

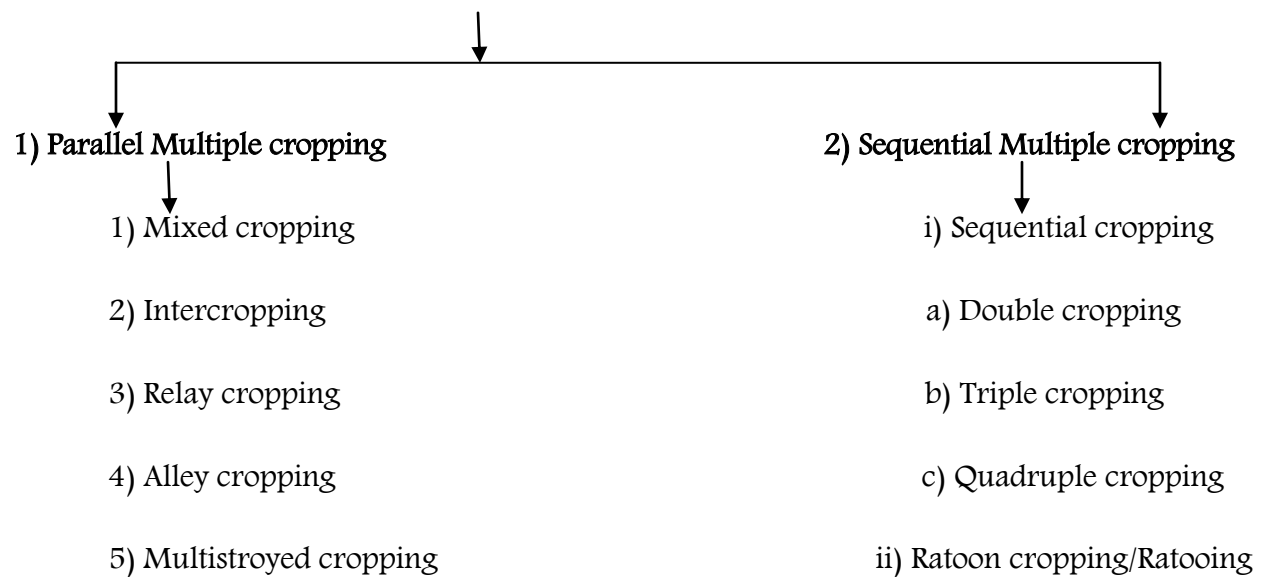
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Chapter No 9. Cropping systems–Meaning, types/classification of cropping systems, advantages and disadvantages of each cropping systems

- **Cropping systems.**– It is defined as the order in which the crops are grown or cultivated on a piece of land over fixed period.
- **Cropping Pattern.**– The yearly sequence and spatial arrangement of crops on a same piece of land over a same period of time.

❖ Classification/Types of cropping systems.–

- 1) Monoculture 2) Multiple cropping 3) Following or Fallow in rotation



A. Cropping systems for dryland and irrigated areas.–

I) Monoculture/Monocropping.– The cropping system in which only one major crop is grown on the same land year after year. Or Repetitive growing of only one crop on same piece of land year after year. e.g Rice–Rice, Bajra–Bajra

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➤ **Advantages of monoculture/monocropping:-**

- 1) Convenience in sowing with the help of machinery under mechanized farming
- 2) It is convenient for harvesting with the help of machinery

➤ **Disadvantages:-**

- 1) Sometimes fertility and productivity of the soil are lowered if suitable soil management practices are not followed.
- 2) Soil structure may be deteriorated.
- 3) Increase infestation of pests, diseases and weeds.

2. Intensive Cropping systems.

1) Multiple cropping:- The cropping system in which two or more crops are grown either in succession or sequence or association for entire or part period of their life cycles on the same field in a year is called multiple cropping.

E.g. Sorghum-Wheat-Green Gram

Maize-Wheat-Green gram

Rice-Wheat-Black gram-Linseed

a) Parallel multiple cropping:- When two or more crops are grown in association for part or entire period of their life cycle is known as parallel multiple cropping. It includes following cropping systems.

i) Mixed cropping:- Growing two or more crops simultaneously with no distinct row arrangement is known as mixed cropping.

E.g. Maize + Green gram + Pigeon pea

Sorghum + Groundnut + Pigeon pea

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- Mixed cropping is common practice in rainfed or dry farming areas.
- Generally, legumes crops like red gram, black gram, green gram, cowpea etc. or oilseed crops like groundnut, mustard etc. are mixed with cereal crops like jowar or bajra.
- Sowing is done by drilling the mixture of seed with the help of seed drill or moghan can be attached behind the seed drill for sowing of mixed crop.
- Usually, cereals are grown as main crop and pulses or oilseeds as minor or mixed crop.

➤ **Advantages of mixed cropping:-**

- 1) Risk of failure of crop is less
- 2) Fullfills the daily requirements of food grains, oilseeds, pulses etc.
- 3) Improve fertility of the soil if legumes are taken as minor crop
- 4) Better distribution of labour through out the crop period
- 5) Increase gross monetary returns
- 6) Well balanced cattle feed is obtained
- 7) Safeguards against pests and diseases
- 8) Full utilization of space and available plant nutrients

➤ **Disadvantages:-**

- 1) Some times control of pests, diseases and weeds become difficult
- 2) Some times affects the yield of main crop
- 3) Harvesting with the help of machinery is not possible

➤ **Types of Mixed Cropping:-**

- i. **Mixed crop:-** Seeds of different crops are mixed together and then sown either in lines or broadcasted is called as mixed crop.

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- ii. **Companion crop**:- Seeds of different crops are not mixed together but different crops are sown in different rows is called as companion crop.
- iii. **Guard crop**:- The main crop is sown in the center, surrounded by hardy crop to provide protection to main crop is called as guard crop. E.g. Safflower around wheat, mesta around sugarcane.
- iv. **Augmenting crop**:- Sub crops are sown to supplement the yield of main crop, the sub crop is called as augmenting crops. e.g. Japanese mustard with berseem.

➤ **Advantages of Augmenting crop**:-

1. Better utilization of available resources
2. Insurance of against total failure of crop
3. Higher yield per unit area per unit time
4. Less incidence of pest and diseases
5. Improvement in soil structure
6. Improvement in soil fertility

➤ **Disadvantages of Augmenting crop**:-

1. Difficult to carry out different field operations
2. More labour requirement
3. Due care is needed while selecting crop

ii) **Intercropping**:- It is cropping system in which intercrop is grown in between rows of the major crop, without affecting the optimum plant population as well as yield of the major crop (base crop) or growing two or more crops simultaneously on the same piece of land with distinct row arrangement is called as intercropping.

E.g. Maize + Pigeon pea (2:1)

Sorghum + Pigeon pea (2:1)

Cotton + Green gram (2:1)

Pigeon pea + Ground nut + Lentil (2:1:1)

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- ✓ In this system in addition to yield of major crop some extra intercrop yield is obtained.
 - ✓ Therefore, intercrop is bonus crop in this system. e.g. Intercropping of groundnut or vegetables in sugarcane or pulse or oilseed crops in sorghum or bajra.
 - ✓ The crops having different growth habits, canopy development, root system and nutrient requirement are chosen.

 - ✓ The crops grown in association are sown by following specific planting pattern for base crop so as to create space to accommodate the intercrop in systematic geometric progression.
- **Characteristics of good intercrop/minor crop/subsidiary mixed crop.-**
- 1) It should not affect the growth and yield of base crop or main crop.
 - 2) It should mature earlier or later than the base crop or main crop.
 - 3) As far as possible it should be a legume crop for maintaining fertility and productivity of the soil.
 - 4) It should have different growth habits and nutrient requirements in order to have minimum competition.
 - 5) It should have different rooting depths.
 - 6) It should differ in canopy development and sunlight requirement.
- **Advantages of intercropping system.**
- 1) It helps to improve the soil fertility and soil productivity.
 - 2) Maintaining the higher crop yield.
 - 3) Better utilization of available resources.

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- 4) It should resist the soil erosion.
- 5) Reduces the incidence of insect pest, disease and weeds.
- 6) Improves the soil structure and water holding capacity of soil.

➤ **Disadvantages:**

- 1) Harvesting with the help of machinery is difficult.
- 2) Intercultural operations are not possible.
- 3) Competition among the resources is more.
- 4) Harvesting makes a time consuming/difficult.
- 5) Weed control is not possible.
- 6) Water requirement is more.

➤ **Types of Intercropping :-**

a) Parallel Cropping:- Cultivation of such crops which have different natural habit and zero competition is called as parallel cropping. e.g. black gram/green gram + Maize.

b) Companion cropping:- System in which production of both intercrops is equal to that of its solid planting is called as companion cropping. e.g. Mustard/Potato/Onion + Sugarcane.

a) Mixed Intercropping:- Growing of two or more crops with no distinct row arrangement is called as mixed intercropping.

There are **four types** of mixed intercropping systems:-

1. **Row intercropping:-** Growing of two or more crops simultaneously, where one or more crops are planted in rows is called as row intercropping.

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2. **Patch cropping**:- Where component crops are planted in patches is called as patch cropping.
3. **Strip intercropping**:- Growing of two or more crops simultaneously in strips wide enough to permit independent cultivation but narrow enough to interact the crop agronomically is called as strip intercropping.
4. **Relay intercropping**:- Growing of two or more crops simultaneously during the part of life cycle of each is called as relay intercropping.

Second crop is planted after the first crop has reached its reproductive stage of growth but before it is ready for harvest. Succeeding crop is planted before harvesting of preceding crop.

iii) Relay cropping:- It is the cropping system in which succeeding crop (next crop) is or sown or planted when the first crop (preceding crop) has reached its physiological maturity stage or before it is ready to harvest is called as relay cropping. e.g. Rice-Linseed/lentil/black gram/chickpea.

➤ **Advantages of relay cropping:**

- 1) Better utilization of residual moisture and fertilizers.
- 2) Reduces the cost of cultivation practices.
- 3) Also reduces the cost of fertilizers and irrigation.
- 4) Labour requirement is less.
- 5) Incidence of pest, diseases and weeds is less due to early sowing operation.

➤ **Disadvantages:-**

- 1) Risk of crop failure is more.
- 2) Harvesting by means machinery is difficult.

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- 3) Lack of availability of skilled labour.
- 4) Greater incidence of pest, disease and weeds.

iv) Alley cropping.– The system of growing jowar, maize, bajra or any other arable crop in the alleys (passage between two rows) of leguminous shrubs like subabul (*Leucaena leucacephala*) is called as alley cropping.

- Growing of maize, jowar, bajra, cowpea in between rows of subabul planted at 5-10 m spacing, this system is useful for conservation of moisture and maintaining fertility of soil in dry farming areas.
- The loppings of the subabul are used as green fodder for animals or spread in between the crop rows as mulch for conservation of soil moisture and after delaying it adds organic matter to the soil.

➤ **Advantages of alley cropping.**

- 1) Better utilization of natural resources.
- 2) Reduces the cost of cultivation.
- 3) Improves the soil fertility and productivity.
- 4) Provides fodder for animals and food for human.

➤ **Disadvantages.**

- 1) Competition among the natural resources i.e moisture, nutrients, light and space.
- 2) Incidence of pest, diseases and weeds is more.
- 3) Chances of crop failure is more.
- 4) Less yield is obtained.

➤ **Types of Alley cropping :-**

1. **Food cum fodder system.**– In this system provides food grains like pulses, cereals, oilseeds and fodder for livestock.

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2. **Food cum mulch system.**– In this system provides food grains as well as crop residues as a mulch for soil and water conservative measures.
 3. **Food cum pole system.**– In this system provides food as well as wood for fuel, timber, furniture etc.
- v) **Multistoreyed cropping.**– In this system the crops of different height and vertical layers of leaf canopies, sunlight requirements and root system are grown together on the same field is called as multistoreyed cropping.

- ✓ Generally, the shorter crops favouring shade and humidity are grown in passage between the rows of taller crops, which are tolerant to strong sunlight.

e.g. Growing of pineapple, sweet potato, black pepper, tapioca, turmeric, ginger etc. in coconut or arecanut.

➤ **Advantages of Multistoreyed cropping:**

- 1) Better utilization of moisture and nutrients in different soil layers.
- 2) Better utilization of sunlight and space.
- 3) Provides a balanced food for humans.
- 4) Enrichment of organic matter or plant residues in soil.
- 5) Improve the water holding capacity of soil

➤ **Disadvantages:**

- 1) Competition among the natural resources.
- 2) More area is required.
- 3) Lack of labour availability
- 4) Incidence of pest, disease and weeds is more.

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a) Synergetic cropping:- The yields of both crops are higher than of their pure crop on unit area basis is called as synergetic cropping. e.g. Sugarcane + Potato

i) Additive Series:- In this system one crop is main crop or base crop and another crop is intercrop.

