ROHINI COLLEGE OF ENGINEERING AND TECHNOLOGY
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CROP PRODUCTION TECHNOLOGY

UNIT II – Crop Selection And Establishment

2. Competition for moisture

- In general, for producing equal amounts of dry matter, weeds transpire more water than do most of our crop plants. It becomes increasingly critical with increasing soil moisture stress, as found in arid and semi- arid areas.
- In weedy fields soil moisture may be exhausted by the time the crop reaches the fruiting stage, i.e. the peak consumptive use period of the crop, causing significant loss in crop yields.

3. Competition for light

- It becomes important element of crop-weed competition when moisture and nutrients are plentiful.
- Unlike competition for nutrients and moisture once weeds shade a crop plant, increased light intensity cannot benefit it.

Competition for space (CO2)

- Crop-weed competition for space is the requirement for CO2 and the competition may occur under extremely crowded plant community condition. A more efficient utilization ofCO2by weeds may contribute to their rapid growth over of crops.

SPACING AND ARRANGEMENT OF CROP PLANTS

Plant Population or Plant Density

Number of plants per unit area in the cropped field is the plant population

Optimum plant population

1. Optimum plant population –It is the number of plants required to produce maximum output or biomass per unit area.
2. Any increase beyond this stage results in either no increase or reduction in biomass.

Crop Geometry

The arrangement of the plants in different rows and columns in an area to efficiently utilize the natural resources is called crop geometry. It is otherwise area occupied by a single plant e.g. rice – 20 cm x 15 cm. This is very essential to utilize the resources like light, water, nutrient and space.

Importance of plant population/ crop geometry/spacing and arrangement of crop plants

1. Yield of any crop depends on final plant population
2. The plant population depends on germination percentage and survival rate in the field
3. When soil moisture and nutrients are not limited high plant population is necessary to utilize the other growth factors like solar radiation efficiently.
4. Under low plant population individual plant yield will be more due to wide spacing.
5. Under high plant population individual plant yield will below due to narrow spacing leading to competition between plants.
6. That level of plant population is called as optimum population
7. So to get Yield per unit area, optimum plant population is maximum necessary.

Factors affecting plant population

Genetic Factors

1. Size of the plant

2. Elasticity of the plant

3. Foraging area or soil cover

4. Crop and variety

Environmental factors

1. **Time of sowing**

The crop is subjected to various weather conditions when sown at different periods.

2. **Rainfall/irrigation**

Under more plant densities, more water is lost through transpiration

3. **Fertilizer application**

1. Nutrient uptake increases within plant population
2. High population under low fertility soil leads to nutrient deficiency symptoms leading low yield

4. **Seed rate**

1. Quantity of seed sown/unit area, viability and establishment rate decides the plant population Under broadcasting the seed rate is higher when compared with line sowing/transplanting, e.g. for rice

Direct sowing -100kg/ha Line sowing - 60 kg/ha
Transplanting - 40 kg/ha

FIELD PREPARATION FOR CROPS INCLUDING SYSTEMS OF TILLAGE

Field Preparation–TILLAGE

Cultivation involves management of physical environment to produce a favourable habitat for successful crop production.

Tillage: is the mechanical manipulation of soil with tools and implements for obtaining conditions ideal for seed germination, seedling establishment and growth of crops.

Tilth: It is the physical condition of soil obtained out of tillage (or) it is the result of tillage. The tilth may be a coarse tilth, fine tilth or moderate tilth, based on the requirement of crops being grown and the soil where we are cultivating.

Objectives of tillage

The main objectives of tillage are

1. To prepare a good seed bed which helps the germination of seeds
2. To create conditions in the soil suited for better growth of crops
3. To control the weeds effectively.
4. To make the soil capable for absorbing more rain water.
5. To mix up the manure and fertilisers uniformly in the soil.
6. To aerate the soil.
7. To provide adequate seed-soil contact to permit water flow to seed and seedling roots
8. To remove the hard pan and to increase the soil depth

Types of tillage: Tillage operations may be grouped with reference to the time of cropping as 'On season tillage' and 'Off-season tillage'

1. ON- SEASON TILLAGE:

Tillage operations that are done for raising crops in the same season or at the onset of the crop season are known as 'on-season tillage'.

