

Cropping pattern and cropping system - Intensive cropping- Sustainable agriculture – IFS

CROPPING PATTERN AND CROPPING SYSTEM

Traditionally, increased food production has come from putting more land under cultivation. However, in large areas of the world, especially in Asia, all the land that can be economically cultivated is already in use. In future, most of the extra food needs must come from higher production from land already being farmed. A major share of this increase is likely to come from increasing the number of crops produced per year on a given land using improved crop cultivars. Such multiple cropping offers potential not only to increase food production but also land degradation.

In India, the concept of cropping systems is as old as agriculture. Farmers preferred mixed cropping, especially under dry land conditions, to minimise the risk of total crop failure. Even in Vedas, there is a mention of first and second crops, indicating the existence of sequential cropping.

A **system** is defined as a set of components that are interrelated and interact among themselves. A **cropping system** refers to a set of crop systems, making up the cropping activities of a farm system. Cropping system comprises all components required for the production of a particular crop and the interrelationships between them and environment (TAC, CGIAR, 1978). In other words, a cropping system usually refers to a combination of crops in time and space. Combination in time occurs when crops occupy different growing period and combinations in space occur when crops are inter planted. When annual crops are considered, a cropping system usually means the combination of crops within a given year (Willey *et al.*, 1989)

Cropping pattern

The yearly sequence and spatial arrangement of crops or of crops and fallow on a given area.

Cropping system

The cropping patterns used on a farm and their interaction with farm resources, other farm enterprises, and available technology which determine their make up.

INTENSIVE CROPPING

Principles

The turn around period between one crop and another is minimised through modified land preparation. It is possible when the resources are available in plenty. Ex. Garden land cultivation. Cropping intensity is higher in intensive cropping system. Crop intensification technique includes intercropping, relay cropping, sequential cropping, ratoon cropping, etc. All such systems come under the general term multiple cropping.

Need for intensive cropping

- Cropping systems has to be evolved based on climate, soil and water availability for efficient use of available natural resources.
- The increase in population has put pressure on land to increase productivity per unit area, unit time and for unit resource used.
- This cropping system should provide enough food for the family, fodder for cattle and generate sufficient cash income for domestic and cultivation expenses.

Intensive cropping: Growing number of crops on the same piece of land during the given period of time.

Cropping intensity: Number of crops cultivated in a piece of land per annum is cropping intensity. In Punjab and Tamil Nadu, the cropping intensity is more than 100% (i.e. around 140-150%). In Rajasthan, the cropping intensity is less.

Multiple cropping: The intensification of cropping in time and space dimensions. Growing two or more crops on the same field in a year.

Forms of multiple cropping

Intercropping: Growing two or more crops simultaneously on the same field. Crop intensification is in both time and space dimensions. There is intercrop competition during all or part of crop growth.

- (a) *Mixed intercropping:* Growing two or more crops simultaneously with no distinct row arrangement. Also referred to as mixed cropping. Ex: Sorghum, pearl millet and cowpea are mixed and broadcasted in rainfed conditions.
- (b) *Row intercropping:* Growing two or more crops simultaneously where one or more crops are planted in rows. Often simply referred to as intercropping. Maize + greengram (1:1), Maize + blackgram (1:1), Groundnut + Redgram (6:1)
- (c) *Strip intercropping:* Growing two or more crops simultaneously in strips wide enough to permit independent cultivation but narrow enough for the crops to interact agronomically. Ex. Groundnut + redgram (6:4) strip.
- (d) *Relay intercropping:* Growing two or more crops simultaneously during the part of the life cycle of each. A second crop is planted after the first crop has reached its reproductive stage of growth, but, before it is ready for harvest. Often simply referred to as relay cropping. Rice- rice fallow pulse.

