МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ

ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ БЮДЖЕТНОЕ
ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ ВЫСШЕГО ОБРАЗОВАНИЯ

«СЕВЕРО-КАВКАЗСКАЯ ГОСУДАРСТВЕННАЯ АКАДЕМИЯ»

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АНГЛИЙСКИЙ ЯЗЫК

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ПРЕДИСЛОВИЕ

Целью данного учебно-методического пособия является развитие лексических навыков обучающихся аграрных вузов по наиболее популярным темам и совершенствование коммуникативных компетенций в рамках профессиональной деятельности. Особое место отводится формированию и тренировке правильного произношения в аспекте чтения и говорения в обучении устной англоязычной речи. Данное учебно-методическое пособие предназначено для студентов бакалавриата I курса очной и заочной форм обучения направлений подготовки Агроинженерия, направленность (профиль) «Технический сервис в агропромышленном комплексе», а также для всех желающих изучать английский язык самостоятельно.

Unit 1.

AGRICULTURAL MECHANIZATION

The term “mechanization” is used to describe tools, implements and machinery applied to improving the productivity of farm labor and of land; it may use either human, animal or motorized power, or a combination of these. In practice, therefore,it involves the provision and use of all forms of power sources and mechanical assistance to agriculture, from simple hand tools, to draught animal power and to mechanical power technologies.

Agricultural mechanization has been pioneered in North America and Europe and more recently in Japan, and is now spreading rapidly throughout the world. The importance of enhancing and upgrading such mechanization practices prior to the almost inevitable transition to engine-driven equipment is now well recognized.

Mechanization is a key input in any farming system. It aims to achieve the following:

- increased productivity per unit area due to improved farm operations;
- expansion of the area under cultivation where land is available;
- accomplishment of tasks that are difficult to perform without mechanical aids;
- improvement of the quality of work and products;
- reduction of drudgery in farming activities, thereby making farm work more attractive.

Mechanization systems are categorized into human, animal and mechanical technologies. Based on the source of power, the technological levels of mechanization have been broadly classified as hand-tool technology (the use of spades, pruners, shovels, rakes, hoes and post-hole diggers, etc.), draught animal power technology (providing farmers with a possibility to use manure from draught animals and farm power necessary to apply renewable practices for land intensification) and mechanical power technology (the use of farming equipment such as tractors, balers, harvesters, and combines).

Hand-tool technology is usually used in farming on a small scale. Traditional farm hand tools and implements have been developed through experience over generations to meet emerging farming challenges. The type of soils and topographic conditions largely influence the type, size and shape of particular tillage tools. These tools are usually light; one can use them manually, without the help of machinery or animals. Commonly, they are used for cultivating small areas or backyard-garden farming, removing soil, loosening the soil around plants and watering plants, spraying insecticides. These tools help farmers cut tall weeds and grasses, dig and break stones, brake hard topsoil, clean the ground and level the topsoil, remove the trash, haul fertilizers, manures, planting materials, and other things.

Animal power can be a cost-effective source of energy for any small farm, particularly those farms that already keep animals for other purposes. Animal power offers some advantages. It doesn’t matter whether it is a small animal such

as a dog or a goat, medium animals such as ponies and horses, or large animals such as oxen and cows, animal power can be created and maintained within a diversified farm environment.

Draft animal power (DAP) has been identified as an environmentally friendly technology that is based on renewable energy and encompasses integration of livestock and crop production systems. Research work has linked the benefits of

using DAP to several aspects such as: carrying out farming operations timely, improving seedbed preparation, deeper plowing, labour saving, and reducing drudgery. Draft animal technology offers a viable potential to increase agricultural productivity using environmentally friendly and locally available resources. Draft animals provided a large part of the power requirements of agricultural production. But, as the need for large farm production arose, the development and invention of heavier and more effective agricultural tools and machines became unavoidable. Farmers work long hours planting, maintaining, and harvesting crops as well as raising the livestock. Working on the fields requires the use of larger ploughs, harrows, mechanical planters, cultivators and heavy farm machinery such as tractors, combines, balers and harvesters to get the job done efficiently.

Therefore, the main concept of mechanical power technology is to apply engineering principles for doing agricultural operations in a better way to increase crop yield. This includes the development, application and management of all mechanical aidsfor field operation, water control, material handling, storage and

processing.

Exercise 1. Make up an annotation of the text.

Unit 2.
A BRIEF HISTORY OF FARM MECHANIZATION

Part1.

After 9,000 BC a great change came over the world. Previously humans lived by hunting animals and gathering plants. Then about 8,500 BC people began to grow wheat, barley, peas and lentils instead of gathering them wild. By 7,000 BC they domesticated sheep, pigs and goats. By 6,000 BC they also domesticated cattle. Farming first began in the Fertile Crescent, which stretches from Israel north to southeast Turkey then curves southeast to the Persian Gulf. However, agriculture was also invented independently in other parts of the world as well. Meanwhile farming spread from the Middle East to Europe. By about 4,000 BC people in central Europe were using oxen to pull ploughs and wagons. About the same time people in the Middle East began using donkeys as beasts of burden. Also, about 4,000 BC horses were domesticated on the steppes of Eurasia.

Part 2.

Farm mechanization began by the moment when people started seeking tools and methods of work that were more efficient. The history of agriculture contains many examples of the use of primitive tools, such as the hoe and the plough.

Egyptians used a device called *shaduf* for irrigation. It was a "see-saw" with a leather container at one end, which was filled with water and a counterweight at the other.

