*Т.А. Ганніченко, О.В. Артюхова*

# *English :*

# *Focus on Agriculture*

Міністерство освіти і науки України
Миколаївський національний аграрний університет

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# English:
# Focus on Agriculture

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Пропонований навчальний посібник з англійської мови має на меті забезпечити розвиток навичок усного мовлення, роботи з текстами професійного спрямування, система лексико-граматичних вправ спрямована на свідоме практичне засвоєння мовних елементів з фаху.

Посібник призначений для аудиторної та самостійної роботи здобувачів вищої освіти ступеня "бакалавр" агрономічних спеціальностей.

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## ПЕРЕДМОВА

Процес оновлення змісту іншомовної освіти, вихід її на новий якісний рівень потребує створення нових підручників та посібників для підготовки фахівців різних галузей народного господарства, зокрема це стосується й фахівців аграрного профілю. Слід зазначити, що підручники з англійської мови для цієї спеціальності не видавалися з радянських часів і є морально застарілими. Володіння англійською мовою професійного спрямування майбутніми аграріями є вимогою часу, а отже необхідним є створення сучасного посібника з англійської мови для студентів цього напряму підготовки.

Навчальний посібник розроблений згідно з Типовою програмою Міністерства аграрної політики України, Департаменту аграрної освіти та науки, Науково-методичного центру аграрної освіти з «Англійської мови», програмою «English for Specific Purposes» на засадах компетентнісного, комунікативного та системного підходів за принципами доступності, зв'язку теорії з практикою, наступності і перспективності. Професійно спрямовані тексти є важливим джерелом спеціальної лексики з фаху, матеріалом для створення комунікативних ситуацій, анотування й реферування. Лексико-граматичні вправи спрямовані на закріплення знань і контроль вироблення мовних і мовленнєвих умінь і навичок. Фахові теми, що пропонуються

до вивчення, сприятимуть удосконаленню навичок усної комунікації і підвищення рівня мовної культури студентів.

Навчальній посібник складається з декількох частин, а саме: 11 тематичних розділів, кожен з яких містить фахові тексти, різноманітні тренувальні вправи та завдання на закріплення фахової лексики і на розвиток навичок усного мовлення; завдання для самостійної роботи з трьох частин, з професійно-орієнтованими текстами та вправами до них; 12 тестів на повторення; додаткові тексти для анотування і реферування; глосарій та англо-український словник термінів, що вживаються в текстах уроків.

Мета навчального посібника – розвиток умінь та навичок фахової усної та письмової комунікації, засвоєння нових лексичних одиниць за професійним спрямуванням, повторення та закріплення граматичних конструкцій у поєднанні з фаховою лексикою. Дібрані тексти, вправи та тести допоможуть студентам розширити свій активний і пасивний словниковий запас з англійської мови в професійній сфері, удосконалити навички читання, перекладу та спілкування, що загалом сприятиме досягненню поставленої мети. Навчальний посібник з англійської мови призначений для аудиторної та самостійної роботи здобувачів вищої освіти ступеня "бакалавр" агрономічних спеціальностей.

## *UNIT 1. AGRICULTURE IN GENERAL*

***1.Memorize the words and word-combinations:***

*to be employed – бути зайнятим (на роботі)*

How many people are employed in your company?

*fibre – волокно*

The fibres in cheaper woollen fabrics are shorter.

*ornamental – декоративний*

The house was surrounded with a beautiful ornamental garden.

*nourishment – харчування, поживні речовини syn. nutrition*

A baby gets all the nourishment it needs from its mother's milk.

*diet – раціон, харчування*

Rice is the main food in the diet of most people in Japan.

*variety – 1) різноманітність, безліч; 2) вид, сорт*

He plays a variety of sport games. Scientists develop new varieties of crops.

*to make up – складати*

The book is made up of ten different articles.

*to remain – залишатися*

The nature of this phenomenon still remains unknown.

*fabric – тканина*

This dress is made of cotton fabric.

*yarn – пряжа*

The sweater is made of brown woollen yarn.

*to reduce – зменшувати*

The plane reduced its speed as it approached the airport.

*demand (for) – попит*

Good specialists are always in great demand.

*raw materials – сировина*

The demand for raw materials in this region is really great.

*(to) tame – приручати, ручний*

It's hard to tame a tiger. Tame rabbits are good as children's pets.

*to spread (spread, spread) – поширювати*

The fire spread very quickly because of the strong wind.

*to replace – замінювати*

The factory replaced most of its workers with (by) robots.

*device – пристрій, пристосування*

This device was invented long ago.

*to aid – допомагати, сприяти*

This project is designed to aid developing countries.

*to inherit – передаватися у спадок, отримувати у спадок*

Who will inherit the house when she dies?

*advance – просування, успіх, прогрес*

Nothing could stop the advance of the fl ood waters.

*excessive – надлишковий, надмірний, зайвий*

Excessive exercise can sometimes cause health problems.

*to prohibit – забороняти*

Smoking is prohibited on public transport.

***2. Translate into Ukrainian.***

1. To be highly productive, milk cows need good nourishment. 2. The ration of the livestock must include vitamins. 3. This new variety of potatoes is disease-resistant. 4. Wheat, barley, oats and some other crops make up the group called cereal grains. 5. The lambs had to be fed by hand when their mother died. 6. The wool of this sheep breed is processed into the high quality yarn. 7. Cattle breeding is widespread in many countries of the world. 8. Chemicals are used to aid plant cultivation.

***3. Study the agricultural terms before reading the text "Agriculture In General".***

alfalfa – люцерна

clover – конюшина

game – дичина

hog – свиня

poultry – домашня птиця

cereal grains – зернові культури

millet – просо

sorghum – сорго

root crops – коренеплоди

beets – буряк

pulses – бобові культури

beans – боби

peas – горох

oil-bearing crops – олійні культури

soybeans – соя

sugarcane – цукровий очерет

coconuts – кокосові горіхи

cocoa beans – какао-боби

turkey – індичка

trout – форель

shellfish – устричні

mussel – мідія

oyster – устриця

flax – льон

silkworms – шовковичні хробаки

natural rubber – каучук

hide – шкіра

castor oil – касторова олія

linseed oil – лляна олія

shrub – чагарник

mink – норка

***4. Read the text and do the exercises that follow it.***

## Agriculture in General

Agriculture is the world's most important industry. It provides us with almost all our food. It also supplies materials for two other basic human needs – clothing and shelter. In addition, agriculture provides materials used in making many industrial products, such as paints and medicines. About half the world's workers are employed in agriculture – far more than in any other industry.

Food is the most important farm product. But farms also provide many other products, from natural fibres to ornamental flowers and trees. Some crops are used only to feed livestock. These forage crops include alfalfa, clover and many grasses. Forage crops are important because they make commercial livestock production possible.