Advantages of intercropping

- Better use of growth resources including light, nutrients and water
- Suppression of weeds
- Yield stability; even if one crop fails due to unforeseen situations, another crop will yield and gives income
- Successful intercropping gives higher equivalent yields (yield of base crop + yield of intercrop), higher cropping intensity
- Reduced pest and disease incidences
- Improvement of soil health and agro-eco system

Sequential cropping: Growing two or more crops in sequence on the same field in a farming year. The succeeding crop is planted after the preceding crop has been harvested. Crop intensification is only in time dimension. There is no intercrop competition.

- (a) *Double, triple and quadruple cropping:* Growing two, three and four crops, respectively, on the same land in a year in sequence.

Ex. Double cropping: Rice: cotton; Triple cropping: Rice: rice: pulses; Quadruple cropping: Tomato: ridge gourd: *Amaranthus* greens: baby corn

- (b) *Ratoon cropping:* The cultivation of crop re-growth after harvest, although not necessarily for grain. Ex. Sugarcane: ratoon; Sorghum: ratoon (for fodder).

The various terms defined above bring out essentially two underlying principles, that of growing crops simultaneously in mixture, i.e., intercropping; and of growing individual crops in sequence, i.e., sequential cropping. The cropping system for a region or farm may comprise either or both of these two principles.

SUSTAINABLE AGRICULTURE

Definition:

A farming systems that are "capable of maintaining their productivity and usefulness to society indefinitely and must be resource-conserving, socially supportive, commercially competitive, and environmentally sound."

USDA (legal)

Sustainable agriculture means, an integrated system of plant and animal production practices having a site-specific application that will, over the long term:

- satisfy human food and fiber needs;
- enhance environmental quality and the natural resource based upon which the agricultural economy depends;
- make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls;
- sustain the economic viability of farm operations;
- enhance the quality of life for farmers and society as a whole.

Advantages

- Production cost is low
- Over all risk of the farmer is reduced
- Pollution of water is avoided
- Very little or no pesticide residue is ensured
- Ensures both short and long term profitability

Disadvantages

- Since sustainable agriculture uses least quantum of inputs, naturally the output (yield) may also be less.

Major components of sustainable agricultural system

- Soil and water conservation to prevent degradation of soil productivity
- Efficient use of limited irrigation water without leading to problems of soil salinity, alkalinity and high ground water table
- Crop rotations that mitigate weed, disease and insect problems, increase soil productivity and minimise soil erosion
- Integrated nutrient management that reduces the need for chemical fertilizers improves the soil health and minimise environmental pollution by conjunctive use of organics, in-organics and bio-fertilizers.
- ‘Integrated pest management that reduces the need for agrochemicals by crop rotation, weather monitoring, use of resistant cultivar, planting time and biological pest control.
- Management system to control weed by preventive measures, tillage, timely inter cultivation and crop rotation to improve plant health.

INTEGRATED FARMING SYSTEM (IFS)

Integration of two or more appropriate combination of enterprises like crop, dairy, piggery, fishery, poultry, bee keeping etc., for each farm according to the availability of resources to sustain and satisfy the necessities of the farmer

Definition: A farming system is a collection of distinct functional units such as crop, livestock, processing, investments and marketing activities which interact because of the joint use of inputs they receive from the environment which have the common objective of satisfying the farmers’ (decision makers) aims. The definition of the borders of the options depends on circumstances; often it includes not only the farm (economic enterprise) but also the household (farm – household system)”

Possible enterprises

Wetland based farming system

- Crop + Fish + Poultry/poultry/pigeon

- Crop + Fish + Mushroom

Gardenland based farming system

- Crop + Dairy + Biogas
- Crop + Dairy + Biogas + Sericulture
- Crop + Dairy + Biogas + Mushroom + Sylvi-culture

Dry land based farming system

- Crop + Goat + Agroforestry
- Crop + Goat + Agroforestry + Horticulture

Benefits of IFS

- Higher Productivity
- Profitability
- Sustainability
- Balanced food
- Recycling reduces pollution
- Money round the year
- Employment generation
- Increase input efficiency
- Standard of living of the farmer increased
- Better utilisation of land, labour, time and resources