In Israel farmers kept oxen and asses. Both were used for pulling ploughs. Oxen also threshed grain by walking on it. Under the Han Dynasty agriculture improved partly due to an increasing number of irrigation schemes, partly due to the increasing use of buffaloes to pull ploughs and partly due to crop rotation which was introduced into China about 100 BC.

In Roman France, a harvesting machine called a gallus was invented. It was a box on wheels with horizontal blades at the front. The box was pushed by an ox. As it moved forward through the wheat the blades cut the heads of the crop and they fell into the box.

Farming improved in the Middle Ages. One big improvement was the heavy plow. A new kind of plow was invented which plowed the soils of Europe much more efficiently. There were no fundamental changes to farming until the 18th century

Part 3.

During the 18th century farming was gradually transformed by an agricultural revolution. Until 1701 seed was sown by hand. In that year Jethro Tull invented a seed drill, which sowed seed in straight lines. He also invented a horse drawn hoe which hoed the land and destroyed weed between rows of crops. In the early and mid-19th century farming prospered. In the mid-19th century, it was helped by the rapid growth of towns(providing a huge market) and by railways. (The railways made it easier to transport produce).

Farming was also helped by new technology. Justus von Liebig and John Lawes introduced new fertilizers. Farmers also began using clay pipes to drain their fields. Meanwhile, Cyrus McCormick invented the reaping machine in 1834 and in 1837 John Deere invented the steel plow. The first combine was designed in 1836. In the middle of the 18th century farmers tried a moldboard plow which was designed to eliminate weeds by turning over a thick layer of the soil.

In 1856 John Fowler invented the steam plow. The year 1869 saw the appearance of a mechanical corn planter, 1875 – a selfbinding reaper. In the 1880s the reaper and threshing machine were combined into the combine harvester. These machines required large teams of horses or mules to pull.

Steam power was applied to threshing machines in the late 19th century. There were steam engines that moved around on wheels under their own power for supplying temporary power to stationary threshing machines. These were called road engines, and Henry Ford seeing one as a boy was inspired to build an automobile.

In 1897 a German engineer Rudolf Diesel invented a new engine known as a diesel which began a transport revolution in cars, lorries, trains and ships. The main advantage of diesels is that they can run on rather cheap fuel.

Part 4.

In the 20th century farms greatly increased production. Tractors gradually replaced horses.

With internal combustion came the first modern tractors in the early 1900s, becoming more popular after the Fordson tractor. At first reapers and combine harvesters were pulled by teams of horses or tractors, but in the 1930s self-powered combines were developed. Today a farmer has a wide range of tractors – gasoline and diesel, with engines varying from 20 h. p. to 400 h. p.

Milking machines were rare in the early 20th century but they became common from the 1940s to the 1960s. By the 1950s farmers of corn, wheat, soy, and other commodity crops had replaced most of their workers with harvesting machines and combines. From the 1950s combine harvesters became common.

Modern agriculture is known by its full-scale mechanization of jobs requiring more intricate agricultural machinery, such as harvesting of sugar beets, mowing of grasses, silaging, livestock care, etc. Many farmers use computers to aid in farm operations.

Exercise 2. Make up an annotation of the text.

UNIT 3.
FARM MACHINERY

Farm machinery, mechanical devices, including tractors and implements, are used in farming to save labor. Farm machines include a great variety of devices with a wide range of complexity: from simple hand-held implements used since prehistoric times to the complex harvesters of modern mechanized agriculture.

The operations of farming for which machines are used are diverse. For crop production, they include handling of residues from previous crops; primary and secondary tillage of the soil; fertilizer distribution and application; seeding, planting, and transplanting; cultivation; pest control; harvesting; transportation; storage; premarketing processing; drainage; irrigation and erosion control; and water conservation.

Livestock production, which not so long ago depended primarily on the pitchfork and scoop shovel, now uses many complicated and highly sophisticated machines for handling water, feed, bedding, and manure, as well as for the many special operations involved in producing milk and eggs.

The difference between farm tools and farm equipment is that most farm tools are smaller and handier, less weighty and less bulky. They don't require much technical know-how to handle as compared to farm equipment. Farm tools are cheaper and easier to maintain. Typical examples of farm tools are hoe, shovel, spade, etc. On the other hand, farm machinery is mainly bigger, more bulky and weightier than most farm tools. The operation of farm machinery requires much more technical know-how than farm tools. Agricultural equipment is more expensive and difficult to maintain.

There are as many farm machines as there are farm works to be done ranging from clearing to harvesting. Some farming machines are multipurpose machines meaning that they are meant to be used for doing more than one farm work.

Here are some of the most common types of farm machinery:

Agricultural equipment used as power: for example, a tractor. A Tractor is practically the basic need of every farm and farmer, and is known for performing several tasks. Tractors are available in various sizes, styles, capacities and so on to suit all the farms. Various trailers or other tools can be attached to tractors and can be customized for different purposes.

Agricultural equipment used for soil cultivation is as follows: cultivators, plows (ploughs), harrows, rollers, soil tillers, destoners, etc. Tillage is the manipulation of the soil into a desired condition by mechanical means. Soil is tilled to change its structure, to kill weeds, and to manage crop residues. Equipment used to break and loosen soil for a depth of six to 36 inches (15 to 90 centimeters) may be called **primary tillage** equipment. It includes moldboard, disk, rotary, chisel, and subsoil plows. **Secondary tillage** is aimed at improving the seedbed by soil pulverization, conserving moisture through destruction of weeds, and cutting up

crop residues. It is accomplished by use of various types of harrows, rollers, or pulverizes, and tools for mulching and fallowing.

Agricultural equipment used during planting includes planters, transplanters, broadcast seeder, air seeder, seed drill, precision drill, etc. Planting equipment is introduced to place seeds or plant parts in or on the soil for production of food and feed crops.

