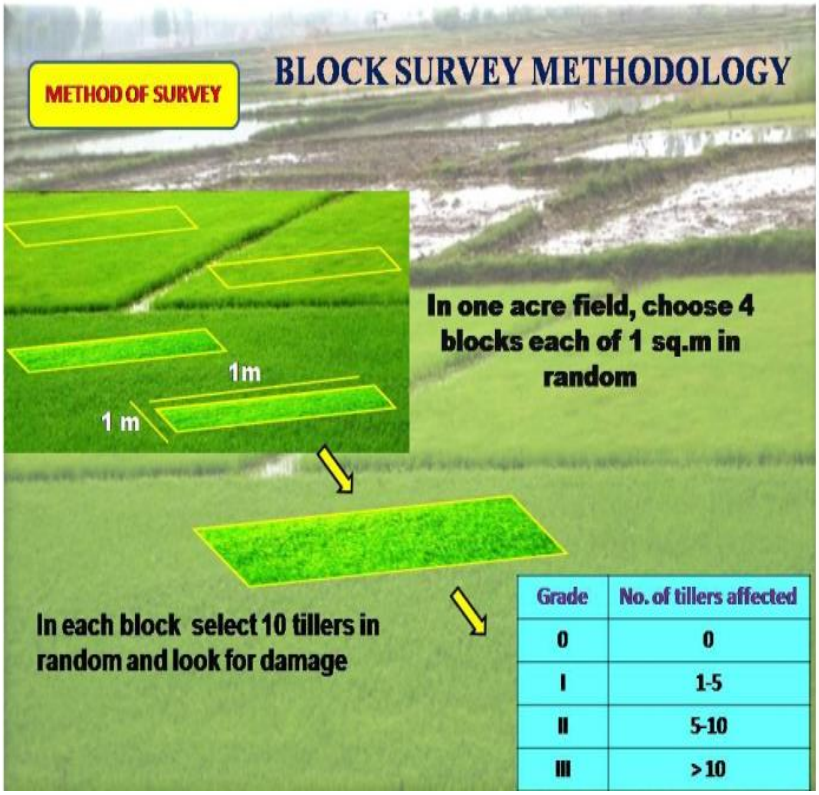
Two types of survey - Roving survey and fixed plot survey

A. Roving survey

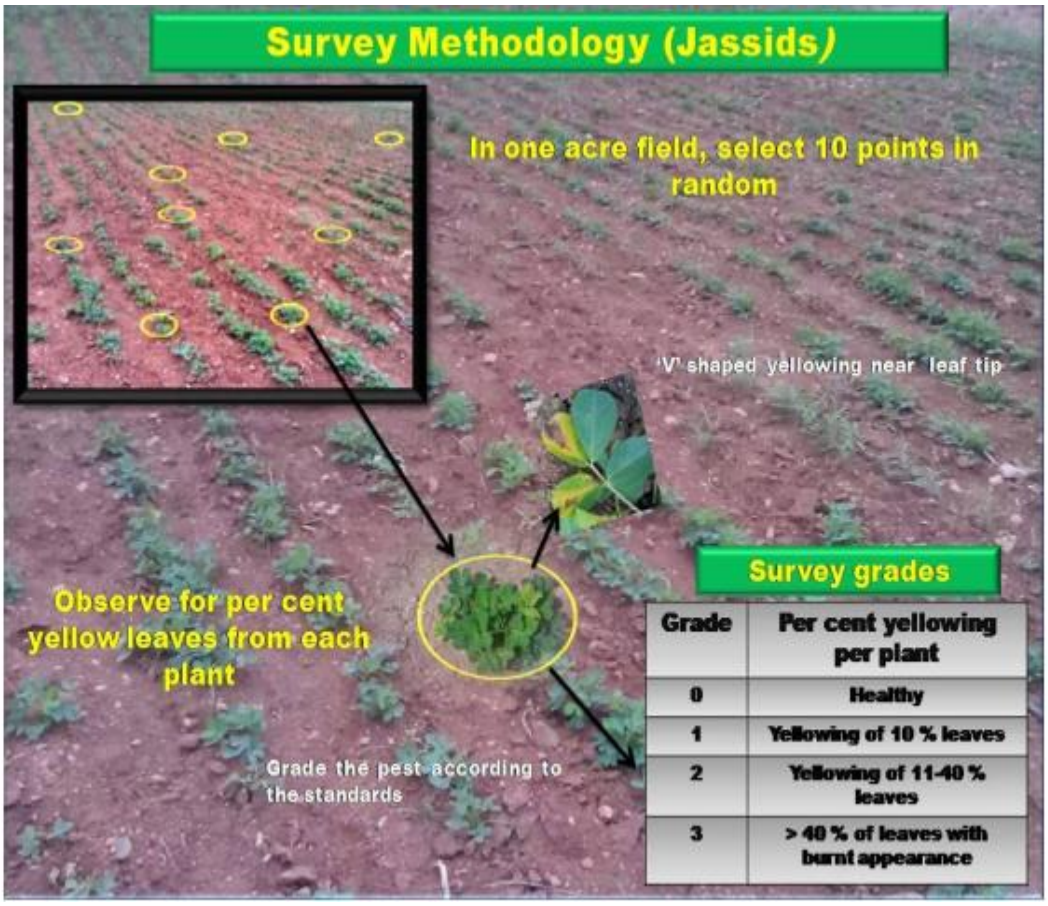
- Assessment of pest population/damage from randomly selected spots representing larger area
- Large area surveyed in short period

