

CHAPTER-1

AN INTRODUCTION TO AGRICULTURE

1.1 Agriculture:

The word 'Agriculture' is a combination of two Latin language words, the 'agri' literary meaning field and 'culture' denoting cultivation. So, the term Agriculture means the cultivation of field. This simplest definition is incomplete as it does not serve the real purpose from the modern farming point of view. In broader sense, agriculture is the cultivation of soil including all farm operations and management of the successful crop and animal production. This also includes purchase of farm inputs (seed, fertilizer, implements etc.) and marketing of farm products. Most agricultural practices are carried out at farm so agriculture is also known as farming. Farm is piece of land that is used for growing crops or rearing animals. The person who operates the farm is called farmer. The comprehensive definition of agriculture is: it is an art, science or industry which deals with growing of crops and rearing of animals, birds, fish or insects by using the (land, air, water, human inputs and machinery by the coordination of socioeconomic infrastructure.

1.1.1 Importance:

Modern agriculture is based on scientific principles. It is a huge factory to produce food and feed, fiber and other raw materials. So the rise and fall of nations mainly depend on agriculture. It is the primary engine of development and economy. Besides food and fiber, agriculture generates more jobs, higher income, export earnings and national wealth.

Agriculture is the key pillar of our country's economy. It makes about 19.5% contribution in gross domestic products (GDP). The 60.78% of the Pakistan's population is inhabiting the rural areas and their livelihoods rely upon agriculture for income generation and employment. About 42.3% employed labor force of the country is engaged in farming. We get 80% of the nation's earnings by exporting cotton, rice and other agriculture related products.

Most of our industries are based on agricultural raw materials. These include food, textiles, sugar, oil, leather, soap, paper and tobacco industries. To boost industrial production, we should develop agriculture sector by encouraging agriculture education and research.

1.1.2 Scope of Agriculture in Pakistan:

Agriculture serves a pivotal role in national development, poverty alleviation and food security. The rapid growth in urban population of Pakistan is a signal for increasing need for valued perishable agricultural food items i.e. fruits, meat, vegetables and dairy. Pakistani government has brought its attention towards improving living standards of rural people through developments in infrastructure and services including roads, transport facilities and natural gas supplies. There is a greater scope of development in agriculture sector of Pakistan through China-Pakistan Economic Corridor that will bring remarkable revolution of agribusiness by value-added product innovation and supply chain.

Livestock share in the agriculture is 58.3 percent with 3.4 percent growth rate compared in this sub-sector of agriculture. The fish culture sub-sector is contributing 2.1 percent to agriculture and prone to 1.2 percent growth rate. Forestry sector's share in agriculture is 2.3 percent and is developing at 14.5% growth rate. The share of major crops wheat, rice, sugarcane maize and cotton to agricultural value addition is 23.8 percent. These crops' share in GDP is 4.6 percent. The crops other than major crops are sharing 11 percent to agriculture. However, their contribution to GDP is 2.2 percent.

1.2. Branches of Agriculture:

There are two main divisions of Agriculture namely (a) Crop production farming or crop husbandry, and (b) Livestock farming or animal husbandry

(A) Crop Husbandry:

It is related to all phases of crop production starting from seed sowing to marketing of the economic crop products. Crop husbandry includes three main sub-divisions:

- i. Agronomy
- ii. Horticulture
- iii. Forestry

i. AGRONOMY:

The word 'Agronomy' is a combination of two Greek words 'agros' which means field and 'nomos' implicating management. It is the branch of agriculture that deals with principles and practices of crop production and soil management. The field or farm management should be of such level that crops are raised most successfully and profitably Hence agronomy covers the following areas directly or indirectly:

a) Crop Production: refers to all operations starting from sowing and ending at harvesting of all crops including cereals, legumes, oilseeds, fiber and sugar crops etc.

b) Crop Breeding: aimed at crop improvement. It is carried out by selection and hybridization of superior genotypes.

c) Crop Physiology: study of the various physiological processes of crop such as photosynthesis, respiration and transpiration.

d) Crop Protection: controls crop pests including weeds, insects, diseases and rodents etc. it includes Entomology (the study and control of insects), Pathology (study of the disease producing organisms i.e. fungi, viruses and nematodes and their control) and weed Science (study and control of undesirable plants).

e) Soil Science: concerns with the soil's physical and chemical properties for better crop stand. This also covers crop nutrition (i.e. soil fertility status), soil and water management.

f) Farm Management: covers the overall organization and control of the farm and its forces in such a manner to get maximum production, and net profit. It also includes farm accounts and records.

g) Farm Mechanics: related to the use and management of farm equipment, implements and machinery.

h) Farm Economics: assesses the cost-benefit relationship of farm operation and production. It also covers the marketing of the farm commodities.

i) Biometry / Biostatistics: refers to the statistical evaluation of various aspects of crops, like varietal and fertilizer trials etc. It is some time also referred to as field plot technique.

ii. HORTICULTURE:

Horticulture is specialized for production of fruits, vegetables, and ornamentals. It covers the following subjects:

a) Pomology / Fruit culture: concerns with fruit production, laying and maintenance of fruit orchards.

b) Olericulture: deals with the production of different types of vegetables e.g. brinjal, coriander, chillies, onion, garlic and turmeric etc.

c) Floriculture: means growing and maintenance of flower plants for the aesthetic value.

d) Landscaping: related to land beautification. It also includes lawns laying-out and management.

iii. FORESTRY:

Forestry is specialized for forest trees and wild life. It is a broader field covering wood production, wood technology, wild life and range management.

a) Wood Production: It includes such areas as tree improvement, soils of forests ecosystems, forest biostatistics and economics etc.

b) Wood Technology: focuses on the many chemical and physical characteristics of wood and its products. Wood technology covers all aspects of wood processing, fabrication, finishing, recycling and remodeling, market distribution and employing wood products in various uses.

c) Wild-life: It is concerned with monitoring of wild animals and birds in the forest. It also covers wild-land recreation and sericulture (silk production). Although this field is related to animals, it is placed in forestry because of the close interaction of wild-life with forest trees.

d) Range management: refers to tree management in relation to the available resources such as land, and water etc.