Farms provide almost all the world's food, including some fish and game. Most food products come from crops. The rest come from animals, especially cattle, hogs, poultry, sheep and other livestock.

The world's farmers grow about 85 major food crops. They can be divided into eight groups. The main group is cereal grains. Grain is grown on half the world's cropland and supplies

much of the nourishment in the human diet. The chief grains are barley, corn, millet, oats, rice, rye, sorghum and wheat.

Various root crops make up the second most important group of food crops. Cereal grains, root crops are grown throughout the world and are a basic food for many people. The leading root crops are potatoes, beets and sweet potatoes.

The six remaining groups of major food crops are: (1) pulses, which consist mainly of beans and peas; (2) fruits and vegetables; (3) oil-bearing crops, such as soybeans and coconuts; (4) sugar-bearing crops, especially sugar cane and sugar beets; (5) nuts; and (6) cocoa beans, coffee, and tea.

Cattle, chickens, goats, hogs, sheep, turkeys and other livestock are the main animals raised for food. Livestock are raised in every country and supply nearly all the world's meat, eggs and milk. Farmers also raise other animals for food. For example, many farmers keep bees for honey. Farmers on fish farms raise freshwater food fish, such as carp and trout, and saltwater shellfish, such as mussels and oysters.

Natural fibres come from a variety of plants and animals raised on farms. Factories use the fibres to make fabrics, yarn and other textile products. Cotton and flax together with some tropical plants are the chief plant fibres. Wool, the principal animal fibres, comes mainly from sheep but also from such animals as goats and

members of the camel family. Silk fibres are obtained from the cocoons of silkworms. However the development of synthetic fi bres has reduced the demand for natural fibres in some countries.

Many farms provide other raw materials for industry besides fibres. These materials include natural rubber, animal hides which are used to make leather and such vegetable oils as castor oil and linseed oil. These oils are used in a variety of products, from paints to medicines. Many farmers grow tobacco. Others grow ornamental flowers, trees and shrubs. A few farmers raise such animals as foxes and minks for their fur [1, p. 154].

***5. Translate into English***.

Найбільш важливі сільськогосподарські продукти; натуральні волокна; декоративні рослини; на корм худобі; кормові культури; комерційне тваринництво; харчові культури; можуть бути підрозділені на групи; основні зернові культури; вирощуються в усьому світі; безліч різних рослин і тварин; використовувати волокна для виготовлення тканин і пряжі.

***6. Define whether the following statements are true or false. Correct the false ones.***

1. Basic human needs include clothing, shelter and entertainment.

2. Forage crops are ornamental plants grown to decorate houses and gardens.

3. Most food products are of animal origin.

4. Millet and sorghum don't belong to pulses.

5. Chickens, turkeys and hogs make up the group of livestock called poultry.

6. Mussels and oysters are not fish, but they are raised on fish farms.

7. The production of natural fibres is growing in the world.

8. Foxes and minks are raised for their fur.

***7. Find the synonyms to the following words and expressions.***

A pig, a breed, to raise (2), to have a job, to get, principal (3), to form, almost, artificial, a ration.

***8. Insert prepositions.***

1. Various food products come ... crops and animals.

2. All major food crops are divided ... several groups.

3. Grain crops are the basic food ... most people.

4. The group of pulses consists mainly ... beans and peas.

5. Nowadays the demand ... natural fibres is reduced.

6. Vegetable oils are used ... various products.

7. Animals are raised mainly ... food.

8. Yarn is obtained ... wool.

***9. Answer the questions to the text.***

1. What does agriculture provide people with?
2. What are the farm products besides food?
3. What are the main groups of food crops?
4. What kinds of animals are raised for food?
5. How are natural fibres obtained?
6. Why has the demand for natural fibres reduced?
7. What are the raw materials besides fibres?
8. Where are they used?

## *UNIT 2. FROM THE HISTORY OF AGRICULTURE*

***1.Memorize the words and word-combinations:***

seed [si:d] – насіння, зерно

domestication – одомашнення, приручення

irrigation [IrI´geIʃn] – зрошення

crop rotation – сівозміна

selective breeding – селекційне розведення

milking machine – доїльний апарат

pump – насос

feeding trough [tr6f] – годівниця

insect pest – комаха-шкідник

wood ash – деревна зола

manure [mə´njuə] – гній

***2. Read the text and do the exercises that follow it.***

**From the History of Agriculture**

For hundreds of thousands of years, prehistoric people lived by hunting, fishing and gathering wild plants. Then about 8000 B.C. (before Christ –до нашої ери) people took the first steps toward agriculture. Some tribes discovered that plants could be grown from seeds. They also learned that certain animals could be tamed and then raised in captivity. These two discoveries marked the beginning of the domestication of plants and animals. Scholars believe that domestication began in the Middle East and then spread to surrounding areas.

The Romans had developed some farming methods, e.g. systems of crop rotation. The selective breeding of plants and livestock began in Europe during Roman times, too.

Since the 1800s, science and technology have helped make agriculture more and more productive in three main ways. They have provided farmers with labor-saving technologies, produced improved plant varieties and breeds of livestock and developed new agricultural chemicals.

**Labor-saving technologies**. Steam-powered tractors were developed in the mid-1800s, but they were expensive and difficult

to operate. The first all-purpose gasoline-powered tractors appeared in the 1920s. They gradually replaced work animals and steam-powered machines on almost all farms. In Japan and several European countries most farms had electric power service by the mid-1930s. Today farmers use electric motors to run milking machines, irrigation pumps, and many other farm machines. Farmers also use electric power to operate electronic and automated equipment. This equipment includes devices that fill feeding troughs or collect and grade eggs automatically.

Many farmers use computers to aid in farm operations. Using the Internet, farmers may make use of data provided by agricultural colleges or other information centers.

**Plant and livestock breeding.** During the mid-1800s an Austrian botanist and monk named Gregor Mendel discovered the principles of heredity. Mendel thus laid the groundwork for genetics – the science that explains how characteristics are inherited. The development of genetics has made it possible to breed plants and animals scientifically.

Since the early 1900s, plant breeders have developed a great number of hybrid crops that produced unusually high yields. The new varieties were intended mainly to help various poor nations, such as India and Mexico, increase their food supply. This effort proved so successful that it has been called the Green Revolution.

Livestock breeders have introduced many improved lines since the early 1900s. Nutrition specialists have developed better livestock feeds, and veterinarians have improved methods of health care. All these advances continue to make livestock more and more productive.

**Agricultural chemicals**. Almost since the beginning of agriculture, farmers have used various substances to enrich the soil and to kill insect pests. For example, they have used wood ash and manure as fertilizers since prehistoric times. Since the beginning of modern chemistry in the late 1700s, scientists have produced many kinds of synthetic chemicals for use in agriculture. These chemicals include fertilizers, insecticides, herbicides or weedkillers and chemicals to control plant and animal diseases. All these chemicals have helped increase farm production greatly. However, improper or excessive use of these chemicals can be dangerous and cause damage to the environment. In many countries state laws limit such practices and prohibit the use of chemicals that have been proved harmful [1, p.157].

***3. Define which verb goes with which noun.***

| | |
|---|---|
| Develop | soil |
| Inherit | methods |
| enrich | data |

| | |
|---|---|
| provide | diseases |
| control | troughs |
| fill | production |
| improve | groundwork |
| run | hybrids |
| lay | machines |
| increase | damage |
| operate | characteristics |
| cause | equipment |

***4. Define whether the following statements are true or false. Correct the false ones.***

1. In the 20th century gasoline-powered tractors replaced steam-powered tractors.
2. Most farms in Europe had electric power service by the early 1920s.
3. Today electric motors are widely used on the farms.
4. Gregor Mendel invented the fi rst automatic milking machine.
5. Geneticists work on breeding new crops and animals.
6. The Green Revolution was the exploration of new farming areas in India and Mexico.
7. Veterinarians are the specialists who develop livestock feeds.
8. Today there are various types of chemicals used on the farms.

9. There is no limit in using all kinds of agricultural chemicals, as they are friendly to the environment.

***5. Prove that:***

• agriculture is the world's most important industry
• farms provide almost all the world's food
• farms supply many industries with raw materials

***6. Talk in pairs (in groups) about the history of agriculture. Discuss the following:***

• domestication of plants and animals
• labour-saving technologies
• plant and livestock breeding
• agricultural chemicals

***7. Read and translate a few funny stories.***

***

One day a farmer asked his son Bobby to go and count the pigs in the farmyard. Bobby came back and said, "Father, there are twenty pigs, but one little pig runs about so quickly that I cannot count it."

***

Two brothers came to a hotel in the country. They didn't like their room.

"What does this pigsty cost?" asked one brother.

"For one pig – two dollars, for two pigs – three dollars," was the quick answer.

## *UNIT 3. WHAT IS AGRICULTURE?*

***1.Translate and memorize the words and word-combinations:***

Acid soils
Agronomy
Application
Branches of agriculture
Cattle breeding
Cotton
Crop growing
Crop rotation
Equilibrium
Feed
Flax
Food crops
Foodstuff
Grain crops
Herbicide
Industrial crops
Intensification
Liming
Mechanization
Mineral fertilizers
Nutrient substances
Organic fertilizers
Pig growing
Plant protection
Poultry breeding
Protein
Raw materials
Soil
To breed
To cultivate
To disturb
To irrigate
Utilization of fertilizers
Yield

***2. Guess the meaning of the following international words and word combinations:***

activity, materials, Latin, cultivation, intensification, climate, hybrid, mechanization, herbicides, biological, equilibrium, sector, economy, industry, factor, system, agronomy, technical, tractor, combine, machinery, electricity, chemical, material, chemization, mineral, organic, biological.

***3.Find the correct word on the right opposite in meaning to the one on the left.***

| | |
|---|---|
| vital | vague |
| increase | inefficient |
| achievement | worse |
| sufficient | drawback |
| better | narrow |
| improvement | unneeded |
| effective | deterioration |
| clear | reduction |
| extensive | unnecessary |
| valuable | inadequate |

***4.Match the words on the right (A) with their definition on the left (B).***

| *A* | *B* |
|---|---|
| 1) to breed | a) produce by cultivation |
| 2) field | b) supply (land) with water |
| 3) agriculture | c) soil management and crop production |
| 4) economy | d) subdivisions of agriculture |
| 5) branches of agriculture | e) a piece of ground especially for pasture or tillage or playing games |
| 6) soil | f) cultivation of the soil and rearing of animals |
| 7) yield | g) upper layer of earth, in which plants grow |
| 8) agronomy | h) produce or return as fruit, profit or result |
| 9) to irrigate | i) management of concerns and resources of state or business or household |
| 10) to grow | g) raise (cattle etc.) |

***5.What are these words derived from? Notice the different suffixes, indicating different parts of speech.***

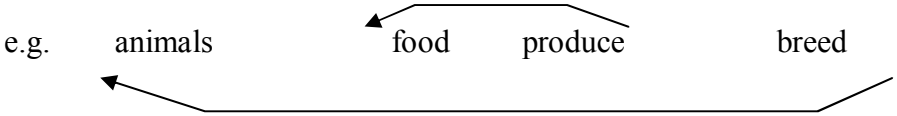
Activity, cultivation, growing, meaning, breeding, achievement, developed, agronomical, rotation, various, considerably, chemical, improvement, deliveries, intensification, comprehensive,

mechanization, utilization, liming, protection, development, valuable, raising, equipment, enlargement, combination.

***6.Give Ukrainian equivalents for:***

crop growing, livestock breeding, sufficient good soil, to produce high yields, crop rotation, chemical fertilizers, comprehensive mechanization, plant breeding, poultry-breeding, pig-growing, nutrient substances.

***7. Draw lines to show which words go together.***




| | | | |
|---|---|---|---|
| 1) protection | country's | plant | achievements |
| 2) application of | rotation | fertilizers | crop |
| 3) utilization of | production | natural resources | agricultural |
| 4) liming of | yields | high | acid soils |
| 5) agronomical | zones | measures | climatic |
| 6) mechanization | use of | full | herbicides |

***8. Open the brackets using the verbs in Passive Voice:***

1. Enough food for all the people (can grow) if there is sufficient good soil for crops to produce high yields
2. An increase in the yield of grain and other crops (to ensure) by a number of factors.
3. Field work already (to mechanize) to a very high degree.
4. Depending upon the field of application crops (to subdivide) into food crops, feed crops, industrial crops and vegetables.
5. Vegetables (to grow) everywhere where the climate is most favourable for these crops.
6. Industrial crops also widely (to cultivate) by the farmers.

***9. Read the text and say why agriculture is a vital sector of economy.***

**WHAT IS AGRICULTURE?**

Agriculture is a human activity in which people use areas of land to produce food, clothing and other necessary materials.

The word *ager* is a Latin word. It means a field. The word *agriculture* means the cultivation of fields and growing crops. But this is the old meaning of this word. Now it also means the use of land to breed animals.

Agriculture is the vita1 sector of the economy. Its condition and development largely determine the country's achievements, the supply of the population with foodstuffs and many industries with raw materials.

At present there are two main branches of agriculture. They are crop growing and livestock breeding.

We do not know when people began to grow crops. It was many thousand years ago. Now crop growing is a highly developed branch of agriculture.

The soil is the basis of agriculture. Enough food for all the people can be grown if there is sufficient good soil for crops to produce high yields. So an increase in the yield of grain and other crops is ensured by a number of factors. First comes the system of agronomical measures. All farms have to introduce better crop rotation systems. Rotation systems naturally differ in various areas and under various conditions. Second goes the technical equipment of farms. Tractors, combines, lorries and other machinery will considerably reduce the time required for agricultural work. Field work has already been mechanized to a very high degree. Power stations provide farms with electricity. Third, an increase in the deliveries of chemical fertilizers and the improvement of their quality.

The enlargement of the material and technical basis of agriculture and its intensification through chemization, the comprehensive mechanization of crop and animal farming and improvement are the key conditions for increasing agricultural production.

Depending upon the soil and climatic zones effective methods should be introduced for the utilization of mineral fertilizers in combination with organic fertilizers along with the liming of acid soils. The production and use of chemical and biological means of plant protection should be increased. But all intensification factors, such as full mechanization, high application of fertilizers and extensive use of herbicides must be used in such a way as not to disturb the biological equilibrium of the soil.

Depending upon the field of application crops can be subdivided into food crops, feed crops, industrial crops and vegetables. Potatoes and other vegetables are major food crops. Vegetables are grown everywhere where the climate is most favourable for these crops.

Industrial crops are also widely cultivated by the farmers. Perhaps the most important industrial crop for textile industry is cotton. Cotton is generally grown on the irrigated lands. Flax is

another important crop. Cotton and flax oils are both edible and valuable.

Livestock breeding comprises cattle-breeding, pig-growing, poultry-breeding, etc. One of the principle problems cattle-breeding faces is that of fodder or feeds. To choose the necessary feeds, rich enough in protein and other nutrient substances is not an easy thing. Increasing the production of meat, milk and wool can be achieved by raising productivity and also by increasing the heads of livestock and the amount of poultry [7, p. 18].

***10. Find information in the text to answer the following questions.***

1. What is agriculture?
2. What are the key conditions for increasing agricultural production?
3. What branches of agriculture do you know?
4. How many groups are crops subdivided into?
5. What does livestock breeding comprise?
6. What problem does cattle-breeding face?
7. How can the production of meat and milk be increased?

***11. Divide the text into several parts. Find the key sentences in each part. Sum up the content of the text.***

***12. Refer to the text again and prove that an increase in the yield of grain and other crops can be ensured by:***

- the system of agronomical measures
- the technical equipment of farms
- an increase in the deliveries of chemical fertilizers and -- an improvement of their quality.

## *UNIT 4. SOIL*

***1. Translate and memorize the words and word-combinations:***

| | |
|---|---|
| vegetable life | yield |
| parent material | moisture |
| weathering | improve |
| rock | tilth |
| utility | horticulture |
| food-stuff | |

***2. Read and translate the text:***

Soil plays a vital and important role in the life of the world and mankind. It is in fact a highly organized physical, chemical and biological complex all of us are dependent on. As the supporter of vegetable life, soil plays the most fundamental of roles in providing food for all animals and men.

Soils develop under the influences of climate, vegetation, slope and drainage, time, the nature of the parent material, and the culture. Climate influences plants, animals and soil directly. Plants influence the soil, the animals and the climate near the ground. Animals play a considerable role in soil development, the type of soil often influences the animals which are present in it, while the animals also influence the vegetation which is growing in the soil.

Finally climate, through weathering, influences the rocks, which in time come part of the soil through the processes of soil formation.

All soils do not have the same utility, but man uses different soils in different ways. "Good" land for the production of food-stuffs must lie well and have good depth, for yields are dependent upon the ability of the soil to take up and use fertilizers and water. Man has done much to adapt crops to the soil and to provide various kinds of fertilizers for plant growth and development. Soils those are not good for the production of food-stuffs may be valuable in other ways. For example, podzols in high elevations are poor for crops but they comprise excellent forest soils.

Each soil series requires skilful handling if it is to produce to its maximum potential; but no two series make the same demands. From season to season conditions of temperature and moisture change, so the farmer must change the management to produce better drainage, improve tilth, prevent erosion, and test the soil to identify the proper kind and the correct proportion of fertilizer needed. Only by careful study of the soil, resulting in an understanding of the complexity of its nature and uses, will man be able to provide food for all the people who will inhabit the earth. The soil cannot reproduce itself. Therefore, man should

improve it through good management and treatment so that future generations can farm more efficiently than their fathers and grandfathers have done. Man can improve the soil now in use and even discover how more kinds of soils can be utilized more productively.

So, the results obtained in soil science can be applied to practical problems in agriculture, horticulture, forestry, engineering, and in planning the future use of land [6, p. 6].

***3. Find false sentences according to the text.***

1. Soil science is only of theoretical value. 2. Different soils have the same utility. 3. To improve the soil one should study it thoroughly. 4. Soil requirements are always the same. 5. Soils those are not valuable for grain crops may be very good for some other purpose. 6. Climate is influenced by soil.

***4. Complete the sentences.***

1. Soils develop under the influences of …….
2. Plants influence ……near the ground.
3. …….influences the rocks, which in time come part of the soil through the processes of soil formation.

4. Man has done much to adapt crops ……for plant growth and development.
5. Farmer must change ……to identify the proper kind and the correct proportion of fertilizer needed.

***6. <u>Ask questions to the text, retell the text.</u>***

## *UNIT 5. PHYSICAL AND CHEMICAL PROPERTIES OF SOILS*

***1. Translate and memorize the words and word-combinations:***

| | |
|---|---|
| particle | water-tables |
| plant root cells | plant nutrients |
| fineness | surface layer |
| coarseness | plow layer |
| sandy loam | silt loam |
| worthless | deteriorated |
| germination | |

***2. Read and translate the text:***

The physical properties of a soil are determined largely by its texture, or the size of the particles of which it consists, and its structure, or the arrangement of these particles.

For a soil to be in good physical condition for plant growth, the air, water, and solid particles must be in the right proportions at all times. Every cubic foot of soil that supports plant life must be:

1) well enough aerated to permit all plant root cells to obtain oxygen at all times, but not excessively aerated to the point

of preventing a continuous contact of roots with moist soil particles;

2) open enough to permit the right amount of rain-water or irrigation water to enter the soil, but not so open as to allow excessive loss of water and plant nutrients by deep percolation;

3) sufficiently retentive of moisture to supply roots with all needed water, but not so retentive as to create undesirable suspended water-tables.

Soil texture has to do with the fineness or coarseness of soil particles. Mineral particles which make up the bulk of soil vary greatly in size. The four principal size categories are "gravel", "sand", "silt", and "clay". Some soils, for example sand, consist largely of particles of approximately the same size. Most soils, however, have two or more groups, classified by size of particles, usually with one group dominant. Thus, in grouping soils into texture classes, the proportion of particles belonging to different size groups, as well as the particle sizes themselves, are important.

In most soils texture varies greatly from the surface downward. The subsoil usually contains more clay and other fine material than does the surface soil, although this is not always the case. In soil classification, the texture of the surface soil seems more significant than that of deeper layers. Therefore, soils are

usually classified according to the texture of a six- to eight-inch thick surface layer, approximately the "plow layer". Six major texture groups are "sand", "sandy loam", "silt loam", "loam", "clay loam", and "clay". Each of these groups may be subdivided when it is useful to do so.

Many soil qualities are closely related to texture. Since fine-textured soils have greater pore space and larger surface area than coarse-textured soils, they provide greater storage space for water and better feeding zones for plant roots. Thus, in a broad way, relatively fine-textured soils are more productive agriculturally than are soils with coarse texture. Too fine a texture, however, adversely affects tillage. Sands and sandy loams are more easily tilled than clays and clay loams because the tilling of the former requires less power and is hindered less by wetness.

Soil structure refers to the manner in which the individual soil particles are arranged. Structure has much in common with texture, although structure is much more complex. As a property of soil, structure in some instances may be even more important than texture. Physical, chemical, and biological forces in nature work together arranging soil particles into a great variety of structural patterns.

Good structure is valuable in any soil. Some soils have structures that make them difficult to manage and render them

practically worthless agriculturally. Because of structural differences, some soils require much more care than others. Preventive measures often check structural breakdowns, and careful management can restore deteriorated structures to normal.

Water is the most variable property of the soil. The functions of soil water are varied. Soil water is vital to plant life, since all nutrients that plants take from the soil are dissolved in it. Water aids in the decomposition of organic and mineral matter and in bringing about chemical changes within the soil.

Soil water is a very significant factor in planting, tilling, and harvesting cultivated crops. It often determines the time and the depth at which seeds should be planted for proper germination. Water may be so abundant in the soil as to restrict machine cultivation, thus making the control of weeds difficult. On the other hand, scarcity of water may make the soil hard, cloddy, and very difficult to plow. Too much soil water at harvest time often delays or completely prevents the use of harvesting machinery [6, p.8].

***2. Read and translate the text:***

Dark-coloured soils are considered to suggest higher productivity than light-coloured ones, though it is not always the case.

***3. Read and translate the text. Give the title to it.***

In practical farming, the two main types of soil are light soils and heavy soils. Light soils are easy to work, need less power to cultivate, can be worked at most times of the year, and do not hold water so much. Sands and gravels belong to this group. Heavy soils are more difficult to work, need much more power to cultivate, can only be worked at certain times when they are in the proper condition, and hold water. They are usually more productive and grow heavier crops. Heavy soils usually contain much clay.

***4. Answer the question:***

«What is the difference between soil structure and soil texture?

***5. Write the annotation to the text «Physical Properties of Soils».***

***6. Read and translate the text:***

**CHEMICAL PROPERTIES OF SOILS**

Soils vary greatly in their chemical make-up. This variation is due to the chemical composition of the parent materials and to the climate and plant and animal life under which the soil developed.

Soils contain most, if not all, known elements in varying amounts and many forms. Oxygen, silicon, aluminium, and iron are the most abundant. Rarely, if ever, does a soil show a deficiency of any of these four elements. However, many soils are deficient in several other elements that are critical to plant growth. These elements are referred to as "fertilizing elements", since they are known to be widely used in artificial fertilizers. Nitrogen, phosphorus, and potassium are the three most common. They are constituents of most commercial fertilizers, their proportions usually being 5-10-5 and 6-4-4.

A few elements essential in small amounts to many plants are contained in very small quantities in most soils. These have been referred to as trace elements, because the amounts present in the soil can neither be estimated nor determined very accurately.

Soil conditions range from acidity to alkalinity. Acidity and alkalinity are directly opposite conditions of soil. Neutral soils are neither acid nor alkaline. Soil water becomes acid by absorbing carbon dioxide from the air and by absorbing acid products formed by the decomposition of mineral and organic matter.

In a broad sense, soils in humid climates tend toward acidity, whereas soils in dry climates tend toward alkalinity.

Most plants, particularly most cultivated crops, will not tolerate a high degree of either acidity or alkalinity. Since most agriculture is carried on in relatively humid climates, acidity is a troublesome and costly problem with many soils. Vast amounts of lime are used to neutralize soil acidity.

Chemically, a soil is acid if a water solution contains more acid ions (hydrogen) than basic ions (hydroxyl), and it is alkaline if the water solution contains more hydroxyl ions than hydrogen ions. If a solution contains the same number of hydrogen and hydroxyl ions, it is neutral.

The breaking down of water molecules into ions is known as ionization. As a matter of convenience, the concentration of hydrogen ions is usually expressed symbolically as pH. A pH scale with numbers ranging from 0 to 14 indicates relative concentrations. For example, at pH = 7, the midpoint, there are the same number of hydrogen ions and hydroxyl ions, and the solution is neutral. Any pH values below 7 indicate the presence of more hydrogen ions, or an acid condition; values above 7 denote the presence of more hydroxyl ions, or an alkaline condition.

Soils of different textures may not have the same pH values. The active hydrogen ions are in the water solution and naturally will react first when lime is added. The hydrogen

molecules that have not yet ionized are held to the surfaces of the solid particles of clay and organic matter. Since clays and organic matter have large surface areas, the potential acidity would be greater among such fine-textured soils.

Sandy soils with a small content of clay and organics would have a lower total acidity than the clay soils. A good application of lime to these soils may be effective for several years [6, p.10].

***7. Find the Ukrainian equivalents to the following words and phrases:***

fertilizing elements, artificial fertilizers, nitrogen, potassium, constituent, acidity, alkalinity, decomposition, neutralize soil acidity, solid particles.

***8. Complete the sentences.***

1. If some plant food is not found in the soil in sufficient amount we call it ... .2. Food elements in a form in which they can be used by a plant are known as ... .3. Food elements in a form in which they cannot be used by a plant are known as ... .

***9. Retell the text:***

**Plant Foods in the Soil**

All the main plant foods are found in a normal soil. Some of each plant food is there in such a form that the plant can use it. This is known as available plant food. Some more of it is in a form which the plant cannot use at the moment. Such plant food is said to be unavailable. To become available it may need to be changed chemically in some way.

Trace elements, the other plant foods which are needed in very small quantities, are found naturally in most soils. Sometimes one particular plant food is short and this deficiency can cause damage to crops, livestock or both.

***11. Characterize the terms:*** acid soils, alkarline soils.

***12. Give the summary of physical and chemical properties of soils.***

## *UNIT 6. ORGANIC MATTER IN THE SOIL*

***1. Translate and memorize the words and word-combinations:***

undecomposed organic matter

raindrops

supplement

chemical constituents

rate of absorption

tight soils

to form crust

a tangled mass

induce

water runoff

large amounts of manure

***2. Read and translate the text:***

Farmers in all ages have used the colour of a soil to assist in judging its productivity: the darker the soil the more organic matter content and the more desirable it was for crop production. Even today, dark-coloured soils are usually considered more productive than light-coloured ones. Undecomposed organic matter aids in crop production by acting physically to provide a

coat of protection against heat and cold and against the effect of beating raindrops.

No one can deny that plants can be grown successfully without organic matter. But everyone will agree that the most efficient way to grow plants is in a productive soil rich in fresh, decomposing organic matter.

Organic matter has many functions in the soils. Some of the essential nutrients for plant growth come directly from organic matter. Where it is insufficient, artificial fertilizers must be used to supplement it. Organic material contributes chemical constituents to soil water largely in the form of acid products. These chemicals perform several functions, but perhaps the most important is to break down some of the minerals of the parent rock, making them available to plants.

Organic matter is an important factor in the water capacity and rate of absorption of some soils. Often droughty soils are greatly improved by generous addition of organic matter. Tight soils with poor air circulation show marked improvement when organic matter is added. This is particularly important in the early stages of plant growth, at the time of seed germination and early root development. Soil with abundant organic matter shows little tendency to form crusts when they dry out after rains; therefore, the young tender plants have little difficulty in breaking through

the surface. In cultivated soils organic matter is an important factor of tillage. Not only does it contribute to the ease of cultivation, but it also reduces the delay of tillage after rains.

Organic matter reduces soil erosion. This is of particular significance where abundant undecomposed material remains on the surface and where plant roots form a tangled mass in the A horizon. Decomposed organic matter, or humus, also tends to bind together soil mineral particles, induce water absorption, check the rate of water runoff, and reduce the removal of surface soil particles by wind. Proper management and control of organic matter is one of the best means of preventing both water and wind erosion.

For any given soil in any given location, the organic matter content fluctuates between relatively narrow limits. Thus if a farmed soil contains 3 per cent organic matter under normal management, this can be reduced to possibly 2 1/2 per cent by poor management, and it can be raised to possibly 3 1/2 per cent by good management. The amount of organic matter in any soil tends to fluctuate over a range of about 1 per cent. Only by exceptional measures, such as annual applications of large amounts of manure, can this soil's content of organic matter be raised above 3 1/2 per cent, and only by very drastic means, such

as excessive cultivation without the use of animal manures or green manures, can it be reduced below the 2 1/2 per cent level.

**Organic Matter and Essential Elements.** Since all plants require 16 elements for proper growth, it is logical to conclude that the dead remains of these plants, like manure, contain all essential elements.

Organic matter, in addition to containing elements essential for plants, also contains elements necessary for livestock and man. These are sodium, cobalt, and iodine which are essential for animals but not for plants. Organic matter also contains traces of nickel and gold; in fact most of the elements in nature are found in plants.

Although organic matter contains all of the elements necessary for plant growth, these elements may not always be in the right balance for producing maximum crop yields [6, p.13].

***3. Ask questions to the text and answer them.***

***4. Complete the sentences.***

1. Proper management and control of organic matter is one of the best means of ……...
2. Often …….. are greatly improved by generous addition of organic matter.

3. Undecomposed organic matter aids in crop production by acting physically to provide ……....
4. Organic material contributes …… to soil water largely in the form of acid products.
5. Some of the essential nutrients for plant growth come directly from …….
6. ……. shows little tendency to form crusts when they dry out after rains.
7. Organic matter, in addition to containing elements essential for plants, also contains elements necessary for …….

## UNIT 7. FERTILITY

***1.Memorize the words and word-combinations:***

tillage – обробка грунту, оброблена земля

decomposition – розпад, розкладання

amendment – добриво, грунтополіпшувач

to retard – затримувати, уповільнювати, відставати

compaction – щільність, компактність

to smother – придушувати, задихатися

to inhibit – перешкоджати, стримувати, придушувати

to inoculate – зробити щеплення

subsequent - наступний

perennial – багаторічний, що триває цілий рік

***2. Read and translate the text:***

### FERTILITY

**Soil Fertility.** Nutrients to meet both the needs of the crop and organic certification standards may be supplied by several management tools: Animal Manure. Manure from any source must be composted for a specific period before application on organic fields (check with your certification body for specific requirements):

· The compost must not be allowed to pollute water sources and the pile must be turned regularly to allow effective decomposition.

· The levels of the various nutrients in the manure vary according to the type of animals, the nature of the feed and how the manure was stored. Manure generally contains all macro-and micronutrients, but rarely in the proportion needed by crops. Manure or compost analysis is essential to identify which nutrients may need supplementation from another source.

· Its physical and biological characteristics make manure an excellent amendment for low organic matter, eroded, saline and other poorlystructured soils.

**Green Manure**. A green manure is a crop grown primarily for the purpose of being plowed down to add nutrients and organic matter to the soil. Organic farmers consider green manure to be an essential part of the farm ecosystem. Green manure plays a role in soil improvement, nutrient management and pest management. It is effective in controlling erosion adding organic matter, improving soil structure, stimulating biological activity in the soil and reducing compaction. Legumes such as alfalfa and sweet clover can fix over 200 lb. per acre of nitrogen. Effective green manure smothers weeds, breaks insect and disease cycles and provides a habitat for bees, parasitic wasps, and other beneficial organisms. Fall rye and oats are particularly competitive. Some crops such as yellow sweet clover and mustard are allopathic and produce natural chemical toxins that retard germination and inhibit the early growth of weed species. The

value of green manure can vary with the type of crop and the timing of the plow down process.

**Legumes in the rotation.** When properly inoculated before planting, annual legumes such as peas and lentils will fix 50-90% of the N they require from the air. Legume residue breaks down more quickly than nonleague residue, which allows N to be available sooner to subsequent crops when the residue is worked into the soil. Perennial legumes such as alfalfa supply substantial amounts of N to the soil from their root systems, even though much of the top growth may be removed as hay or grazed pasture.

**Rotating high and low nutrient demand crops.** Different crops require different amounts of the various essential nutrients. Rotating high and low nutrient demand crops may avoid depleting one of more of those essential nutrients in the soil. Knowing the nutrient demands of various crops is essential to the producer and many resources are available to provide this information.

**Crop Residues**. Returning crop residues to the soil contributes tremendously to the organic matter and the nutrient pool available for new plant growth. Crop residues also prevent soil erosion and improve the water holding and infiltration properties of soils.

**Conclusion**. The health of the soil is essential for a successful organic cropping system. Any management practice that increases biological activity in the soil will enhance the

productivity of the soil environment. All living things depend on a healthy soil – plants, animals and humans alike. Proper attention to fertility in an organic production system will be the key to the farm's sustainability [5, p.41].

***3. Find the Ukrainian equivalents to the following words and phrases:***

Legumes, alfalfa, sweet clover, weed, bee, parasitic wasp, beneficial organisms, rye, oats, yellow sweet clover, mustard, allelopathic, chemical toxin, germination, weed species, pea, lentil, hay, grazed pasture, nutrient pool, properties of soil, fertility, farm's sustainability.

***4. Find true sentences according to the text.***

1. Nutrients to meet both the needs of the crop and organic certification standards.
2. Manure from any source must not be composted for a specific period before application. 3. Animal manure contains all macro and micronutrients needed for crops.
3. Green manure is being plowed down to reduce nutrients in soil.
4. Green manure plays a role in soil improvement, nutrient management and pest management.

5. Effective green manure smothers weeds, breaks insect and disease cycles and provides a habitat for bees, parasitic wasps, and other beneficial organisms.
6. Legumes will fix 50-90% of N if they are not inoculated.
7. Crops demand similar amount of essential N.
8. Crop residues prevent soil erosion.
9. The health of the soil is essential for a successful organic cropping system.

***5. Complete the sentences.***

* Nutrients to meet both the needs of the crops and organic certification standards may…..
* Animal manure must be composted for….
* Its physical and biological characteristics make manure….
* Green manure is a crop grown for…
* Green manure is effective in…
* Perennial legumes supply substantial nutrients to….
* Rotating high and low nutrient demand crops may avoid …
* Crop residues contribute …
* All living things depend on …

***6. Prove that:***

1. Soil testing is an important practice in managing an organic farm.
2. There are 17 essential nutrients required for plant growth.

3. Loss of nutrients may harm the environment.
4. Animal manure contains all macro and micronutrients but not in the proportion needed for crops.
5. Green manure plays a role in soil improvement, nutrient management and pest management.
6. Legumes may fix 50–90% N.
7. Different crops demand different amount of various essential N.
8. Returning plant residues to the soil contributes to the organic matter and N. pool.
9. Health of soil is essential for successful organic cropping system.

***7. Imagine that you are making a report on international conference on organic farming. Speak on different organic soil management techniques used inUkraine:***

1. Soil testing.
2. Nutrient requirements and N. run-off.
3. Animal manure management tool.
4. Green manure management tool.
5. Legumes in the rotation.
6. Rotating high and low N. demand crop.
7. Crop residues.
8. What is a key to farm's sustainability in Ukraine.

## *UNIT 8. FERTILIZATION*

***1. Translate and memorize the words and word-combinations:***

agrochemicals
calcium
carbondioxide
compensate
constituent
degradation
emit
exhaust
impact
liquid
mineral
nucleic acids
pesticide
phosphorus
potassium
raw materials
release
root
solution
sulphur
to protect
weeds
arable
magnesium
chlorophyll
concentration
decomposing
eliminate
enzyme
imbalance
insect
metabolism
nitrogen
nutrients
pests
plough
protein
reduce
residue
solid
storage
tillage
topsoil

***2. What kind of the text would you expect from the title "Food and Fertilizers" and the following key phrases which come from the text:***

plant nutrients, major nutrients, micronutrients, deficiencies of nutrients, plant gross suffer, exhausted soil, to replenish nutrients, fertilization, fertilizer application, manure.

***3. Cross out words and phrases which are not connected with the problem of using fertilizers in agriculture:***

fertilizers, organic, mineral, combine harvester, manure, increasing yields, nutrients, steering wheel.

***4. Find the most common word or word-combination among the following:***

nitrogen, phosphorus, potassium, plant nutrients, calcium, magnesium, sulphur.

***5. Before you read the text decide which of the following statements you agree or disagree with:***

a) Plants tend to exhaust the soil.

b) The best way to increase soil fertility is applying fertilizers.

c) It is preferable to add mineral fertilizers into the soil.

d) Fertilization is the only way to improve soil fertility.

e) Use of fertilizers has only positive effect.

***6. Scan the text quickly and find what the main components of a rich soil are and how plants are supplied with them.***

For this the following strategies are possible:

- look through subtitles
- look for key words
- look for word meaning through context
- categorize information
- classify information

***7. Read and translate the text:***

**FOOD AND FERTILIZERS**

We all, 5000 millions of us, depend on plants for our food, and plants depend on mineral nutrients for their growth and development.

13 elements derived from the soil are indispensable for all plant growth. They are called plant nutrient. An additional 4 or 5 elements are beneficial for proper development of some plants. Fertilizers are plant nutrients.

**Plant nutrients**. Plant form their complex organic matter from water and nutrients from the soil, carbon dioxide from the air and energy from sunlight.

Plants use six of the nutrients in relatively large amounts: nitrogen, phosphorus, potassium, sulphur, calcium and magnesium. These are called "major nutrients". They are constituents of many plant components such as proteins, nucleic acids and chlorophyll, and are essential for processes, such as energy transfer, maintenance of internal pressure and enzyme function.

The other nutrients are required in small or trace quantities and are referred to as "micronutrients" or "trace elements". They have a variety of essential functions in plant metabolism.

The metals are constituents of enzymes.

Micronutrients are Chlorine (Cl), Iron (Fe), Manganese (Mn), Zinc (Zn), Copper (Cu), Boron (B), Molybdenum (Mo).

When deficiencies or gross imbalances of nutrients occur, plant gross and development suffer.

For optimum plant growth, nutrients must be available for plants:

- in solution in the soil water
- in appropriate and balanced amounts
- at the right time.

Plants are supplied with nutrients mainly from:

- release of nutrients from soil reserves
- decomposing plant residues (roots, straw, etc.)
- organic manures
- mineral fertilizers
- biological nitrogen fixation
- aerial deposition.

Nutrients removed from the soil must be replenished, otherwise the soil becomes exhausted and crops will suffer and eventually fail.

Soil contains reserves of nutrients, e.g., the topsoil content of nitrogen ranges from some 3 to 20 t/ha. However, these reserves are mostly in forms unavailable to plants; only a minor portion in released each year through biological activity or chemical processes. Plants can only take up nutrients as water soluble compounds

When the nutrients supply is insufficient for crop needs, additional nutrients can be supplied in fertilizers to make up the difference. Mineral fertilizers are not substances foreign to nature: they contain normal plant constituents.

**Fertilizer application.** Most fertilizers are applied by surface spreading. In arable crops sowing and fertilization are combined in one operation, with the fertilizer placed near the

seeds. Later application of nitrogen are spread on the surface. Injection of liquid ammonia into the soil using special equipment and the spreading of fertilizers dissolved in water are also used in some regions.

Plants take part most of their nutrients from the soil solution through the roots, but they can also take up some nutrients sprayed on the leaves. This is the usual application method for correcting deficiencies of micronutrients.

Fertilizers should be used according to fertilizer recommendations published by governmental and agricultural agencies and by fertilizer producers. Increasingly, fertilizer plans are made for each field. Crop requirements, nutrient supply from soils as determined by soil analysis, residues from past cropping, manure application and local soil and climatic conditions are all important in estimating the fertilizer rate.

Application timing is also important. Needs vary with the stage of plant development. Too little fertilizer reduces crop yields, too much is wasteful and result in environmental problems.

**Manure.** Organic manure can be of plant or animal origin or a mixture of both. The largest quantities derive from the dung and urine of farm animals.

