Farming Practices

Integrated pest & disease management in coffee

Farmer Group Educator (FGE) training sessions

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Content

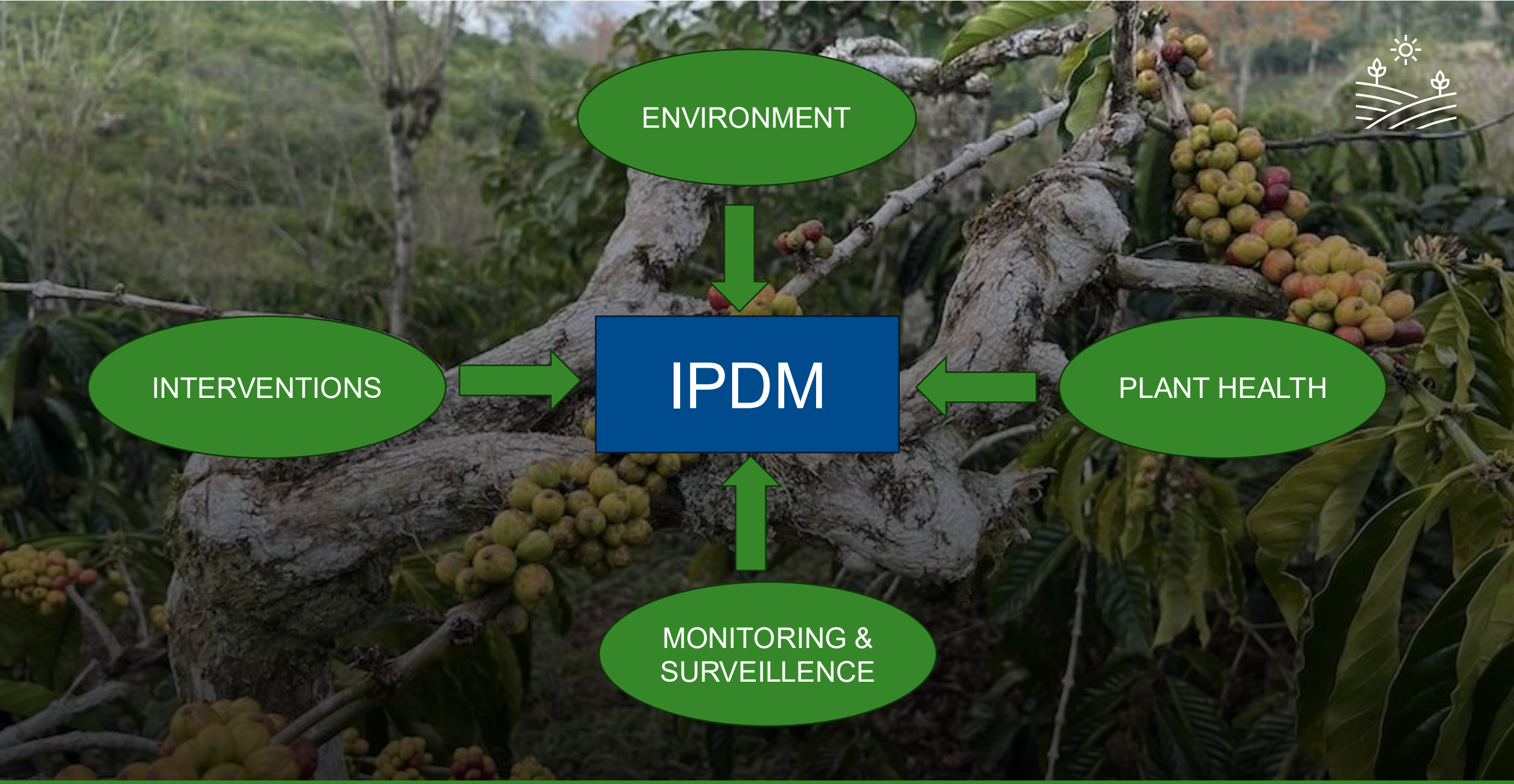
- Concepts and components of integrated pest & disease management
  - Microclimate / environment
  - Plant health
  - Monitoring / surveillance
  - Interventions – prevention and timely control
- Integrated management of major pests
- Integrated management of major diseases