B. Fixed plot survey

- Assessment of pest population/damage from a fixed plots of a region.
- The data on pest population/damage recorded periodic from sowing till harvest.



Grade	No. of tillers affected
0	0
I	1-5
II	5-10
III	>10



Grade	Per cent yellowing per plant
0	Healthy
1	Yellowing of 10 % leaves
2	Yellowing of 11-40 % leaves
3	> 40 % of leaves with burnt appearance

Pest Surveillance

Refers to an official process which collects and records data on pest occurrence or absence by survey, monitoring or other procedures .

Objectives of Pest Surveillance

1. to know existing and new pest species
2. to assess pest population and damage at different growth stage of crop
3. to study the influence of weather parameters on pest
4. to study changing pest status (Minor to major)
5. to assess natural enemies and their influence on pests
6. effect of new cropping pattern and varieties on pest

There are two major types of surveillance systems

General surveillance:

Process whereby information on particular pest which is of concern for an area is gathered from many sources, wherever it is available and provided for use by NPPOs (National Plant Protection Organizations)

Specific survey:

Procedures by which NPPOs obtain information on pest of concern on specific sites in an area over a defined period of time

Pest Forecasting

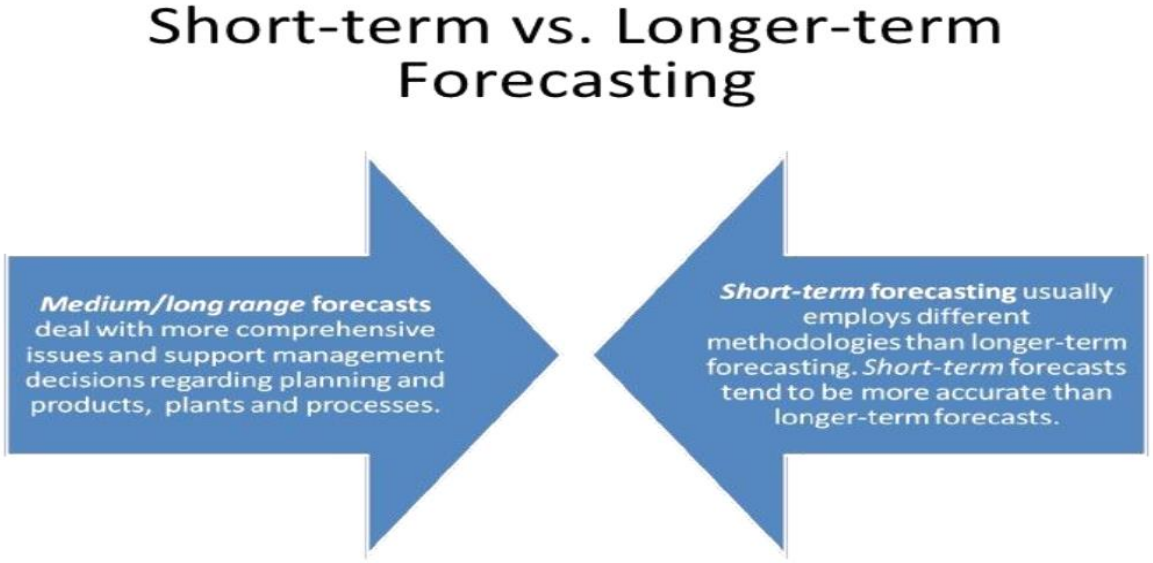
Forecasting of pest incidence or outbreak based on information obtained from, pest surveillance.

Uses

- Predicting pest outbreak which needs control measure
- Suitable stage at which control measure gives maximum protection

Two types of pest forecasting

a. Short term forecasting - Based on 1 or 2 seasons
b. Long term forecasting - Based on affect of weather parameters on pest



Sampling Techniques

1. **Absolute sampling -** To count all the pests occurring in a plot
2. **Relative sampling -** To measure pest in terms of some values which can be compared over time and space

   e.g. Light trap catch, Pheromone trap.

