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Floor Management in Fruit Orchard

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Introduction

Orchard floor management system is one of the most important operations in the successful orchard and affects the growth and overall development of fruit trees. It also affects the tree growth, cropping, fruit quality, and tree nutrition, through its effect on the nutrient and moisture availability and improving the soil physical properties. Proper orchard floor management is vital to the health and productivity of fruit trees, with management practices impacting tree growth, yield and quality of fruit. Management of the orchard floor can influence the effectiveness of irrigation, fertility, disease and insect management practices. Producing economic yields of high-quality fruit requires judicious management of factors.

What is orchard floor management?

- Orchard floor management refers to the management of the orchard soil in such a manner that the fruit trees give higher yield of quality fruits in successive years for sustainable economic returns.

Objectives

- To provide optimum soil moisture during the critical plant growth stages
- Prevent or reduce soil erosion
- Increase or at least maintain organic matter in soil
- Increase nutrients status of soil
- Control weeds in the orchard
- Improve soil structure and loosen it for good aeration and water percolation
- To ensure additional income from the interspaces of the orchard, especially during the pre-bearing stage
- Enhance biocontrol and improve microbial activity

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Components

1. Soil

- ✓ Plant available water & nutrients
- ✓ Erosion control
- ✓ Compaction
- ✓ Nutrient cycling
- ✓ Gas exchange
- ✓ Soil-borne disease control
- ✓ Pesticide decomposition
- ✓ Soil life

2. Water and nutrients

- ✓ Intake
- ✓ Storage and cycling
- ✓ Minimal nitrate
- ✓ Chemical leaching
- ✓ Water conservation

3. Biodiversity

- ✓ Potential to control pests via. IPM
- ✓ Fixation of nutrients
- ✓ Soil fauna and flora diversity
- ✓ Beneficial organisms

4. Energy

- ✓ Frost protection
- ✓ Reduced energy inputs for machinery and irrigation

Weeds

- ❖ In tropical and subtropical countries, 70% of the labour input is diverted for weeding.
- ❖ Nearly 90% losses are observed in the crops where weeds are allowed to grow along with the crops till harvesting.
- ❖ Weeds exert their competition for light, water, nutrients, and interfere with other operational factors.

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Control measures of weeds in fruit crops

Crop	Losses	Methods
Mango	First 5 years of planting	Hand weeding Mechanical Intercropping Chemical
Banana	30-40 %	Hand weeding Cover cropping Mulching Chemical
Pineapple	20-30 %	Earthing up Chemical
Papaya	70 %	Cover cropping Mulching Chemical
Apple	30-50 %	Chemical
Strawberry	34 to 67 %	Mulching

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Soil stabilization

- ✓ Soil stabilization is a permanent physical and chemical alternation of soils to enhance their physical property.
- ✓ Increase the strength or stability of soil and to reduce the constructions cost by making best use of locally available materials.

Methods of soil stabilization:

1. Mechanical
2. Soil cement
3. Soil lime
4. Soil bitumen
5. Lime fly ash
6. Lime fly ash bound

Irrigation water

- ➢ Irrigation is a vital management practice in fruit production regions of the world, particularly in arid and semi-arid climates.
- ➢ Optimum growth and production of fruit crops is strongly linked managing irrigation water.
- ➢ Insufficient water supply may result in reduced tree growth, yield and fruit quality due to water stress.
- ➢ Excessive irrigation, may increase nutrient leaching, water-logging problems, incidence of pests and diseases, and the associated cost of frequent operation and maintenance of the irrigation system.

EC level suitable in fruit crops

Very low tolerance EC < 0.7 dS/m	**Low tolerance EC < 1.3 dS/m**	**Medium tolerance EC < 2.7 dS/m**	**High tolerance EC < 4.5 dS/m**
Loquat Litchi Papaya Pecan nut Persimmon	Almond Apple Avocado Citrus fruit Grape	Fig Pomegranate	Date palm