Agricultural equipment used for spreading fertilizers or spraying other agrochemicals is presented by sprayers, fertilizer spreader, manure spreaders, etc. These are mainly used for application of fertilizers and pest control.

Agricultural equipment used for irrigation: the examples are irrigators used for drip irrigation or center pivot irrigation as well as hydroponics, etc.

Agricultural equipment for sorting agricultural products according to color, size, taste, weight, density includes color sorters, density sorters, weight sorters, blemish sorters, shape sorters, etc.

Agricultural equipment used for harvesting: typical examples are the various types of harvesters such as combine harvesters, threshers, reapers, sugarcane harvesters, rice harvesters, cotton harvesters, forage harvester, beet harvesters, mowers, corn harvesters, etc.

Agricultural equipment used in making hays such as balers, mowers, hay tedders and hay rakes, etc.

Agricultural equipment used for loading agricultural products: such as backhoe loaders, front-end loaders, etc

Other farm equipment comprises carts, hedge cutters, livestock trailers, mulching machines, trimmers, etc.

In livestock production machinery and equipment can be used to help producers care for and manage their livestock. Milking machines, automated feeding and watering systems, incubators, egg candlers, tractors, computers, and many other types of equipment can be used by the producer to improve efficiency and quality of products.

As technology is advancing various types of machines for doing various types of farm work have been introduced. The farming industry has been improved greatly thanks to the use of heavy farm equipment in doing farm work. There are farming machines meant for family or subsistent agriculture and those meant for commercial farming. Along with the development of the farm machinery manufacturing industry a great number of heavy haulage companies have been established in the world.

Exercise 1.What machinery and equipment will you choose for the following farm operations?

1. Harvesting potatoes	a.tractor
2. Cutting grass	b. backhoe loader
3. Cutting up crop residues	c. irrigator
4. Reaping wheat or rye	d. combine harvester

5. Adding manure to the soil	e. baler
6. Placing seeds in the soil	f. broadcast seeder
7. Watering young plants	g. harrow
8. Compressing cut and raked crop	h. manure spreader
9. Loading agricultural products	i. potato harvester
10. Transporting beets from the field	j. mower

Exercise 2. Match these words and phrases to the definitions.

1. pitchfork	a. the agricultural preparation of soil
2. multipurpose	b. a sowing device that precisely positions seeds in the soil and then covers them
3.tillage	c. the production of crops and farm animals for sale, usually with the use of modern technology
4. seed drill	d. a tool like a large fork, used on farms for lifting and carrying hay
5. commercial farming	e. a modern farm machine for threshing grain, now a part of combine harvesters rather than a separate implement
6. thresher	f. a machine for cutting grass
7. mower	g. able to be used for several different purposes

Exercise 3. Describe the main types of agricultural equipment used for crop production according to the given plan.

PLAN

1. Definition
2. Aim of use
3. Different types

Example model: Harvesting equipment is equipment used to pick, reap, or otherwise gather crops. Harvesting equipment includes combines, pickers, balers, and mowers.

A combine is a machine used to harvest crops as it moves across a field.

A mower is a piece of equipment used to cut standing vegetation. Mowers are used to harvest forage crops, such as grass and alfalfa.

A baler is a piece of equipment used to harvest forage crops that have been cut, dried, and placed in rows.

What farm machinery is widely used in your country?

Exercise 4. Make up an annotation of the text.

UNIT 4
PRIMARY TILLAGE EQUIPMENT

Exercise 1. Read the text and translate the key sentences about all kinds of plows: moldboard, disk, rotary, chisel, and subsoil. Then fill in the following table:

Kinds of plows	Main features	Main functions
1. moldboard plows		
2. disk plows		
3. rotary plows		
4. chisel plows		
5. subsoil plows		

Equipment used to break and loosen soil for a depth of six to 36 inches (15 to 90 centimeters) may be called primary tillage equipment. It includes moldboard, disk, rotary, chisel, and subsoil plows.

The *moldboard* plow is adapted to the breaking of many soil types. It is well suited for turning under and covering crop residues. There are hundreds of different designs, each intended to function best in performing certain tasks in specified soils. The part that breaks the soil is called the bottom or base; it is composed of the share, the landside, and the moldboard.

When a bottom turns the soil, it cuts a trench, or furrow, throwing to one side a ribbon of soil that is called the furrow slice. When plowing is started in the middle of a strip of land, a furrow is plowed across the field; on the return trip, a furrow furrow. When two strips of land are finished, the last furrows cut leave a trench about twice the width of one bottom, called a dead furrow. When land is broken by continuous lapping of furrows, it is called flat broken. If land is broken in alternate back furrows and dead furrows, it is said to be bedded or listed.

Different soils require different-shaped moldboards in order to give the same degree of pulverization of the soil. Thus, moldboards are divided into several different classes, including stubble, general-purpose, general-purpose for clay and stiff-sod soil, slat, black land, and chilled general-purpose. The black land bottom is used, for example, in areas in which the soil does not scour easily; that is, where the soil does not leave the surface of the emerging plow clean and polished.

The share is the cutting edge of the moldboard plow. Its configuration is related to soil type, particularly in the down suction, or concavity, of its lower surface. Generally, three degrees of down suction are recognized: regular for light soil, deep for ordinary dry soil, and double-deep for clay and gravelly soils. In addition, the share has horizontal suction, which is the amount its point is bent out of line with the landside. Down suction causes the plow to penetrate to proper depth when pulled forward, while horizontal suction causes the plow to create the desired width of furrow.

Moldboard-plow bottom sizes refer to width between share wing and the landside. Tractor-plow sizes generally range from 10 to 18 inches (25 to 45 centimeters), although larger, special purpose types exist.

On modern mechanized farms, plow bottoms are connected to tractors either as trailing implements or integrally. One or more bottoms may be so attached. They are found paired right and left occasionally (two-way), with the advantage of throwing the furrow slice in a constant direction as the turns are made. A variation is the middle breaker, or lister, which is a bottom equipped with both right- and left-handed moldboards.

The *disk* plow employs round, concave disks of hardened steel, sharpened and sometimes serrated on the edge, with diameters ranging from 20 to 38 inches (50 to 95 centimetres). It reduces friction by making a rolling bottom in place of a sliding one. Its draft is about the same as that of the moldboard plow. The disk plow works to advantage in situations where the moldboard will not, as in sticky non-scouring soils; in fields with a plow sole; in dry, hard ground; in peat soils; and for deep plowing. The diskplow bottom is usually equipped with a scraper that aids in pulverizing the furrow slice. Disk plows are either trailed or mounted integrally on a tractor.

The *rotary* plow's essential feature is a set of knives or tines rotated on a shaft by a power source. The knives chop the soil up and throw it against a hood that covers the knife set. These machines can create good seedbeds, but their high cost and extra power requirement have limited general adoption, except for the small garden tractor.

The *chisel* plow is equipped with narrow, double-ended shovels, or chisel points, mounted on long shanks. These points rip through the soil and stir it but do not invert and pulverize as well as the moldboard and disk plows. The chisel plow is often used to loosen hard, dry soils prior to using regular plows; it is also useful for shattering plow sole.

Subsoil plows are similar in principle but are much larger, since they are used to penetrate soil to depths of 20 to 36 inches (50 to 90 centimetres). Tractors of 60 to 85 horsepower are required to pull a single subsoil point through a hard soil at a depth of 36 inches. These plows are sometimes equipped with a torpedo-shaped attachment for making subsurface drainage channels.

Exercise 2. Make up an annotation of the text.

UNIT 5
SECONDARY TILLAGE EQUIPMENT

Exercise 1. Read the text and find the English equivalents for the following Russian words and phrases. Translate the sentences with these words and phrases:

Предпосевная обработка почвы, борона, каток, зубовая борона, борона с пружинными зубьями, противоэрозионное земледелие, стерневая мульча, штанговый культиватор, паровой культиватор, растительные остатки, зарастание сорняками, почвенная влажность, всасывание влаги, влагонакопление.

Secondary tillage is aimed at improving the seedbed by increased soil pulverization, conserving moisture through destruction of weeds, and cutting up crop residues. It is accomplished by use of various types of harrows, rollers or pulverizers, and tools for mulching and fallowing. Used for stirring the soil at comparatively shallow depths, secondary-tillage equipment is generally employed after the deeper primary-tillage operations; some primary tillage tools, however, are usable for secondary tillage. There are five principal types of harrows: the disk, the spike-tooth, the spring-tooth, the rotary cross-harrow, and the soil surgeon. Rollers or pulverizers with V-shaped wheels make a firm and continuous seedbed while crushing clods. These tools often are combined with each other.

When moisture is scarce and control of wind and water erosion necessary, tillage is sometimes carried out in such a way that crop residues are left on the surface. This system is called trash farming, stubble mulch, or subsurface tillage. Principal equipment for subsurface tillage consists of sweeps and rod weeders. Sweeps are V-shaped knives drawn below the surface with cutting planes horizontal. A mounted set of sweeps provided with power lift and depth regulation is often called a field cultivator.

The typical rod weeder consists of a frame with several plowlike beams, each having a bearing at its point. Rods are extended through the bearings, which revolve slowly under power from a drive wheel. The revolving rod runs a few inches below the surface and pulls up vegetative growth; clearance of the growth from the rod is assisted by its rotation. Rod weeders are sometimes attached to chisel plows.

Some control of weeds is obtained by tillage that leaves the middles between crop rows loose and cloddy. When a good seedbed is prepared only in the row, the seeded crop can become established ahead of the weeds. Plowing with the moldboard plow buries the weed seeds, retards their sprouting, and tends to reduce the operations needed to control them. If weed infestations become bad, they can be reduced somewhat by undercutting.

Since rainfall amount and distribution seldom match crop needs, farmers usually prefer tillage methods that encourage soilmoisture storage at times when crops are not growing. From the soil-moisture standpoint, any tillage practice that does not control weeds and result in greater moisture intake and retention during the storage period is probably unnecessary or undesirable.

Exercise 2. Make up an annotation of the text.

UNIT 7
FERTILIZERS APPLICATION

Exercise 1. Read the text and find the information about:
– forms of fertilizers;
– fertilizing equipment;
– names of fertilizers and forms of application.

Fertilizers may be added to soil in solid, liquid, or gaseous forms, the choice depending on many factors. Generally, the farmer tries to obtain satisfactory yield at minimum cost in money and labour. Manure can be applied as a liquid or a solid. When accumulated as a liquid from livestock areas, it may be stored in tanks until needed and then pumped into a distributing machine or into a sprinkler irrigation system. The method reduces labour, but the noxious odours are objectionable. The solid-manure spreader conveys the material to the field, shreds it, and spreads it uniformly over the land. The process can be carried out during convenient times, including winter, but rarely when the crop is growing. Application of granulated or pelleted solid fertilizer has been aided by improved equipment design. Depending on design such devices can deposit fertilizer at the time of planting, side-dress a growing crop, or broadcast the material. Fertilizer attachments are available for most tractor-mounted planters and cultivators and for grain drills and some types of plows. They deposit fertilizer with the seed when planted, without damage to the seed, yet the nutrient is readily available during early growth. Placement of the fertilizer varies according to the types of crops; some crops require banding above the seed, while others are more successful when the fertilizer band is below the seed. The use of liquid and ammonia fertilizers is growing, particularly of anhydrous ammonia, which is handled as a liquid under pressure but changes to gas when released to atmospheric pressure. Anhydrous ammonia, however, is highly corrosive, inflammable, and rather dangerous if not handled properly; thus, application equipment is quite specialized. Typically, the applicator is a chisel-shaped blade with a pipe mounted on its rear side to conduct the ammonia five to six inches (13 to 15 centimetres) below the surface. Pipes are fed from a pressure tank mounted above. Mixed liquid fertilizers containing nitrogen, phosphorus, and potassium may be applied directly to the surface by field sprayers where close-growing crops are raised. Large areas can be covered rapidly by use of aircraft, which can distribute both liquid and dry fertilizer.

Exercise 2. Make up an annotation of the text.

UNIT 8
GRAIN DRILLS

Exercise 1. Read the text and find the information about:

– the earliest versions of grain drills;
– modern grain drills;
– the aim of application of grain drills and planters.

Grain drill is a machine for planting seed at a controlled depth and in specified amounts. The earliest known version, invented in Mesopotamia by 2000 BC, consisted of a wooden plow equipped with a seed hopper and a tube that conveyed the seed to the furrow. By the 17th century, metering systems were in use to ensure accuracy of the rate of planting; most consisted of wheels bearing small spoons that dipped into the seed hopper and guided it to the furrows in standard amounts.

Modern grain drills have a variety of metering systems and furrow openers. In general, the metering device, spoon, cup, fluted roll, or other, passes the seed by tube to one of several furrow openers, which are forced into the soil by springs or weights with a short length of chain dragged behind to cover the seed. Drill widths are determined by the number and spacing of furrow openers.

Grain drills and seed planters are key components in developing successful conservation plantings. They are complex machines that deliver seed at a metered rate, place it at a consistent depth in the soil, and produce light compaction to provide good seed to soil contact. Planters and drills come in many different forms with varying strength and weaknesses depending on the seed being used and condition of the planting site. Some require prepared seed beds, others require little to no seed bed preparation, and others are capable of preparing the seed bed and planting in a single pass.

Exercise 2. Make up an annotation of the text.

UNIT 9
HARVESTING MACHINERY

Exercise 1. Read the text and translate the key sentences about different types of harvesting. Then fill in the following table:

Types of crops	Harvesting operations	Machinery used
grains	cutting, threshing…	combine harvester

Harvesting machinery is generally classified by crop: reapers for cutting cereal grains and threshers for separating the seed from the plant. Corn (maize) harvesting is performed by mechanical corn pickers that snap the ears from the stalk so that only the grain and cobs are harvested. Corn shelling may be done mechanically in the field, after or with picking. Stripper-type cotton harvesters, which strip the entire plant of both open and unopened bolls, work best late in the season after frost has killed the green vegetative growth. Hay and forage machines include mowers, crushers, windrowers, field choppers, balers, and some machines that press the hay into wafers or pellets.

Grass, legumes, corn (maize), and other crops are often put into silos to keep them in a succulent and fermented state rather than stored dry as hay. To make silage, the crops must be cut up to permit tight packing in the silo, producing anaerobic fermentation and preventing formation of mold. Almost all silage crops are cut in the field with a forage harvester that cuts and chops the crop immediately or picks up and chops a windrow that has been cut and raked earlier.

Root crops are harvested with diggers and digger-pickers, which often pull up clods, stones, and vines with the crop. Though some machines carry workers who manually sort out extraneous material, this task is increasingly being performed mechanically. Modern sugar-beet harvesters lift the whole root from the ground, clean the earth from it, and deliver it to a bin or wagon. Sometimes the beet tops are removed before harvest of the roots and used for cattle feed. Peanuts (groundnuts) are lifted, vines and all, and allowed to dry before removal of the pods.

Tobacco-harvesting aids may be classified in three principal ways, according to the harvesting and curing methods used, which depend on the type of tobacco and its use. Flue-cured tobacco, a large plant that may stand three to four feet (90 to 120 centimetres) high, is harvested with machines that carry several workers who ride the lower platforms of the machines, cut the leaves, and place them on conveyor belts where the leaves are tied mechanically or by hand. Burley tobacco has usually been harvested by workers using a machete-type knife. After cutting, the large end of the stalk is fixed onto the sharpened end of a stick, which is hung

by hand in a tobacco barn for curing. Researchers are attempting to mechanize the cutting, impaling, and hanging of burley tobacco. Little has been done, however, toward the mechanization of the harvesting of the small aromatic tobacco leaves, which are grown in the shade, picked by hand, tied with a string, and then hung for curing.

Tree-crop harvesting is accomplished by hand or with mechanical shakers. Vegetable crops such as asparagus, lettuce, and cabbage are still harvested largely by hand, though scarcity and high cost of field labour has led to some mechanization in this area, notably with tomatoes.

Exercise 2. Make up an annotation of the text.

UNIT 10
CROP-PROCESSING MACHINERY

Exercise 1. Read the text and translate the sentences about dryeration methods, feed-processing methods and crop-processing equipment.

Machinery is widely used to prepare crops for convenient transportation, for safe storage, for the market, and for feeding t livestock. Advances in such machines have been rapid, particularly with new crops, increased yields, multiple-crop practices, and changing techniques.

In the most common method of crop drying, the crop, usually grain, is spread on floors or mats and stirred frequently while exposed to the sun. Such systems, though extremely common in the underdeveloped countries, are very slow and dependent on the weather. Forced-air-drying systems allow the farmer much more freedom in choosing grain varieties and harvest time. Fairly simple in operation, these systems have been gaining popularity in the tropics. Heat is often added to increase air temperatures during the drying period.

In a process called dryeration, wet corn (maize) is placed in a batch or continuous dryer. After losing 10 to 12 percent of its moisture, the hot corn is transferred to the dryeration cooling bin, in which it is tempered for six to 10 hours and then slowly cooled by ventilation for 10 hours. This process reduces kernel damage and increases dryer output.

High moisture in stored hay not only causes rapid deterioration of its value as feed but often results in spontaneous combustion. When hay is first cut, it usually contains 70 percent or more moisture. It wilts and quickly dries to a moisture content of about 40 percent. At this stage, it can be dried to a safe storage condition, about 15 percent moisture, by blowing air through it, sometimes with supplemental heat.

Feed-processing mills, often referred to as feed grinders, are used principally for milling cereals for livestock feed, which aids digestion. The ground material is usually fairly coarse and at times may only be crushed. Modern mills frequently are designed to allow the farmer to grind the grain and to mix in various other ingredients in desired quantities.

Other types of crop-processing machinery include machines that separate desirable seed from weed seed, stems and leaves, and dirt; grading machinery to classify seed by width, length or thickness; fruit graders and separators; and cotton gins, which separate cotton seeds from the fibres.

Exercise 2. Make up an annotation of the text.

UNIT 11
TRACTORS

Exercise 1. Read and translate the text.

The word tractor is related to words like “traction” and “tractive” from the Latin word “tractus” meaning drawing (pulling). A tractor is essentially a machine designed to pull things along, usually very slowly and surely. A tractor is basically a machine that provides machine power for performing agricultural tasks. Tractors can be used to pull a variety of farm implements for plowing, planting, cultivating, fertilizing, and harvesting crops, and can also be used for hauling materials and personal transportation.

The farm tractor is one of the most important and easily recognizable technological components of modern agriculture. Today’s tractors are incredible, amazing, powerful feats of mechanical engineering and precision. Its development in the first half of the twentieth century fundamentally changed the nature of farm work, significantly altered the structure of agriculture, and freed up millions of workers. The tractor represents an important application of the internal combustion engine, rivaling the automobile and the truck in its economic impact.

The heart of a farm tractor is a powerful internal combustion engine that drives the wheels to provide forward motion. Direct ignition (diesel) and spark-driven engines are both found on tractors. Power from the engine can be transmitted to the implement being used through a power take-off (PTO) shaft or belt pulley. The engine also provides energy for the electrical system, including the ignition system and lights, and for the most recent models, air conditioner, stereo system, and other comforts.

As early as the 1870s, engineers had succeeded in producing steam engines, referred to today as steam tractors. These monsters, weighing in excess of 30,000 pounds (excluding water), could move under their own power, and had impressive horsepower capacity. Unfortunately, their size, mechanical complexity, and constant danger of explosion made these traction engines unusable for farms. For the reasons, adoption of steam power was clearly not a candidate to replace the horse.

With the commercialization of the internal combustion engine, a more practical alternative emerged. Companies began developing gasoline-powered traction engines during the same period; the first commercial machines were sold in 1902, and quickly became known as ‘tractors’.

Between 1916–1922 more than 100 companies were producing farm tractors for farm uses. By 1928, the first general purpose tractor was introduced, which allowed for planting and cultivating three rows at a time, increasing productivity. Until the late 1930s, farm tractors had steel wheels, making farmers very cautious about whether rubber wheels would be able to do as much work as those with steel wheels. However, by 1939, the Model “B” tractor was introduced with an electric starter and lights, rubber tyres, and higher horse-power. The Model “R” tractor was the first John Deere tractor that had more than 40 horsepower, as well as the first diesel tractor.

The evolution of tractors continued and by 1966, John Deere became the first manufacturer to offer farmers a tractor that had a roll bar to help protect the operator. By the early 1970s, farm tractors started to feature more comfortable seating for the operator and a sound guard protecting the tractor cab, helping to shield them from heat, cold, and dust.

New innovations in tractor technology are coming out all the time. Technologic improvements especially in manufacturing industry have leaded to improvements in the engine frame. Innovations in the injectors have paved the way for a reduction in exhaust emission levels owing to less fuel consumption and better combustion.

Tractor world has been affected positively by the recent developments in the comfort field of the automotive sector. Modern tractor cabins are equipped with air-conditioning system, trip computer, ergonomic seat and water and dust proof design. In addition, by the means of the instrument panel placed inside the cabin, feed rate, power take-off circuit, digital hour, fuel and temperature gauge, tractor working hour, ground operated per hour, programmable service times and power supply voltage status could be monitored easily. At the same time, by enhancing the adherence capability of the tyres, it provides a high level drafting performance.

Along with the sensitive agriculture applications, robotic agriculture and robotic tractors have come to the forefront as well. Due to robotic agriculture multiple small intelligent machines replace large manned tractors, increase work requirements.

Exercise 2. Make up an annotation of the text.

UNIT 12

TYPES OF FARM TRACTORS

Exercise 1. Read the text and find the criteria of farm tractors classification.

A tractor is an engineering vehicle specifically designed to deliver a high tractive effort at slow speeds, for the purposes of hauling a trailer or machinery used in agriculture. Most commonly, the term is used to describe a farm vehicle that provides the power and traction to mechanize agricultural tasks, especially tillage, but nowadays a great variety of tasks.