Preparatory tillage: This refers to tillage operations that are done to prepare the field for raising crops. It consists of deep opening and loosening of the soil to bring about a desirable tilth as well as to incorporate or uproot weeds and crop stubble when the soil is in a workable condition.

Types of preparatory tillage:

Primary tillage: The tillage operation that is done after the harvest of crop to bring the land under cultivation is known as primary tillage. Ploughing is the opening of compact soil with the help of different ploughs. Country plough, mould board plough are used for primary tillage.

Secondary tillage: The tillage operations that are performed on the soil after primary tillage to bring a good soil tilth are known as secondary tillage. Secondary tillage consists of lighter or finer operation which is done to clean the soil, break the clods and incorporate the manure and fertilisers. Harrowing and planking is done to serve those purposes.

Tertiary tillage/Seedbed formation:

Levelling board, buck scrapers etc. are used for levelling and giving final touch for the seedbed preparation. These seed bed formations may be grouped into two major or categories as: Bed formation for nursery and main field sowing / transplanting.

After tillage /Inter tillage or inter-cultivation: The tillage operations that are done in the standing crop after the sowing or planting and prior to the harvesting of the crop plants are called after tillage. This is also called as inter cultivation or post seeding planting cultivation. It includes harrowing, hoeing, weeding, earthing-up, mulching, drilling or side dressing of fertilisers etc. Spade, hoe, weeders etc. are used for inter cultivation.

2. OFF-SEASON TILLAGE: Tillage operations done for conditioning the soil suitably for the forthcoming main season crop are called off-season tillage. Off season tillage may be

Post harvest tillage/fallow tillage: done after the harvest of a crop.

Summer tillage: done during summer period prior to the starting of next season preparatory cultivation.

Winter tillage: done during winter period in between the two crops.

3. SPECIAL PURPOSE TILLAGE: Tillage operations intended to serve special purposes are said to be special purpose tillage.

Sub soiling: To break the hard pan beneath the plough layer special tillage operations (chiselling) are performed to reduce compaction. Sub soiling is essential once in four to five years where heavy machineries are used for field operations, seeding, harvesting, transporting etc.

Clean tillage: It refers to working of the soil of the entire field in such a way no living plant is left undisturbed. It is practiced to control weeds, soil borne pathogen and pests.

Blind tillage: It refers to tillage done after seeding or planting the crop either at the pre – emergence stage of the crop plants or while they are in the early stages of growth so that crop

plants (tuber crops) do not get damaged, but extra plants and broad leaved weeds are uprooted.

4. MODERN CONCEPTS IN TILLAGE:

Zero tillage (No tillage)

In this, new crop is planted in the residues of the previous crop without any prior soil tillage or seed bed preparation and it is possible when all the weeds are controlled by the use of herbicides. Zero tillage is applicable for soils with

Minimum tillage: It aims at reducing tillage operations to the minimum necessity for ensuring a good seed bed. The advantages of minimum tillage over conventional tillage are

Stubble mulch tillage or stubble mulch farming

Soil is protected at all times either by growing a crop or by leaving the crop residues on the surface during fallow periods. Sweeps or blades are generally used to cut the soil upto 12 to 15 cm depth in the first operation after harvest and depth of cut is reduced during subsequent operations.

Conservation tillage

The major objective is to conserve soil and soil moisture. If stubble form the protective cover on the surface it is usually referred to as stubble mulch tillage. The residues left on soil surface interfere with seed bed preparation and sowing operations.

ESTABLISHMENT OF AN ADEQUATE CROP STAND AND GROUND COVER, INCLUDING SELECTION AND TREATMENT OF SEED, AND NURSERY GROWING

Seeds and sowing, importance and characteristics of good quality seeds - factors affecting germination

Seed is a fertilized ripened ovule consisting of three main parts viz., seed coat, endosperm and embryo which in due course gives rise to new plant.

Dormancy

The physiological phenomenon of a seed by which the seeds remain viable without germination i.e., resting period is called as dormancy