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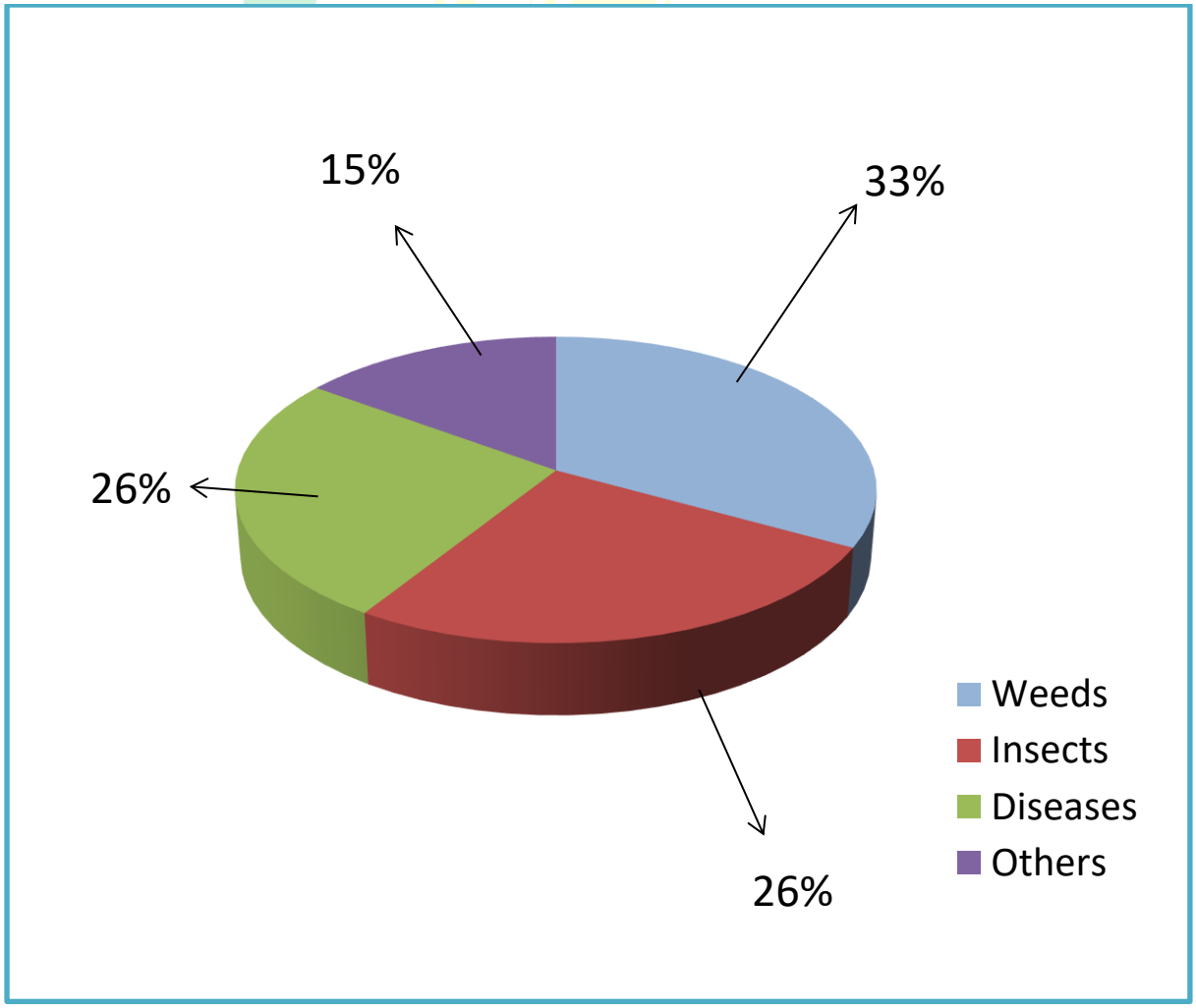
Strawberry	Passion fruit Pear Walnut		

Pest management

- As per estimate, about 20.0% of total loss to crops is attributed to insect/pest alone.
- If the cover crops or intercrops are taken regularly, the insect/pest will be automatically suppressed.
- Sometimes due to excessive use of pesticides, the build up of natural enemies in floor orchard.
- IPM involves compiling detailed, timely information about a crop and its pests to ensure that pest management decisions are economically, environmentally, and socially sound

Status of losses caused by biotic stresses in fruit crops



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Important soil management practices

Clean cultivation

- The inter space between the trees is kept clean by tillage and removal of weeds
- Vegetation except main crop is removed
- Disfavour in respect to maintaining soil fertility
- Soil fertility gets depleted
- Moisture loss aggregates