The tractor types can be subdivided by application in three main ways:

Type of construction. In other words, how is the tractor designed and made? Is it a tractor that allows the driver to easily sit and drive the machine with ease, or is it one where the user walks alongside of the equipment (also known as the walking type tractor)?

Type of drive. According to the type of drives you can find the wheel type tractor or the track type ones (the latter of which consists of half-track and full-track models). There are also two-, three-, and four-wheeler types of tractors to consider. Tracked type has half-track and full track types of tractors. Wheel type is sub divided into two wheeled, three wheeled and four wheeled types of tractors.

Track type tractors are generally used for reclaiming barren lands and are not much used for agricultural tasks. These machines are very useful in dams and in areas where earth moving tasks are required.

Early farm tractors had fixed distance front wheels with a solid front axle. The Saunderson Tractor and Implement Co., a company based in Bedford in Massachusetts, manufactured a four-wheel tractor in 1908 that proved very popular. Another successful tractor manufacturing company, established in 1837 and still in operation, is John Deere, with their distinctive green and yellow tractors.

Next came the tricycle type tractors, with either a single front wheel or closely-placed double front wheels. The tractor manufacturer Farmall was famous for its bright red, tricycle design machines. These designs were in vogue from the 1930s to the 1970s.

Four-wheel tractors, however, were easier and safer to handle. They were less likely to keel over than the three wheeled ones. They also proved more suited to the requirements of mechanized farming. Design-wise, a four-wheel tractor has two large driving wheels and two steerable wheels. The driving wheels are on an axle and the steerable wheels are below the engine compartment. The seat and the steering wheel are set in the center of the four wheels, usually inside an enclosed driving cab.

The exact purpose. The types of tractors depend upon the purpose for which they are used. Different kinds of tractors have been developed for different farming requirements. These include row crop, wheat land, high crop and utility tractors. They come in different sizes, ranging from small to large.

The row crop and high crop tractors have adjustable treads that allow careful navigation through crop rows. These vehicles can make their way through rows of

tomatoes, maize, wheat or other crops without damaging the plants. The high crop types have increased ground clearance and suited for farm work with vegetables or high growing crops.

The wheat land farm tractors are used for heavy field work on extensive tracts of farmland. The utility ones are usually smaller, general purpose vehicles. These can be used for non-farming activities like gardening, landscaping and excavation. Such utility tractors are fitted with turf tires that are softer than the regular agricultural tires.

Exercise 2. Make up an annotation of the text.

UNIT 13
TRACTOR PARTS

Exercise 1. Read and translate the text.

Modern tractors are much more sophisticated than traction engines and they can do all kinds of things, thanks to some useful features.

(A) Hauling heavy loads is still one of the most important jobs that a tractor does for a farmer. Tractors pull implements (farm machines such as plows, trailers, hay balers, manure spreaders, and so on) using a sturdy rod called a ***drawbar,*** which makes a secure but very flexible link between the tractor and whatever is following it. The drawbar can pivot so a tractor can easily pull its load around corners. Reversing is a bit trickier!

(B) All a horse can really do is drag something behind it, which is a problem because implements often have to be moved from one field to another, sometimes by driving them down public roads. Modern tractors get around this using a hydraulically powered pulling and lifting system at the back, known as a hitch. The ***hitch*** makes it easy for a tractor to lower a plow when it is working on a field, and then raises it up again to drive it somewhere else – but that's not all it does. It can raise and lower implements off the ground with a flick of a switch, but it also keeps the tractor pulling effectively as the ground conditions change and give more resistance. It transfers some or all of an implement's weight to the back wheels of the tractor giving it more grip against the ground. The mechanical design of the hitch keeps the whole tractor safe and stable and stops it flipping backward if the implement it’s pulling suddenly snags in the ground. Most importantly of all, it allows one tractor to work with many different implements. All tractors use similar hitches, so virtually any implement will work with any make of tractor.

Harry Ferguson, an Irish-born British tractor pioneer, popularized the modern hitch system, which is called a three-point hitch (or three-point linkage), in the 1940s, though it was largely developed by his engineer and mechanic, Willie Sands. The hitch made Ferguson rich and famous, partly because of a short-lived partnership with Henry Ford; today, Ferguson is best remembered as one of the founders of the Massey-Ferguson tractor company.

(C) Early traction engines could be used to power harvesters, elevators, and other kinds of equipment by parking them, disengaging their driving wheels, and then transmitting their power to another machine. Typically, this was done by looping a long rubber belt over the spinning wheel on top of the traction engine so it passed over a similar wheel on the machine that needed to be driven. Power was carried between the machines in much the same way as a bicycle chain takes power from the pedals to the back wheel (only with a rubber belt instead of a metal chain).

Virtually all modern tractors can power implements or machines using what's known as ***the power takeoff (PTO)***. It's a rotating shaft, usually at the back of a tractor, from which power can be taken from the tractor's engine. To use the power takeoff, you need to hook up a special spinning rod (with clever, flexible

connections called universal joints) between the tractor and the implement. A machine like a hay baler has spinning rakes, wheels, and gears inside it. When it's hooked to the back of a tractor, it's connected to the power takeoff so the tractor's engine powers the machinery inside the bailer as well as driving its own wheels. That's why tractors pulling powered machinery have to drive relatively slowly: a fair bit of their engine power is being diverted to the equipment behind them.

Look closely at a tractor working in a field and you can often see the power takeoff rod spinning between the tractor and whatever it's pulling. But never get close to one: they spin at about 500rpm and can be extremely dangerous.

(D) The most noticeable thing about a tractor is its giant wheels and tires. Large pneumatic (airfilled) tires spread the weight of the tractor over a larger area and deep treads give excellent grip. By reducing the pressure on the ground the tires stop it from sinking in to soil and mud that would quickly bog down a conventional car. The more the tires spread the load, the less damage the tractor does to the soil.

Most tractors have two-wheel drive, with the large rear wheels driven from the engine and the small front wheels used only for steering. Since a tractor is usually pulling things, that's fine: the heavy weight behind it pushes the rear wheels down, increasing their grip, so there's no particular advantage in having powered front wheels as well. (Four-wheel drive tractors are also less common because they're more complex and expensive.) Some tractors have extremely wide, multiple wheels and tires for negotiating particularly soft or difficult terrain; for obvious reasons, and you won't see those on the roads!

(E) Tractors are generally powered by large diesel engines, which are particularly good at providing high pulling power at very low speeds (that's why they're used in trucks and buses). Smaller tractors may have gasoline engines and some are powered by LPG (liquefied petroleum gas), usually to make them more economical or environmentally friendly.

(F) Driving a tractor might look easy – the engine is doing most of the work – but it needs a great deal of skill. Powerassisted steering and braking are essential to help tractor drivers keep heavy loads safely under control. Since tractors are heavy and often have to work on steep slopes and soggy, unstable ground, there's always a risk they might tip over so modern tractors generally have reinforced cabs fitted with anti-roll bars. Although tractors could never be described as luxurious, most now have heated cabs, air conditioning, and GPS satellite navigation to help farmers plan how they work their fields with military precision.

Exercise 2. WHICH TRACTOR PART :

1. helps tractor drivers keep heavy loads safely under control?
2. makes it easy for a tractor to lower a plow when it is working on a field?
3. spreads the weight of the tractor over a larger area?
4. takes the power from the tractor's engine?
5. stops it flipping backward if the implement it's pulling suddenly snags in the ground?
6. provides high pulling power at very low speeds?

7. makes a secure and flexible link between the tractor and whatever is following it?
8. can raise and lower implements off the ground with a flick of a switch?
9. lessens the damage of the tractor to the soil?
10. makes tractors more economical or environmentally friendly?

Exercise 3. Make up an annotation of the text.

UNIT 14
AGRICULTURAL ELECTRIFICATION

Exercise 1. Read and translate the text.

Agricultural electrification means a wide range of application of electric energy in the field of agricultural production and rural life. It is the important technical basis of mechanization and automation of agricultural production, including the production, transmission, distribution and utilization of agricultural power, the development of agricultural technology and equipment.

Agricultural electrification, also called rural electrification, refers to widely establishing power plant network in rural areas, sending electricity to rural areas, improving agricultural production and farmers' lives. In other words, rural electrification is the process of bringing electrical power to rural and remote areas. This definition appears simple but it is becoming more and more complicated as new devices and systems are developed to provide various levels of electricity service. Electric tractor cultivated land, power harvesters, power pumping irrigation machine, electric scissors for shearing and electric milking machine and so on, are inseparable from the power.

The impact of electric power on modern agriculture has been at least as significant as that of either steam or gasoline, because electricity in its nature is far more versatile than the earlier power sources. Modern applications of electricity in farming range from comparatively simple to some complex ones in manufacturing industries. They include conditioning and storage of grain and grass; preparation and rationing of animal feed; and provision of a controlled environment in stock-rearing houses for intensive pig and poultry rearing and in greenhouses for horticultural crops. Electricity plays an equally important part in dairy farming for feed rationing, milking, and milk cooling; all these applications are automatically controlled. Computers have increasingly been employed to aid in farm management and to directly control automated equipment.

Most workers in rural electrification find themselves fully occupied with one operation as farm service, adviser, inventor, agricultural engineer, distribution engineer, administrator etc. Specialists should know electrical applications, the service in keeping electric lines. They must understand and design simple electrical and electronic systems for agricultural industry, electrical equipment for agricultural production and processing operations.

Engineers were long ago able to heat buildings for chick and young animals, glass-houses and other structures used for plant production. In addition to these examples, there are further applications of electricity for soldering and welding, as well as the known process of brazing by means of carbon tips connected to the welding apparatus. The engineer and the farmer have combined to develop electrically powered equipment for crop conservation and storage to help overcome weather hazards at harvest time and to reduce labour requirements to a minimum. Grain can now be harvested in a matter of days instead of months and dried to required moisture content for prolonged storage by means of electrically driven fans and, in many installations, gas or electrical heaters.

Conditioning and storage of such root crops as potatoes, onions, carrots, and beets, in especially designed stores with forced ventilation and temperature control, and of fruit in refrigerated stores are all electrically based techniques that minimize waste and maintain top quality over longer periods than it was possible with traditional methods of storage.

Rural farms will greatly benefit from electricity. Electricity will make it possible to run their farms better. They will be able to use timers, improve irrigation, and improve their farming activities. Not all rural areas are equally isolated or off the grid. However, rural electrification will make any area safer through outside lighting, safety signs, alarm systems, and even traffic lights. Electricity is what makes many of our homes and offices safe and it can do the same for people in rural areas.

Depending on the source, rural electrification (and electricity in general) can bring problems as well as solutions. New power plants may be built, or existing plant's generation capacity increased to meet the demands of the new rural electrical users. A government may be inclined to use the cheapest generation source, which may be highly polluting, and locate the power plant next to rural areas. However, renewable energy is ever more imposing itself as not only clean but also cost-effective technology for remote rural areas.

Exercise 2. Make up an annotation of the text.

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