1. Intercrop is introduced into the base crop by adjusting or changing crop geometry.
2. Plant population of main crop is kept same so that recommended for pure stand by reducing row spacing.
3. Intercrop is sown in the reduced space.
4. The objective of the system is to get additional income and to cover risk.
5. LER (Land Equivalent Ratio) is more than 1.
6. **Additive series is more efficient than the replacement series.**

ii) Replacement Series:- Both the crops are component crops. The plant population of both crops is less than their recommended population in pure stand. LER is less than 1.

- ✓ **Replacement series** is less efficient than the **Additive series**.
- ✓ **LER of intercropping system should be 1.**

2) Sequential multiple cropping:- It is the multiple cropping system in which two or more crops are grown in sequence on the same piece of land in a year or over a fixed period.

i) Sequence cropping:- In this cropping system two or more crops are grown in sequence one after another on the same piece of land in a year.

a) Double cropping:- It is multiple cropping system in which two crops are grown in sequence on the same piece of land in a year. e.g. Black gram-Jowar, Black gram-Wheat, Rice-Gram, Groundnut-Wheat etc.

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b) Triple cropping.– It is the multiple cropping system in which three crops are grown in sequence on a same land in a year.

✓ It is possible when irrigation facilities are available throughout the year.

e.g. G.nut-Wheat-Okra, Rice-Wheat-G.nut, Jowar-Potato-Green gram, Soybean-Wheat-G.nut etc.

c) Quadruple cropping.– It is the multiple cropping system in which four crops are grown in a sequence on the same land in a year.

✓ It is possible under irrigated conditions throughout the year. e.g. G.nut-Coriander-Wheat-Green gram, Soybean-Methi-Wheat-Green gram etc.

ii) Ratoon cropping or Ratooning.– The cultivation of crop regrowth after harvest is known as ratoon cropping.

- Ratooning is one of the important systems of intensive cropping, which implies more than one harvest from one sowing/planting because of regrowth from the basal buds on the stem after harvest of first crop.
- Thus ratooning consists of allowing the stubbles of the original crop to strike again or to produce the tillers after harvesting and to raise another crop.

e.g. Ratooning of Sugarcane, Hybrid Jowar, Hybrid Bajra, and Redgram etc.

➤ **Advantages of multiple cropping.**–

- 1) It increases the total production and gross monetary returns from the unit area in a year.
- 2) Fullfills various needs of food grains, pulses, oilseeds, vegetables, fodder etc.
- 3) Facilitates even distribution of labour throughout the year.
- 4) Better utilization of land, labour, power and other resources on the farm.

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5) Regular flow of income through the year.

➤ **Disadvantages of multiple cropping:-**

- 1) Fertility and productivity of the soil is lowered or exhausted if proper soil management practices are allowed.
- 2) Sometimes it affects the structure of the soil due to continuous cropping and irrigation.
- 3) Sometimes control of pests, diseases and weeds becomes difficult.

III) Fallowing or fallow in rotation:- In scarcity areas (dry farming) where rainfall is very low only two crops are taken in three years as against one crop every year is called as fallowing or fallow in rotation.

- A fallow year or season is one in which the field is not cultivated with any crop but left without crop.
- The field may be left undisturbed in a ploughed condition or kept clean by frequent harrowing.
- This practice is useful for conservation of soil moisture and maintaining fertility of the soil.
- In irrigated areas some times one season is kept fallow for maintaining fertility of the soil and minimizing the damage to the soil due to continuous use of irrigation and cropping.

➤ **Definitions of important terms in cropping systems:-**

- 1) **Base crop:-** It is the major crop grown in intercropping system.
- 2) **Inter crop:-** It is the additional crop grown in the space created in intercropping systems.

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3) **Mixed crop/minor/subsidiary crop**:- In the crop grown by seed mixture in main crop in mixed cropping.

4) **Main crop**:- The major crop grown in mixed cropping system.

5) **Companion crop**:- The crop grown in association in cropping system for complementary effect.

6) **Component crop**:- Either of the crop grown in multiple cropping system.

➤ **Land Equivalent Ratio (LER):**

It is defined as relative land area under sole cropping to produce the yield from one hectare in intercropping.

$$\text{LER} = \frac{\text{Yield of base crop in intercropping}}{\text{Yield of base crop in sole cropping}} + \frac{\text{Yield of inter crop in intercropping}}{\text{Yield of intercrop in sole cropping}}$$

➤ **Crop Rotation**:- A crop rotation may be defined as more or less systematic recurrent succession of crops on the same piece of land.

e.g. Jowar-Gram, Groundnut-Wheat

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