B) Animal Husbandry:

This refers to the rearing, breeding and maintenance (health and hygiene) of animals to provide food for human consumption. It covers the following major areas:

i. LIVESTOCK MANAGEMENT:

It covers cattle, horses, sheep and goat rearing and breeding for milk, meat and draft purposes. Animal Nutrition is an off-shoot of this field. It deals with the nutritional quality of feed in relation to animal growth, health and production.

ii. DAIRY FARMING:

Dairy farming deals particularly with the maintenance of cows and buffalo for milk production.

iii. POULTRY FARMING:

It includes the rearing of birds such as cocks, hens, ducks and turkey etc. for egg and meat purposes.

iv. FISH CULTURE:

It is related to fish farming for human food.

v. APICULTURE:

It refers to the rearing and maintenance of bees for the production of honey.

VI. ALLIED SCIENCES OF ANIMAL HUSBANDRY: Animal breeding and genetics, animal health and hygiene, veterinary sciences are also closely connected to animal husbandry.

1.3 Development of Scientific Agriculture:

In pre-scientific agriculture, six persons might turn out enough food for themselves and for four others. In years of unhealthy harvest, they might turn out just enough just for themselves. With the event of Agricultural Science and application of advanced technology, 5 persons are able to turn out enough food for ninety-five others. In those years, agricultural knowledge was merely accumulation of experience channeled verbally from one farmer to other farmer. A systematic way of planning and executing plant nutrition experiments was firstly initiated by van Helmont (1577-1644 A.D.). Jethro Tull (1674-1741 A.D.) performed a series of experiments on cultural practices that resulted into the invention of seed drill and animal drawn cultivator. He then published a book, 'Horse Hoeing Husbandry'. Arthur Young (1741-1820 A.D.) through his pot experiments, proved that crop yields could be increased by applying several stuffs like niter, poultry dung, gun powder etc. He presented his work in 46 volumes of journal named 'Annals of Agriculture'.

The discipline of Soil Science started with the formulation of theory of humus in 1806. Field experiments were started in Rothamsted Experimental Station, England in 1834 and soon after in other places in Europe. Research on plant physiology and physiology was started in 18th century and continued to grow in scope. Sir Humphry Davy wrote a book with name 'Elements of Agricultural Chemistry' in 1813. About 1837, Sir John Bennet Lawes started to do scientific study on manures' influence on crops. A truly scientific approach to farming was started in 1840 by Justus von Liebig. In 1842, Lawes developed the procedure of processing phosphate rock to synthesize superphosphate. His work thus originated the industry of synthetic fertilizer.

The scientific work on plant selection for selecting superior cereal varieties on the basis of estimation of their potential yields was started in the 18th century. The discovery of the Laws of heredity and the ways to cause mutations by Gregory Johann Mendel in 1866 led to the development of modern plant breeding. In 1876, Charles Darwin developed new techniques of self and cross pollination in plants that brought revolution in the field of Plant Breeding. In 1920, the involvement of applied genetics

in evolution of new varieties of plants and animals brought about drastic developments in the field of agriculture.

Agricultural Engineering was mainly concerned with improving farm machinery and implements originally improvised by farmers. Mechanization assumed controls in Western Europe in 1785 and a contributed a larger share in agriculture in 1803. A well fabricated seed drill was developed in 1880s. The mechanized agriculture was started with tractors, cultivators, drills and harvesters which over a period of few years enabled the agriculture to enter into new era of advancement and large scale agriculture. The inventions of modern machinery and techniques related to food post-harvest processing, preservation and storage have created the greater ease in food processing and preservation thus modernized the agriculture on industrial basis. Through modern agricultural breeding techniques, scientists have evolved high yielding varieties of animals, plants and poultry thus enhanced productivity and efficiency of agricultural production. Everywhere in the world, agricultural teaching and research organizations are endeavoring to enhance yields by creating new knowledge and technology in agriculture and spreading latest knowledge of improved agricultural technology and by extension and outreach activities.

1.4 History of Agriculture:

Agriculture concerning domestication of plants and animals turned into evolved round 12,000 years in the past, although despite the fact that earlier people started out altering groups of vegetation and animals with aim to get personal advantage including fire-stick farming. It has been said that native Australians made use of fire to burn the natural flora to facilitate hunting and to alter the vegetation and animal's composition within the area they inhabit.

Agriculture has experienced enormous evolutions since days of oldest farming. The fertile crescent of Western Asia, India and Egypt has been region of the earlier deliberate crop domestication and production. In addition, independent advancement in agriculture happened in China, New Guinea, Africa's Sahel (transition zone between Sahara Desert and Sudanian Savana), several parts of Americas and regions of India.

Agricultural practices such as fertilizer application, crop rotation, irrigation were advanced just after the Neolithic revolution (era of agriculture revolution including such a huge level shift from the existing life style of hunting and gathering to organized agriculture) around 8000 B.C. but at rapid pace during the previous 200 years. One of the examples is the Haber-Bosch method of preparing NH_4NO_3 constituted a chief lap forward to boost-up many folds. The journey of agriculture development from primitive to today agriculture was travelled in following 7 phases as elaborated below: