Lesson 2: Crop Uses (Products and By-Products)

Agricultural crops are commonly used as food for human or animal consumption. Technology and research have also extended crop usage beyond food. This lesson will address the uses of crops as sources of food and industrial products.

Major Uses of Crops

There are over 300,000 species of plants that have been identified. The majority of these plants are not used as food sources. The term "crop" encompasses any plant grown for a specific reason.

Many crops grown in the U.S. or throughout the world are produced for human or animal consumption. Some crops can be grown to feed both humans and animals. Often these crops are fed to livestock such as beef cattle, chickens, sheep, and hogs, which may then be processed for human consumption. Other uses of crops involve the production of various oils for cooking and industrial uses. Another major use of crops is in the production of pharmaceuticals (i.e., medicines).

Other major uses of plants are the production of fibers, sugars, alternative fuels, shelter products, ornamental plants, and stimulants.

Major Crops

Crops can be categorized according to their use. The major categories are: human and animal consumption, oils, pharmaceuticals, fibers, sugars, alternative fuels, shelter, ornamentals, and stimulants.

Crops grown for human and animal consumption: These crops include cereal and grain crops, legumes for seed, fruits, vegetables, nuts, and forages. Cereal grain crops are grasses that are grown for their edible seeds. The U.S. produces seven major grain crops, which are used in the U.S. and/or exported to many other countries. Major grain crops are corn, wheat, barley, oats, rye, rice, sorghum, and soybeans. Less than 10 percent of the corn grown in the U.S. is for human consumption.

Legume plants such as dry beans and peas are important foods in the diet of many Americans and people around the world. They are highly nutritious and relatively inexpensive. Food products made from field beans, field peas, peanuts, cowpeas, and soybeans are found in most grocery stores. Fruits such as apples, peaches, berries, and cherries are grown for human consumption. Vegetables like tomatoes, cucumbers, squash, and potatoes are also grown for human consumption. Pecans, walnuts, etc., are nuts commonly grown for human consumption.

Forage crops are used for animal feeds. Examples of forage crops include tall fescue, clovers, and orchard grass.

Production of various oils: These crops are grown primarily for the oil extracted from the seeds. They are used to produce oils for human consumption and industrial products. People throughout the U.S. are becoming more health conscious and are changing their diets. The use of vegetable oils has grown and is replacing the use of animal fats in cooking. Crops such as soybeans, peanuts, castor beans, corn, and canola produce quality oils for human consumption. Crops such as soybeans, flax, and cotton also produce oils that can be used in industrial products such as paints and stains.

Production of pharmaceuticals: Plants have been used for years to produce medicines. For example, Foxglove is a source for digitalis, which is used today almost exclusively as a heart stimulant and pulse regulator. Plants are grown to produce medicines that can help in controlling malaria and hypertension.

Production of fibers: Cotton, flax, and hemp are examples of fiber crops. They are used to produce materials like textiles or rope. The fibrous plant material in flax is used to produce linen. Flax fiber is also used in the production of paper pulp, binder twine, insulating wallboards, and numerous upholstery products. Besides the fiber portion of the flax plant, the seeds are used to produce linseed oil. Hemp has been used for making rope, twine, sails, tarpaulins, and numerous other products. Cotton is used in manufacturing cloth and thread in addition to the oil that is extracted from the seed.

Production of sugars: Sugar crops are sugar cane and sugar beets. Sugar cane is a member of the grass family. It is valued

for the juices contained in the stem. At maturity, the plant's stems contain sucrose or crystallized sugar. Sugar beets supply over 40 percent of the world's sugar. Sugar beet tops are also processed and used for livestock feed. The sugar beet (fleshy taproot) is processed for its high sucrose content.

