

Area/rotation	Cropping intensit.
e. wheat-maize-senji-sugarcane	166%
f. wheat-maize-sugarcane	100%
g. wheat-sugarcane-sugarcane (ratoon)	150%
h. sugar beet-sugarcane-sugarcane-tobacco + maize	166%
Four-year rotations	
a. wheat-wheat-toria-cotton	100%
b. guara (GM)-wheat-toria-cotton-wheat	125%
c. wheat-maize + senji-sugarcane-cotton	125%
d. wheat-wheat-gram-cotton	100%
Five-year rotations	
a. wheat-fallow-wheat-toria-cotton	80%
b. wheat-wheat or gram-maize + senji-sugarcane-cotton	120%
c. kharif fodder-oat or gram-wheat guara (GM)-wheat-mash + cotton	140%
d. wheat-fallow-wheat-kharif fodder-gram-cotton	100%
B. WELL-IRRIGATED AREAS	
One-year rotations	
a. potato-maize-potato	300%
b. tobacco-maize-potato or cauliflower	300%
c. cauliflower-gourd	200%
d. cabbage-cauliflower-onion-maize	400%
e. wheat-cotton	200%
f. cauliflower-cabbage-onion-cucurbits-maize fodder	500%
Two-year rotations	
a. kharif fodder-wheat-maize-wheat	200%
b. wheat-cotton-fallow-wheat	150%
c. maize-wheat-bajra-turnip	200%
Three-year rotations	
a. maize-wheat-bajra-melon-oat or wheat	200%
b. tobacco-maize + senji-sugarcane	138%
Four-year rotations	
a. wheat-maize + senji-sugarcane-cotton	125%
b. wheat-mash or turnip-cotton + senji-sugarcane or tobacco	125%
C. BARANI AREAS	
Two-year rotations	
a. wheat or gram-chari + guara or bajra	100%
b. wheat-gram or sarson	100%
c. wheat-mash + sesame-fallow	150%
d. wheat-fallow-wheat	66%

In conclusion, a well-planned crop rotation pattern has important functions in soil improvement and fertility, weed control, regulation of labour and water use, and stability and security of income, so that in many cases it can confer economic advantages over monoculture.

9.3 Farming systems

9.3.1 Concept of type and system of farming

The term 'farming system' consists of two words; let us define each of these words separately, and then the term 'farming system'. A farm is a piece of land on which crops, livestock, or both are raised. Farming is the business of operating a farm, which includes all the operations farmers do to raise crops or livestock. A system is an established way of doing things. Thus a farming system is an established way of operating a piece of land for raising crops, livestock, or both; it involves everything done on the farm or outside of the farm which is related to farm operations.

When a farmer operates a farm, he is trying to achieve certain objectives. Farmers use resources like land, water, manure, labour, and capital to accomplish the jobs necessary to reach their goals. They also operate under constraints like limited resources, non-availability of machinery, labour, or markets, restrictions, and public opinion. The interaction of objectives, resources, and constraints leads to a specific way of operating a given piece of land to raise crops and/or livestock, which we call a farming system—the totality of things done on a farm.

Each farm has a unique system which has evolved in relation to the environment and soil of the farm, social and economic conditions, technology and capital availability, communication and marketing facilities, plant and animal genetic resources, and implements and labour available. Though each individual farm has its own particular system, relatively similar systems can be grouped, based on different criteria, into various classifications.

There are two broad types of farming systems, with a third resulting from a combination of the two.

1. Arable production
2. Livestock rearing
3. Mixed farming

Other classification criteria are: (a) extensive and intensive farming systems, (b) subsistence and commercial farming systems, (c) dry and irrigated farming systems, (d) sole and multiple cropping systems. There are also other ways to group farming and cropping systems, like grassland farming, fruit farming, truck farming, vegetable farming, dairy farming, poultry farming, monocropping, and organic farming systems.

A typical farmer in Pakistan raises food crops, cash crops, forage crops, and vegetables for home consumption or for market; he also rears cows, buffalos, goats or sheep, and poultry for his own consumption. He buys certain inputs like fertilizer and insecticides, and sells certain outputs which he produces especially for market or which are in excess of his requirements. All these operations constitute a farming system. This example represents a mixed farming system.

9.3.2 Factors affecting the choice of a farming system

There are many factors which determine the choice of a farming system for a particular farm. Although the broad outline of the farming system on a particular farm may not change with time, the specific kinds of small-scale operations and features always change. Thus, when one looks at the small-scale features of a system, a farming system changes with changes in technology, standard of living of the farmers and general population, product demand, income, and many other factors. At a given time or on any given farm, one factor may affect the choice of a farming system; at other times or at other farms, a different factor may have a more important influence on the system or the way it changes.