Concepts and components of IPDM

Integrated management of pests & diseases

The IPDM is a management strategy for tackling pests & diseases within the context of given environmental conditions and population dynamics and by utilising all available technologies in an appropriate manner so as to keep the losses within the economic threshold levels. It comprises of the following components:

- Environment – microclimate & conservation of natural enemies
- Maintenance of health of the plants
- Continuous monitoring / surveillance
- Interventions – Prevention & timely control measures


ENVIRONMENT
INTERVENTIONS
IPDM
PLANT HEALTH
MONITORING &
SURVEILLENCE

Environmental factors

- Optimum plant population
- Judicious shade management – diverse shade trees & shade regulation
- Maintenance of natural vegetation to harbour natural enemies of pests & diseases – birds, ladybirds, spiders etc.

Shaded plantation (Source: CCRI, India)

Plant health

- Authentic, healthy planting material
- Soil Health – Organic Matter, pH
- Integrated nutrition
- Pruning
- Effective weed control

Healthy Robusta plant (Source: CCRI, India)

Surveillance & monitoring

- Farmers gain knowledge on identification and management of pests & diseases
- Regular monitoring of pests & diseases, natural enemies
- Monitor weather conditions
- Record keeping
- Interaction with neighbours

Field monitoring (Source: CCRI, India)

Interventions – prevention & timely control

- Prevention measures – avoiding nematode infested seedlings
- Cultural – pruning, isolation trenches
- Phyto-sanitation – removing & burning of infested parts in early states
- Traps
- Use of natural products / bioagents
- Need based use of safer chemicals

Broca trap (Source: CCRI, India)

Integrated management of major pests

Coffee Berry Borer (*Hypothenemus hampei* Ferrari)

Images courtesy: CCRI, India

IPM of Coffee Berry Borer

- Maintain optimum shade and good drainage
- Remove off-season berries on plants, if any before commencement of next crop cycle - (Feb-March)
- Regularly monitor new crop, remove & destroy infested fruits – beetles waiting at the tip of fruits (May-June)
- Spray entomopathogenic fungus *Beauveria bassi*ana – BBASS developed by ICCRI (100g spores per ha) (June-July)
- Take up clean harvesting, cover the ground with mats to avoid gleanings
- Install Broca traps during post harvest period to trap beetles from leftover inoculum (Jan-Feb)
- Dry the cherry coffee to prescribed moisture (12%) before storage

BBASS – *B.bassiana* spores developed by ICCRI

Broca Trap – developed by CCRI, India

hyp-O-tan Broca Lure developed by ICCRI

Black Twig Borer / Branch borer (*Xylosandrus compactus* Eichfoff)

- Incidence usually seen from Sept till the onset of dry conditions
- Thickly shaded & poorly drained conditions favourable to this pest
- Severe infestation causes loss of crop bearing branches and potential productive branches. Crop losses may go up to 10%

Source: CABI

IPM of Black Twig Borer / Branch Borer

- Provide optimum thin shade
- Maintain good drainage especially in low lying humid areas
- Prune the bushes every year after harvest to maintain proper ventilation to the bushes
- In case the plants exhibit luxurious growth, cut down the dosage of Nitrogen & maintain the Potassium levels in the soil
- Cut the infested twigs below the point of attack and burn them especially during April-May and Sept - Dec
- Periodically remove suckers. Can be combined with other operations like weeding, fertilizer application

Parasitic nematodes

- Several species of nematodes attack coffee, but three main species cause extensive damage to all types of coffee in Indonesia. They are
  - Root lesion nematode (*Pratylenchus coffeae* Zimm)
  - Burrowing nematodes (*Radopholus similis)*
  - Root-knot nematodes (*Meloidogyne incognita)*
- Nematodes usually spread through rain water, seedlings from infested nurseries, and farm implements

Nature & symptoms of attack

Knots on the roots (Source: CCRI, India)

Aerial symptoms (Source: CCRI, India)

IPM of Nematodes

- Avoid seedlings from unknown sources
- If nursery is raised within the farm
  - test the nursery site and nursery medium for nematodes
  - dig the nursery site deep and expose it for sun for 2-3 months
  - Sieve the nursery medium to remove old roots & dry it thoroughly before use
- If incidence is seen in the field
  - uproot and burn the plant at the same site