Advantages

- Improves soil aeration and physical conditions
- Controls weeds and thus reduces competition for light, nutrients and moisture
- Eliminates or avoids alternate hosts for pests and diseases
- Improves the infiltration of water through breaking the hard soil surface crust

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- ❑ Enhances biological activity in the soil through better aeration

Sod culture

- Grasses are allowed to grow in the interspaces between the trees without tillage or mulching
- The grasses are mowed periodically to reduce competition for water and nutrients with the trees
- Grown grass is mown time to time use as a mulch
- Sod serves as a cushioning material for the falling fruits of orchard

Advantages

- Controls soil erosion
- Maintains optimum soil moisture and organic matter
- Provides better aeration to the roots
- Enhances microbiological activity in the soil through better aeration
- Avoids bruising of falling fruits

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Sod mulch

- ✓ Grasses are allowed to grow in the entire area of the orchard
- ✓ Tree basins are mulched with straw, instead of tilling
- ✓ The grasses are mowed down regularly and are spread to maintain the mulch in basins
- ✓ Sod mulch implies to use of cut over grasses as a mulch in fruit cultivation

Benefits

- ✓ Moisture conservation
- ✓ Temperature regulation
- ✓ Weed suppression
- ✓ Better nutrient availability
- ✓ Hastended microbial activity
- ✓ Minimized soil compaction
- ✓ Controlling or checked soil erosion
- ✓ Improves fruit coloration and enhances fruit maturity

Use of herbicide

- Herbicide also commonly known as weed killers, are chemical substances used to control unwanted plants
- Herbicides are applied to soil to manage weeds
- While it is desirable for the chemicals to control weeds during the season of application, it is not desirable for them to persist and affect subsequent crop growth

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Common name	Trade name	Fruit crop
Glyphosate	Round up	Pineapple, Grape
Pelargonic acid	Scythe	Apple, Pear, Apricot, Cherry, Nectarine, Peach, Plum, Strawberry, Grape and other fruits
Trifluralin	Preen	Non-bearing tree fruits and nuts
Paraquat	Cyclon, gramoxon	Mango, Banana, Pineapple
2,4-D	Weedon, Barrage	Highly used in grape and other fruits
Clethodim	Select maax	Pecan nut, Strawberry

Mulching

Mulch can be defined as material, organic or inorganic, that is used for placement on the soil surface as a protective cover.

Types of mulching	
Organic mulch	**Inorganic mulch**
Straw, Compost, Manure, Saw dust, Wooden pieces, Rice husk, Leaf litter, newspaper and onion garlic scales	Plastic film, Metal foil, Gravel, Stone and Plastic mulch

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Plastic mulch

History

The idea of using polyethylene film as mulch in plant production saw it's beginnings in the mid 1950's.

Advantages

- Increased yields
- Earlier maturing crops
- Crops of higher quality enhanced
- Insect management
- Weed control

Mulches affect:

- Weeds
- Soil and orchard temperature
- Soil moisture, physical properties
- Soil C, N, other nutrients
- Soil biology
- Tree performance
- Pests (rodents)

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Intercropping

Intercropping is the cultivation of growing two or more crops at the same time in the same field.

Types of intercropping

1. Mixed intercropping
2. Row intercropping
3. Strip intercropping
4. Relay intercropping

Advantages

- It gives additional yield income/unit area than sole cropping
- Higher productivity per unit area
- Maintain soil fertility
- Reduction in soil runoff and control weeds
- Provide shade and support to the other crops
- It utilizes resources sufficiently and their productivity is increased
- Intercropping with cash crops is highly profitable

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Cover crops

- Cover crops It is the cheapest and most effective method of maintaining soil productivity and soil structure.
- Thus, the water holding and nutrient holding capacity is improved along with increased soil aeration.

Cover crops affect:

- Weeds
- Soil C, N, other nutrients
- Soil biology, moisture
- Pests (insect, disease)
- N fixation (legumes)
- Soil and orchard temperature
- Manage excess vigour
- Increase fruit cleanliness/quality at harvest

Clean strips (strips cropping)

- Crops are planted/grown in form of relatively narrow strips across the land slope
- A way to minimize erosion by sowing rows of different crops next to each other
- Increase density of plant matter makes it harder for soil to be washed away by rain water
- It is method to more effective to erosion control
- It helps prevent the spread of pests and plant diseases