Food & Culture Encyclopedia:

Agronomy

Agronomy embraces the branch of agriculture that deals with the development and practical management of plants and soils to produce food, feed, and fiber crops in a manner that preserves or improves the environment. The term "agronomy" represents the disciplines of soils, crops, and related sciences. In the soils area, specialties includesoil microbiology, soil conservation, soil physics, soil fertility and plant nutrition, chemistrybiochemistry, and mineralogy. Specialties in the crops area relate primarily to plant genetics and breeding, crop physiology and management, crop ecology, turf-grass management, and seed production and physiology. Researchers in agronomy often work in close cooperation with scientists from disciplines such asentomology, pathology, chemistry, and engineering in order to improve productivity and reduce environmental problems. Even though less than 2 percent of the U.S. population are farmers who actively produce farm crops, the need for agronomists by other segments of society is increasing.

In the United States, field crops consist of those plants grown on an extensive scale, which differs from horticultural crops, which are usually grown intensively in orchards, gardens, and nurseries, but the distinctions are disappearing. Some of the major agronomic crops grown in the United States are alfalfa and pasture crops, peanuts, corn, soybeans, wheat, cotton, sorghum, oats, barley, and rice. Soil management aspects of agronomy encompass soil fertility, land use, environmental preservation, and non-production uses of soil resources for building, waste disposal, and recreation. Agronomists who work as soil scientists play extremely important roles in helping preserve water quality and preserve natural environments.

Agronomy is not a new field. As early as 7000B.C.E. wheat and barley were grown at Jarmo, in present-day Iran. One could argue that the first farmers were in fact agronomists. In prehistoric times, humans shifted from foraging to cultivating specific crops, probably wheat or barley, for their food value. At harvest time, plants with easily gathered grain were selected first. This natural selection eventually made these food plants better adapted to continued cultivation because they were more easily harvested. Throughout the centuries, selection also occurred for other crop characteristics, such as taste, yield, and adaptation to specific soils and climates. The goal of today's production agronomists is essentially the same: to improve the quality, adaptability, and yield of our most important crops.

The Science of Agronomy

There are both basic and applied aspects of agronomy. Agronomists examine very basic components of soils and crops at subcellular or molecular levels. For example, at the basic level, agronomists use sophisticated techniques to unravel the genetic makeup of major crops in order to change their adaptation, nutritive value, or to breed medicinal benefits into agronomic crops. Genetic improvement is an area where major breakthroughs are likely to occur. Agronomists have developed highly specialized computer models of crop growth in order to better understand how environmental and management components affect the way crops grow. These models help in the development of such things as precision fertilizer application techniques, which provide the crop with the correct amount of nutrients at the correct time in its life cycle. This technique helps reduce fertilizer overapplication, which is costly to the farmer, and may increasegroundwater pollution. Models of how chemicals move in the soil also help assure proper application of animal manures, municipal waste, and soil amendments necessary for crop growth. Molecular components of soil constituents are studied to determine basic interactions affecting plant growth and nutrition, and soil and water quality.

Crop Production and Soil Management

Crop production consists of integrating all aspects of the field environment to assure an

economically feasible and environmentally sound system of growing crops. At the applied level, agronomists use basic research information to help manage crop production systems and soil and water conservation programs. Agronomists provide a wealth of information to farmers to assure the soundness of their production programs.

Environmental and economic conditions vary dramatically, and crops must be adapted to the soils and climate for efficient crop production. Crops such as wheat grow best in the Great Plains of the United States, because wheat is well suited to the soils, rainfall, and length of growing season of the area. Likewise, crops such as cotton and peanuts are best adapted to the southern United States because these crops require warmer temperatures, a longer growing season, and more rainfall than does wheat.

Applications of sound principles of soil management are key to maintaining a healthy environment. Agronomists aid in identifying environmental risks and devise methods of reducing these risks. Management techniques developed by agronomists include terracing, strip cropping, and reduced tillage methods to reduce soil erosion. Developments in Global Information Systems (GIS) and site-specific technology are being used by agronomists to more precisely manage how, when, and where to apply soil amendments and fertilizers. GIS is also extremely useful in identifying type and extent of pest infestations. This helps reduce environmental pollution by pinpointing when and where to apply pest control and reducing the amount of pesticides used in crop production.

International Agronomy

Agronomy is an international discipline. Many of the problems, issues, and challenges faced by societies around the world are universal in nature, and require international cooperation. For example, a major problem facing the developed world is that of how best to use our land resources. Within the developing world, the same problems exist. The questions of how much and which land should be saved for food and fiber production and which land should be used for nonagricultural uses must be addressed by both developing and developed societies. Agronomists play a crucial role in assessing land quality to assure an environmentally friendly use of land. Studying how plants adapt to differing climates and environments has allowed plant scientists to increase food and fiber production in regions of the world where the necessities of life are most limited. Knowledge gained and disseminated by agronomists in the developed world has helped improve the human condition in the developing world. For example, plant geneticists and breeders use similar hybrid and variety development techniques in both developed and developing countries. Through plant breeding, for example, agronomists have developed high-yielding rice that is adapted to tropical climates. Breakthroughs in gene transfer permit plant breeders to improve grain quality and nutritional traits. These techniques have also contributed to increased production efficiency by genetically incorporating into food crops increased pest resistance and by broadening their range of adaptation.