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Advances Agriculture Geography

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Introduction

Agriculture is the art and science of cultivating the soil, growing crops and raising livestock. It includes the preparation of plant and animal products for people to use and their distribution to markets. Agriculture provides most of the world's food and fabrics. Cotton, wool, and leather are all agricultural products. Agriculture also provides wood for construction and paper products. These products, as well as the agricultural methods used, may vary from one part of the world to another.

Aims and Objectives

1. To focus the advances in Agriculture Geography
2. To understand the new trends in Agriculture Geography

Methodology

Present research article is informative the information required to fulfill the objective collected through various secondary sources of information

Start of Agriculture

The growth of agriculture contributed to the rise of civilizations. Before agriculture became widespread, people spent most of their lives searching for food—hunting wild animals and gathering wild plants. About 11,500 years ago, people gradually learned how to grow cereal and root crops, and settled down to a life based on farming. By 2,000 years ago, much of the Earth's population had become dependent on agriculture. Scholars are not sure why this shift to farming took place, but it may have occurred because of climate change. When people began growing crops, they also began herding and breeding wild animals. Adapting wild plants and animals for people to use is called domestication.

The first domesticated plant was probably rice or corn. Chinese farmers were cultivating rice as early as 7500 BCE. The first domesticated animals were dogs, which were used for hunting. Sheep and goats were probably domesticated next. People also domesticated cattle and pigs. Most of these animals had once been hunted for hides and meat. Now many of them are also sources of milk, cheese, and butter. Eventually, people used domesticated animals such as oxen for plowing, pulling, and transportation. Agriculture enabled people to produce surplus food. They could use this extra food when crops failed or trade it for other goods.

Food surpluses allowed people to work at other tasks unrelated to farming. Agriculture kept formerly nomadic people near their fields and led to the development of permanent villages. These became linked through trade. New economies were so successful in some areas that cities grew and civilizations developed. The earliest civilizations based on intensive agriculture arose near the Tigris and Euphrates Rivers in Mesopotamia and along the Nile River in Egypt.

Improved Technology

For thousands of years, agricultural development was very slow. One of the earliest agricultural tools was fire. Native Americans used fire to control the growth of berry-producing plants, which they knew grew quickly after a wildfire. Farmers cultivated small plots of land by hand, using axes to clear away trees and digging sticks to break up and till the soil. Over time, improved farming tools of bone, stone, bronze, and iron were developed. New methods of storage evolved. People began stockpiling foods in jars and clay-lined pits for use in times of scarcity. They also began making clay pots and other vessels for carrying and cooking food. Around 5500 BCE, farmers in Mesopotamia developed simple irrigation systems. By channeling water from streams onto their fields, farmers were able to settle in areas once thought to be unsuited to agriculture.

In Mesopotamia, and later in Egypt and China, people organized themselves and worked together to build and maintain better irrigation systems. Early farmers also developed improved varieties of plants. For example, around 6000 BCE, a new variety of wheat arose in South Asia and Egypt. It was stronger than previous cereal grains; its hulls were easier to remove and it could be made into bread. As the Romans expanded their empire; they adapted the best agricultural methods of the people they conquered. They wrote manuals about the farming techniques they observed in Africa and Asia, and adapted them to land in Europe. The Chinese also adapted farming tools and methods from nearby empires.

A variety of rice from Vietnam ripened quickly and allowed farmers to harvest several crops during a single growing season. This rice quickly became popular throughout China. Many medieval European farmers used an open-field system of planting. One field would be planted in spring, another in autumn, and one would be left unplanted, or fallow. This system preserved nutrients in the soil, increasing crop production. The leaders of the Islamic Golden Age in North Africa and the Middle East made agriculture into a science. Islamic Golden Age farmers learned crop rotation. In the 15th and 16th centuries, explorers introduced new varieties of plants and agricultural products into Europe. From Asia, they carried home coffee, tea, and indigo, a plant used to make blue dye. From the Americas, they took plants such as potatoes, tomatoes, corn (maize), beans, peanuts, and tobacco. Some of these became staples and expanded people's diets.

Machinery

The important agricultural development began in the early 1700s for Great Britain and the Low Countries like Belgium, Luxembourg, and the Netherlands, which lie below sea level. New agricultural inventions dramatically increased food production in Europe and European colonies, particularly the United States and Canada. One of the most important of these developments was an improved horse-drawn seed drill invented by Jethro Tull in England. Until that time, farmers sowed seeds by hand. Tull's drill made rows of holes for the seeds.

By the end of the 18th century, seed drilling was widely practiced in Europe. Many machines were developed in the United States. The cotton gin, invented by Eli Whitney in 1794, reduced the time needed to separate cotton fiber from seed. In the 1830s, Cyrus McCormick's mechanical reaper helped modernize the grain-cutting process. At about the same time, John and Hiram Pitts introduced a horse-powered thresher that shortened the process of separating grain and seed from chaff and straw. John Deere's steel plow, introduced in 1837, made it possible to work the tough prairie soil with much less horsepower. Along with new machines, there were several important advances in farming methods. By selectively breeding animals (breeding those with desirable traits), farmers increased the size and productivity of their livestock.

Cultures have been breeding animals for centuries—evidence suggests Mongolian nomads were selectively breeding horses in the Bronze Age. Europeans began to practice selective breeding on a large

scale beginning in the 18th century. An early example of this is the Leicester sheep, an animal selectively bred in England for its quality meat and long, coarse wool

In 1866, Gregory Mendel's studies in heredity were published in Austria. In experiments with pea plants, Mendel learned how traits were passed from one generation to the next. His work paved the way for improving crops through genetics. New crop rotation methods also evolved during this time. Many of these were adopted over the next century or so throughout Europe. For example, the Norfolk four-field system, developed in England, proved quite successful. It involved the yearly rotation of several crops, including wheat, turnips, barley, clover, and ryegrass. This added nutrients to the soil, enabling farmers to grow enough to sell some of their harvest without having to leave any land unplanted.

Most of the world was not affected by these developments, however. Farmers in Asia, Australia, Africa, and South America continued to use old ways of agriculture.

Scientific Approach

An average farmer in the U.S. produced enough food to feed a family of five. Many of today's farmers can feed that family and a hundred other people. How did this great leap in productivity come about? It happened largely because of scientific advances and the development of new sources of power. By the late 1950s, most farmers in developed countries were using both gasoline and electricity to power machinery. Tractors had replaced draft animals and steam-powered machinery. Farmers were using machines in almost every stage of cultivation and livestock management. Electricity first became a power source on farms in Japan and Germany in the early 1900s. By 1960, most farms in the U.S. and other developed countries were electrified. Electricity lit farm buildings and powered such machinery as water pumps, milking machines, and feeding equipment.

Today, electricity controls entire environments in livestock barns and poultry houses. Traditionally, farmers have used a variety of methods to protect their crops from pests and diseases. They have put herb-based poisons on crops, handpicked insects off plants, bred strong varieties of crops, and rotated crops to control insects. Now, almost all farmers, especially in developed countries, rely on chemicals to control pests. The definition of "pest" ranges from insects to animals such as rabbits and mice, as well as weeds and disease-causing organisms—bacteria, viruses, and fungi. With the use of chemicals, crop losses and prices have declined dramatically.In the early 1800s, scientists discovered which elements were most essential to plant growth: nitrogen, phosphorus, and potassium. Later, fertilizer containing these elements was manufactured in the U.S. and in Europe. Now, many farmers use chemical fertilizers with nitrates and phosphates because they greatly increase crop yields. However, pesticides and fertilizers have come with another set of problems.

The heavy reliance on chemicals has disturbed the environment, often destroying helpful species of animals along with harmful ones. Chemical use may also pose a health hazard to people, especially through contaminated water supplies. Agricultural scientists are looking for safer chemicals to use as fertilizers and pesticides.

Water

Agriculture includes such forms of cultivation as hydroponics and aquaculture. Both involve farming in water. Hydroponics is the science of growing plants in nutrient solutions. Just one acre of nutrient solution can yield more than 50 times the amount of lettuce grown on the same amount of soil. Aquaculture—primarily the cultivation of fish and shellfish—was practiced in China, India, and Egypt thousands of years ago. It is now used in lakes, ponds, the ocean, and other bodies of water throughout the world. Some forms of aquaculture, such as shrimp farming, have become important industries in many Asian and Latin American countries. Climate change and improved technology are altering the way freshwater and ocean fisheries operate.

Global warming has pushed warm-water species toward the poles and reduced the habitats of cold-water species. Traditional fishing communities in both developed and developing countries find the number of fish dwindling. Bottom trawling has affected ocean ecosystems. In bottom trawling, enormous nets are strung from fishing boats and dragged at the bottom of the ocean. The nets catch halibut and squid, but also stir up sediment at the bottom of the ocean. This disturbs the marine life that forms the basis of the food chain.

Genetic Modification

People have bred new types of plants and animals by random experimentation. During the 1950s and 1960s, scientists developed new strains of high-yield wheat and rice. They introduced them into Mexico and parts of Asia. As a result, production of grain soared in these areas. This bold experiment in agriculture has been called the "Green Revolution."With the successes of the Green Revolution came problems. To produce high yields, the new strains required chemical fertilizers, pesticides and irrigation.

In many developing countries, independent farmers cannot afford the new technology and big business has taken over agriculture. The new, high-production crops also put stress on native plants and animals. Later, scientists and farmers understood why the new strains developed. This gave rise to a new green revolution: genetic modification of food. Inside every cell are genes, material that determines many of the characteristics of an organism. Genetics is the study of what characteristics organisms inherit and how these traits are transmitted. With a greater knowledge of genetics, people can scientifically select characteristics they want to reproduce. New technology has revolutionized the selective breeding process in both plants and animals. Beginning in the 1970s, scientists found that they could rearrange genes and add new ones to promote disease resistance, productivity, and other desired characteristics in crops and livestock.These genetically modified organisms are now common throughout the developed world. Biotechnology allows scientists to alter the DNA of microbes, plants, and animals. GMOs that have genetic material, or DNA, from other species are called transgenic organisms. A gene from an Arctic plant, for example, could be added into the DNA of a strawberry plant to increase the strawberry's resistance to cold and thus extend its growing season.

The strawberry would be a transgenic plant. Businesses sell farmers genetically modified seeds that resist certain pesticides and herbicides produced by the company. With these seeds, farmers can use toxic chemicals without harming the crop. Biotechnology has brought advances in animal husbandry Cattle, for example, are grazing animals. Their digestive system has evolved to process grasses and other crops. Corn and other grains cause a cow's digestive system to become acidic. That makes it easier for dangerous bacteria to develop. Bacterial infections can be harmful to the cow, and can also infect their milk and meat consumed by people. Antibiotics are spliced into the DNA of feed corn to prevent such infection. Antibiotics have been used since the 1950s to stimulate cattle growth. Over time, this practice has led to the development of antibiotic-resistant bacteria in cattle and people. Many cattle are also given anabolic steroids, or growth hormones, to make them get bigger, faster. The controversies surrounding GM foods are enormous.

Farmers who grow GM foods increase production with less labor and less land. Many consumers favor GM foods. Vegetables and fruits last longer and are less likely to bruise. Meats are fattier—more tender and salty. Critics argue that GM foods have less nutritional value and decrease biodiversity. The organic and "free-range" food industries have grown in opposition to "factory farming." Most of the world's farmers live in developing countries in Africa, Asia, and Latin America. Many of them cultivate land as their ancestors did hundreds or even thousands of years ago. They do not use agricultural technology involving expensive chemicals or production methods. These people are subsistence farmers. They use the bulk of the food they produce for themselves and their families, unlike commercial farmers,

Methods of Cultivation

Agricultural methods often vary widely around the world, depending on climate, terrain, traditions, and available technology. Low-technology farming involves permanent crops: food grown on land that is not replanted after each harvest. Citrus trees and coffee plants are examples of permanent crops. Higher-technology farming involves crop rotation, which requires knowledge of farmable land. Scholars and engineers not only use crop rotation and irrigation, but plant crops according to the season, type of soil, and amount of water needed. In coastal West Africa, farmers, usually women, plant corn soon after the first rains of the growing season. They often use an ancient method of clearing called slash-and-burn. First, the farmer cuts all the brush in her plot. When this vegetation dries, she sets fire to it. The heat from the fire makes the soil easy to turn, and the burned vegetation fertilizes it.

The farmer then sows kernels of corn saved from the previous year's harvest. Between rows of corn; the African farmer plants other staple crops: legumes, such as peas, or root vegetables, such as yams. This practice of growing several crops in the same plot is called intercropping. By covering most of the ground with vegetation, intercropping prevents moisture loss and soil erosion from seasonal rains. Rain supplies water for the growing plants. The farmer weeds her plot with a hoe. At harvest time, she and her family pick the corn, husk it, and spread the ears in the sun to dry. They grind the dried corn to make porridge. Traditionally, the African farmer uses the same plot for several years, until its fertility declines. Then she moves to another plot, leaving the first to lie fallow for up to 10 years. Now, an increasing population has caused fallow periods to be reduced and has made permanent cultivation more common.

Agricultural methods used in the Corn Belt of the U.S. are very different. The Corn Belt is the area of the northern Midwest where most of the nation's corn crop is grown. First of all, farmers rarely work alone—the size of American farms requires a lot of labor. Soon after they harvest the corn in autumn, farmers work leftover vegetation, or stubble, into the soil. In the spring, farmers work the soil again, using an implement with rows of sharp-edged steel discs, called a disc harrow. The discs cut into the soil, breaking it into smaller pieces and supplying it with air. Next, a tractor-pulled planter sows rows of seed. The machine makes furrows in the soil, drops in kernels of high-yield, genetically modified corn, and covers them with dirt. After the corn seeds have sprouted, another machine injects liquid fertilizer into the ground. The farmers then use chemicals to control weeds and pests, and loosen the soil with a tractor-pulled cultivator during the harvesting season. U.S. Industrial farmers may plant a thousand acres of just corn. The practice of specializing in a single crop is known as monoculture. To harvest the crop, farmers use a mechanical harvester that picks the ears of corn and shells them into a bin.

Livestock

From alpacas in Peru to zebus in India, billons of domesticated animals around the world are raised and cared for in a variety of ways. In many countries, domesticated animals are an important source of food. In Nigeria, for example, the Fulani people have long been nomads. They move with their cattle herds from one grazing area to another. The cattle feed on scrub and grasses in land unsuitable for farming. The Fulani rely on cattle for milk, but rarely slaughter their animals for meat. Throughout the U.S., beef cattle are bred to grow quickly and yield large quantities of fatty meat. When they are five to 12 months old, the animals are shipped to feedlots. There, they are kept in pens and fed grain and vitamin supplements until they reach market size. Then they are slaughtered.

The two ways of raising livestock are confronting each other in the developing world. In Uganda, Ankole cattle have been bred to withstand the harsh climate of Central Africa—their long, curved horns help distribute heat and their digestive systems have adapted to poor nutrition and little water. However, the market for milk has driven many Ugandan farmers to import Holstein cattle. Holsteins are native to Northern Europe. Keeping them healthy in an equatorial region requires a high amount of antibiotics,

vaccines, and other chemicals. The Ankole, which produce little milk and leaner meat, may be extinct within the century.

Many farmers throughout the world practice free-range poultry farming. The birds forage for food in farms or community yards, eating whatever they find: seeds, insects, household scraps, and surplus grain. In many developed countries, poultry production has become a major agricultural industry. Birds are given the same sort of vaccines and hormones used for cattle. Chickens are bred for either eggs or meat. One poultry house may contain more than a million birds. Often, machines automatically provide feed and water, collect the eggs, and remove waste.

Fight against Hunger

Food production must keep pace with population growth and distribution methods. This is an enormous agricultural and political challenge. The challenge is not food shortages but unequal distribution of the world's food supply. The ratio of population to farmable land has favored some countries more than others. Some experts believe government policies in developed and developing countries have hindered equal food distribution. Droughts, floods, and other disasters continue to cause local food shortages. Overpopulation also contributes to unequal distribution of food resources. Much of the population increase over the next 100 years will occur in developing countries, where hunger is already a serious problem. Exporting food or agricultural technology from countries with surpluses to those with shortages will not solve the problem of world hunger. Poor countries do not have the money to buy all the food they need and do not want to permanently rely on other countries.

Many developing countries also regard biodiversity as an important resource and do not want to threaten it with GMOs. Experts believe that the hunger problem will be solved in two ways. First, citizens of all countries need to have the ability to grow or purchase their own food. Second, citizens of all countries need to have responsible diets and spending habits. What about addressing the problem of overpopulation? Agricultural science will help countries adjust to healthier methods of food production. Scientists are developing new high-yield varieties of crops that require fewer fertilizers or pesticides. Such crops reduce the need for using costly chemicals and trade. The challenges of feeding the hungry cannot be met unless the world's land and water are safeguarded. Agricultural practices in developed and developing countries have led to a severe loss of valuable topsoil, water, and other resources.

Many countries need better programs for replanting forests. Overpopulation has pushed a growing number of farmers onto lands too fragile to sustain cultivation. Demand for food has led to increased irrigation worldwide. In some areas, irrigation has caused water tables to drop, rivers to run dry, and wells to go empty. Agricultural chemicals that increase productions often contaminate soil and groundwater and disrupt food chains. Agriculture does not have to harm the environment. By protecting the land, water, and air, and by sharing knowledge and resources, people may yet find solutions for the problem of world hunger.

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