Production of alternative fuels: Crops that contain starch or sugars can be processed to produce an alcohol product known as ethyl alcohol or ethanol. Alternative fuel from fibrous or woody plants is known as methyl alcohol or methanol. Grains, tubers, and whole plants that contain fibrous materials can be used to produce this fuel. Once these alcohols are produced, they must be distilled before being blended with gasoline to make gasohol. Common crops used to produce alcohol are grain sorghum, wheat, potatoes, sugar beets, sweet sorghum, sugar cane, and corn. Alcohol can also be produced from legume and grass crops.

Production of materials for shelter: Plants used for shelter are predominately trees. Trees grown for lumber products such as dimensional lumber (e.g., 2 x 4s and 2 x 12s), plywoods, and trims can be grown on tree farms. Pines, furs, and hardwoods such as oaks, walnut, cherry, and hickories are used for buildings and furniture.

Production of ornamental plants: Ornamental plants include all plants grown for their beauty. Ornamental plants may be used indoors or outdoors depending on the type of plant. Boston ferns, African violets, impatiens, azaleas, goldenrain trees, flowering crabapple trees, petunias, and lilac are a few examples of ornamental plants.

Production of stimulant crops: Stimulant crops include tea, tobacco, and coffee. Tobacco is primarily grown in the south-eastern U.S. Coffees and teas are grown in South America, India, China, Africa, Japan, and Indonesia.

Products from Corn

Corn is the most widely grown crop in the U.S. Corn can be eaten as corn on the cob (sweet corn), popcorn, cornmeal, or flour. Field corn can be processed to be fed to livestock. Corn can be used to produce vegetable oils, breakfast cereals, refined corn sugar, and starch. Corn can also be processed to make adhesives, dyes, plastics, and alcohol, which is used to make gasohol.

Products from Soybeans

The soybean is another very important agricultural crop. Soybeans can be used as a grain crop or an oilseed crop. Soybeans can be processed into cooking oils, soy flours, shortening, margarines, and soy sauces. Soybean meal is a by-product after the soy-oil has been extracted from the seed. It is used as a protein source in livestock feed.

Soybean oil can be used to make industrial products: printer inks, paints, varnishes, caulking compounds, and linoleum floor coverings. Soybeans and soybean by-products have become very important to the U.S. and many parts of the world. In many parts of the world, soybeans and soybean by-products are used as a protein source in human diets. Tofu (soybean curd) is a soybean product that is gaining in popularity as a food. Many additional products have been developed from soybeans. Many new uses will be discovered in the future.

Determining Plant Use

Humans have been growing plants to eat and to feed livestock for centuries. Human survival is dependent on plants. Although there are over 300,000 types of plants, farmers have cultivated certain plants to mass produce because of the characteristics that these plants possess. Early agricultural producers selected plants by trial and error. The selection criteria related to the plant's usefulness as a human or animal food.

Through the use of modern technology and research, scientists are able to determine the nutritional requirements of humans and animals. They can also identify plants that can best supply these nutritional needs. The nutritive value (protein content, carbohydrate content, oil content, etc.) of plant leaves, stems, roots, or seeds and the plant's palatability (pleasing taste) are important factors in determining plant use.

Plants are used for more than human food or animal feed. The use of plant parts (stems, leaves, roots, and seeds) for specific products other than food is another characteristic

that determines plant use. New uses for crop plants have been discovered to meet the needs of a changing world. For example, researchers have found that the seed of the jojoba plant contains about 50 percent oil which, after processing, yields a liquid wax. Jojoba wax can serve as a substitute for furniture polishes or extenders for other waxes.

Many plants have been produced for many years. One such plant is the rubber tree, which provides latex that is processed into rubber for tires and other industrial materials. New crops such as canola are growing in popularity. Canola produces a high quality vegetable oil that provides an alternative source of food and industrial products. Agricultural scientists continue to conduct research on plants to identify new and alternative products.

Summary

Plant crops have many uses. Human food, animal feed, oils, pharmaceuticals, sugars, beverages, and fibers are produced through the cultivation of plants with specific characteristics. Because of growing world needs, scientists continue to develop new plant products through the use of research and technology.

Credits

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