IPM of Nematodes

- dig an isolation trench (1.5'x1.5') around the infested site by keeping a buffer of 2-3 rows surrounding the affected plant. Put the soil within the isolated spot
- In the isolated patch apply compost enriched with mycorrhiza (VAM) & keep it weed free
- Plant trap crops like Marigold
- The vacant spots can be planted with grafted plants raised on tolerant root stocks (??) after a gap of one year

Red Borer (*Zeuzera coffeae* Nietner)

- A minor pest of Robusta coffee usually affecting at early years
- Adult moths lay eggs on the crevices of bark on main stem/ thick branches
- The emerging larva, red in colour, makes a tunnel by feeding on the wood affecting flow of sap. The tunnel may extend up to roots
- The plants can be identified by dull looking canopy, dropping leaves and presence of holes on stem and frass like pellets neat the base of the stem
- In advanced cases, the branch or the whole plant may die

IPM of Red Borer

- In early stages, when holes on main stem/ thick branches and frass at the base of stem are noticed, insert a metal wire to kill the larva and plug the hole with 1% Bordeaux mixture
- Cut the affected branches and burn them
- In advanced stage when the whole plants show wilting and yellowing, uproot and burn them to prevent further spread

Red borer larvae (Source: CCRI, India)

Integrated management of major diseases

Coffee Leaf Rust (*Hemileia vastatrix* B&Br

- The coffee leaf rust (CLR) is a major disease of coffee of great economic significance
- The fungus is an obligate pathogen specific to coffee. Arabica is most susceptible compared to other species of coffee
- The disease is characterised by presence of small yellow spots on lower surface of leaf

Coffee Leaf Rust (*Hemileia vastatrix* B&Br

- Within 2 weeks, the spots enlarge and produce yellow rust spores
- The affected leaves fall prematurely and in severe case only barren and dead branches can be seen
- The crop losses may go up to 70%

Symptoms of CLR attack

CLR affected leaves (Source: CCRI, India)

CLR affected plant (Source: CCRI, India)

Integrated disease management of CLR

- Use of disease tolerant varieties – eg: Andungsari 2K, Sigar Utang
- Maintain optimum shade (about 40%)
- Maintain healthy and vigorous plants – timely weeding, nutrition
- Prune the coffee bushes after harvest every year
- If disease tolerant varieties are grown, spray 0.5% Bordeaux mixture or copper oxychloride 50%WP (2g per litre) once before onset of rainy season and again towards end of rainy season as prophylactic measure
- For susceptible varieties, apart from Bordeaux mixture spray before rainy season, systemic fungicides like triademefon @0.02% a.i. or hexaconazole @0.01% a.i. should be sprayed towards the end of main rainy season

Anthracnose (*Colletotrichum gleosporioides* Penz)

- Anthracnose causes many types of attcaks on coffee plant viz., Twig die back/ summer dieback; Stalk rot of berries and leaves and bron blight of leaves, but stalk rot of berries and leaves causes major damage
- The stalk rot of berries and leaves infestation is seen mainly during rainy season both in arabica and robusta
- Low temp., high humidity, prolonged wetting of leaves are some of the predisposing factors for the development of the disease

Symptoms of damage

- Stalk portion of berries and leaves start decaying leading to defoliation and berry drop, leaving the rotten stalks on the branches
- The rotten stalks induce necrotic spots on the branches leading to death of tender branches from the site of infection
- If not controlled initially, the disease spreads rapidly and cause severe crop losses

Fruit rot

Necrotic patch on branch

Images courtesy: WASI, Vietnam)

Integrated disease management of Anthracnose

- Provide proper drainage especially in low lying lands
- Take up pruning of coffee bushes after harvest and maintain health of plants through timely weeding and manuring
- In endemic areas, take up prophylactic spray of Bordeaux mixture @ 0.5% (or) Copper Oxychloride @0.02% before onset of rainy season to prevent disease development
- Monitor the coffee plantation during rainy season for detecting disease development at early stage
- When disease is first noticed, prune the disease branches and burn them
- During break in rains spray carbendazim @ 0.03% (0.6g per litre of water) to prevent further spread of disease

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