Light trap

Yellow sticky trap

Pheromone trap

Methods of sampling

a. **In situ counts -** Visual observation on number of insects on plant canopy (either entire plot or randomly selected plot)

b. **Knock down -** Collecting insects from an area by removing from crop and (Sudden trap) counting (Jarring)

c. **Netting -** Use of sweep net for hoppers, grasshopper etc.

d. **Norcotised collection -** Quick moving insects anaesthetized and counted

e. **Trapping -** Light trap - Phototropic insects
Pheromone trap - Species specific
Sticky trap - Sucking insects
Bait trap - Sorghum shoot fly - Fishmeal trap
Emergence trap - For soil insects

Pheromone trap

Light trap

f. **Crop samples**
Affected plant parts are counted *e.g. Bollworms*

Stage of Sampling
- Usually most injurious stage counted
- Sometimes egg masses counted - Practical considerations
- Hoppers - Nymphs and adult counted

Sample Size
- Differs with nature of pest and crop
- Proper sample size gives accurate results

Decision Making
- Population or damage assessed from the crop
- Compared with ETL and EIL
- When pest level crosses ETL, control measure has to be taken to prevent pest from reaching EIL.

Eco-friendly methods of pest management

Tillage

- **Fall ploughing (*H.armigera*, RHHC, Root grub, Cutworms)**
- **Tilling of soils near bunds(grasshoppers)**
- **Rakingup and hoeing of soil(decreases fruitfly in melon and mango)**
- **Light earthingup in sugarcane(decreases shoot borer)**
- **Removal of weed that act as carryover hosts**

SUMMER PLOUGHING

Exposes the pupae to sun and birds

Cattle egrets

Removal of weeds : Helicoverpa

Most common alternate host
(Legasca mollis)

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

Diverting Pest Populations from the crop

a) Trap cropping

b) Intercropping

c) Barrier crops

d) Mulches

e) Push-Pull Polycropping

a) Trap Cropping

- **A trap crop is a plant that attracts agricultural pests away from nearby crops.**
- **Saves the main crop from destruction by pests without the use of pesticides.**
- **Involves planting small areas of a crop or other species near the protected crop.**

Host crop	Trap Crop	Target Pest
Cabbage or Cauliflower	Sesamum or mustard	Diamond back moth
Groundnut	Castor or Sunflower	Spodoptera Litura
Tomato	Marigold or Cucumber	Helicoverpa armigera, Tomato yellow leaf curl virus
Field beans	Chrysanthemum	Liriomyza trifolii
Rice and potato	Marigold	Nematodes
Maize	Sorghum	Corn stalk borer
Cowpea	Sesamum	Bihar hairy caterpillar
Cotton	Bhendi	Sucking Pests and Bollworms

b) Intercropping

- **Crop intensification in both time and space dimensions.**
- **The two crops should not have the same pest problems (like Tomatoes and Okra are effected by same fruit borer)**
- **Nutrient need of two crops should not be same or they should extract nutrients from different layers of soil (shallow & deep root crop).**
- **If one crop is tuber (Potato, Onion) other should be fruit bearing (Tomato, Brinjal).**
- **Better to have a row of crops which acts as pest repellent like Garlic, Marigold, Onion etc.**

Sorghum + Redgram

Advantages

1. Additional yield income/unit area than sole cropping.
2. Insurance against failure of crops in abnormal year.
3. Soil fertility maintained as the nutrient uptake is made from both layers of soil
4. Reduction in soil runoff and controls weeds.
5. Intercrops provide shade and support to the other crop.
6. Utilizes resources efficiently and their productivity is increased
7. Intercropping with cash crops is higher profitable.
8. Helps to avoid inter-crop competition and thus a higher number of crop plants are grown per unit area.

Disadvantages

1. Yield may decrease as the crops differ in their competitive abilities.
2. Management seems to be difficult task having different cultural practices
3. Improved implements cannot be used efficiently.
4. Higher amount of fertilizer or irrigation water cannot be utilized properly as the component crops vary in their response of these resources.
5. Harvesting may be difficult.

c) Barrier crops

The barrier can consist of a relatively tall species that is planted around the perimeter of a primary crop.

Living barriers include graminaceous species, like sorghum (Sorghum bicolor), Johnson grass (*Sorghum halepense), corn (Zea mays) and elephant grass (Pennisetum purpureum).*

Has been successful for vector management with non-persistent aphid transmitted viruses as aphids lose their infectivity few minutes after acquisition.

Napier – Border Cropping

Border Cropping

- **As trap crop – Life stages**
- **As Banker crop – Support NE's**
- **As Ecofeast crop – Sacrifice crop**
- **Maize around cotton field (decrease sucking pest and *H. armigera*)**
- **Castor in Groundnut, cotton (suppress Spodoptera)**

Maize around cotton field