The following factors affect the choice of a farming system for a particular farm.

1. **CLIMATE:** temperature and duration of the frost-free period, rainfall and irrigation, solar radiation and photoperiod, humidity, wind and storms, and air pollutants.
2. **SOIL:** texture, depth, slope, erosion, pH, fertility, deficiencies of elements, and drainage.
3. **GENETIC POTENTIAL OF PLANTS AND ANIMALS:** what crops and animals are adapted to the environmental conditions of the specific farm.
4. **SOCIO-POLITICAL AND ECONOMIC FACTORS:** population pressure, consumer preferences, credit, demand, prices and farm income, markets, transportation, farmer psychology, farm size, tenancy, etc.
5. **BIOLOGICAL FACTORS:** weeds, diseases, insects, and other pests.
6. **TECHNOLOGY:** availability of improved production technology, machinery, and mechanization.
7. **RESOURCES:** seeds, fertilizers, insecticides, herbicides, capital, labour.
8. **MISCELLANEOUS:** proximity of agro-based industry, export facilities, cold storage facilities.

9.3.3 Kinds of farming systems

Intensive farming. Intensive farming systems involve growing more than one crop and raising more livestock on the same piece of land in one calendar year to maximize land use and labour productivity. One of the key components is multiple cropping, which maximizes crop production per unit of land by producing several crops from the same piece of land in one calendar year. In these systems, one tries to maximize the utility of solar energy and efficiently utilize other natural resources.

Extensive farming. In extensive farming systems, large areas are used with minimum expenditure of or attention to efficient use of other resources. In these kinds of farming systems, yields per unit of area are usually low. The aim in this type of farming system is to maximize yield per unit of the scarce resource, e.g. water, labour, fertilizer.

Grassland farming. These systems are mainly concerned with growing grasses for consumption by livestock kept for meat or milk production. Grass may be grazed by animals directly; may be cut, brought, and fed to livestock; or it may be preserved in the form of hay or silage to be fed to animals when the growth of grass is slow or has stopped in extremely hot or cold seasons.

Diversified farming. This is an expanded type of farming system in which a variety of crops are produced and many types of animals are reared.

Arable farming. The term arable farming refers to systems in which only crops that require cultivation of the soil are grown. Crops are grown on land that is prepared by ploughing, harrowing, etc. This may include different kinds of cropping systems.

Livestock and poultry farming. This category includes farming systems in which various kinds of livestock are reared for meat, milk, wool, and eggs. These systems include dairy farming, in which buffalos, cows, or goats are kept for milk; poultry farming, in which poultry (including turkeys) are reared for meat or eggs; and production of sheep or beef animals.

Truck farming. Truck farming refers to a system in which the bulk of the outputs are produced and marketed. The system may center around one or two main crops or kinds of livestock. Usually the crops are grown for nearby industry or consumption centers.

Dry farming. Farming systems in which crops and livestock are raised on land which does not receive sufficient rainfall for water-intensive crops, and no irrigation facilities are available fall into this category. When the water balance is less than the water requirements for crop growth, the yields of crops are affected. In these cases, farming systems are followed where the aim is conservation of moisture in a manner to maximize production, income, and profit per unit of rainfall or water availability.

Fruit farming. Farming systems in which orchards are planted and the objectives are to maximize fruit production, enhance quality, and increase income. Usually fruit trees adapted to the climatic and soil conditions are planted, and the products are sold in either local or distant markets.

Commercial farming system. Farming systems in which crops are raised on a commercial scale for marketing. The crops are planted on large areas rather than on small areas for home consumption. In these systems, livestock may be raised to sell the products in bulk.

Subsistence farming. Systems of farming in which basic necessities like food, clothing, and shelter are produced for the family to live on. In these systems the farmer's main objective is to produce food for his family. Most of the farmers in Asia have very small holdings, and they produce food for their families to live on.

REVIEW QUESTIONS

1. Define crop rotation and explain its advantages.
2. How is crop rotation related to yield?
3. Give some basic reasons why crop rotation is necessary, and factors affecting the choice of a particular crop rotation system.
4. Explain the principles and limitations of crop rotation.
5. (a) What is meant by intensity of cropping? (b) How it is calculated?
6. Define farm and farming system. Explain how the concept of farming system can be used to help in the improvement of agriculture.
7. Explain the different factors which affect the choice of farming system in a locality.
8. Briefly explain the various systems of farming practiced in Pakistan.

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