**Animal manure.** Depending on the method used for collection and storage, manure can occur in various forms: dry,

wet (urine), slurry (mixed dry and wet) or as a compost. Nutrient content depends on the species of animal, type of feed and method of storage. Manure is a source of organic matter and contributes to structure and humus content.

Sewage sludge is used in some areas as a manure through it often has the disadvantage of a high heavy metal content.

Part of the nutrients in manure is in water-soluble form and immediately available to crops. The rest is in insoluble organic matter and must be decomposed (mineralized) by micro-organism before becoming available. The rate of this process depends on many factors so it is difficult to predict the amount and timing of nutrient release following application of organic manure.

Guano, accumulated dropping of birds, seals and other wild animals, is a traditional fertilizer. Peru is the major supplier, but the production is only about 25000 tones per year. This is quite insignificant as a nutrient supply on a world scale.

Manure is a resource that should be utilized fully where available. But the application of manure only returns nutrients to soil. It does not compensate for nutrient losses and exports from the farm unless animal feed is brought in from outside. Farmyard manure was traditionally surface applied on arable land and cultivated into the soil. Slurry is mostly surface spread on grassland. Injecting liquid manure reduces, ammonia losses and

this practice is increasing. Handling of manure is labour intensive and requires special equipment. Some regions (e.g., Southern Netherlands) have so many animals fed oh imported feed that manure is produced in excess of local needs. Manure is bulky and long distance transport uneconomic. For this reason, drying processes are being developed that make a product which typically contains about 4 per cent nitrogen, 2 per cent phosphorus and 5 per cent potassium. However, processing costs are considerable.

**Green manure.** When fresh plant material is added directly to the soil without composting or passing through animals, it is termed "green manure". Use of green manure helps to prevent erosion and conserves nutrients but does not add nutrients except when legumes are used as a source for nitrogen [5, p.41].

***8. Read and translate the text, compare it with the previous text.***

In spite of the increasing use of synthetic fertilizers in agricultural practice and the subsequent raise of crop yields, it is found generally that to maintain a high level of inherent fertility their use must be accompanied by periodic applications of bulky organic manure, either in the form of farm manure, compost, or

other organic by-product, either of the farm or of certain industries.

The maintenance of high productivity depends on a number of factors; the soil must be in the optimum condition for crop growth and must be in a position to furnish both food and water; it must have a suitable reaction in the chemical sense, and it must contain no substances toxic to growth. It must be physically amenable to cultivation, resistant to forces of erosion, and the micro-flora and micro-fauna must be of a character to ameliorate the general chemical and physical properties of the soil and the soil-plant relationship. Any substance which when added to the soil brings about an improvement in any one of those directions could be considered as a fertilizer or manure using the terms in their widest sense, and it is in connection with these indirect benefits that organic manures are of such great importance in fertilizer practice.

As a source of plant food, farmyard manure contains all the important nutrients although their availability is variable. The potassium present is readily soluble and immediately available; the nitrogen is present in both available forms, and in compounds which only slowly break down; the phosphate compounds also decompose slowly. This is one reason why, for particular crops, applications of manure need to be supplemented with dressings of

inorganic fertilizers and in particular with available phosphorus compounds. The less available portions of the farmyard manure are slowly released and become of value to succeeding crops.

Whatever the type of soil, applications of manure can have a beneficial action upon the physical properties. Heavy soils can be made easier to work, and the aeration and drainage improved by means of the increased organic-matter content, whilst on sandy soils the moisture-holding capacity of the manure increases drought resistance, the binding effect of the organic matter controls erosion and the increased base- exchange capacity1 improves the power of the soil to retain plant nutrients. Soil colour will be darkened by the incorporation of humus, with an increase in the heat-absorbing power.

If a crop is growing under conditions of a single nutrient deficiency, the addition of appropriate fertilizer will give an increase in yield, but increases so observed are not directly proportional to the quantity of fertilizer used. As the rate of application increases, a given extra increment of fertilizer gives a smaller increase in crop until a maximum yield is reached. Beyond this figure further additions may either have no effect or may even do damage and cause crop reduction.

The growth responses following the provision of adequate supplies of two or more limiting nutrients are not necessarily the

arithmetical sum of the separately obtained responses. Quite frequently it is found that the increase in yield of a crop when supplied with two different fertilizers is much greater than the sum of the individual yield increases; the two fertilizers are then said to have a positive interaction.

The use of compound or mixed fertilizers is increasing and possesses many advantages from a management point of view. Labour costs are considerably lowered by the reduction of the number of operations necessary, and frequently compounds can be obtained commercially containing the nutrients in concentrated form, thus reducing the quantity to be applied in any particular instance.

Fertilizer must be put into the seed-bed, where it will do most good to the young plant as it grows. This is done in two ways: a) fertilizer is spread on the seed-bed before the seed is sown and usually harrowed in; b) fertilizer is put in at the same time as the seed and usually near to it in the soil. Top-dressing means putting a fertilizer onto a growing crop. It is commonly done with nitrogen fertilizers on growing grain crops such as a spring dressing of sulphate of ammonia for a crop of winter wheat. If the nitrogen had been applied in the seed-bed, most of it would be washed out during the winter. Lime and plant foods in fertilizers are not all used up in the year they are applied to the soil. Some of

the value is left over for a year or more and helps later crops [6, p.15].

***9. Read, translate the text and test yourself :***

**FERTILIZATION: ITS EFFECT**

The intensive use of inorganic fertilizers, particularly those that contain nitrogen and phosphorus, is a key factor in the high yields obtained per hectare in modem intensive agriculture. In the United States, increases in yield per hectare, due in the part to the use of such materials, led to a decline in the area of cultivated land by 27 million hectares between 1944 and 1969. During this period, fertilizer use climbed from about 10.9 million tons per year. This increase was necessary partly because of the depletion of nature fertility that had occurred since American farmlands were first put into cultivation. However it was permitted some agricultural land to return temporarily to grass and woodlands, which protected it from erosion and allowed fertility to build up again.

It is easy to demonstrate that the addition of inorganic fertilizers makes rapid and significant improvement in crop yields. In general, about 20 per cent of total crop and forage production is due to fertilizer use although the specific affect varies with crop and location. In other words, if present use of fertilizer were

stopped, the next season's yield would be expected to drop by that amount (all other factors being equal). On the other hand, a number of basic crop species, such as soy-beans and wheat neither receive much fertilizer nor show strong responses to it.

It is clear that fertilization is essential to permanent agriculture and just as clear that the fertilizing techniques in mechanized agriculture are highly successful. Nevertheless, there are negative side effects, moreover, the increasing energy costs and the important considerations of raw material availability make it essential to examine present fertilizers use critically.

More nitrogen fertilizers are used than any other. Now, however, a serious problem has developed in the form of increasing cost of nitrogen fertilizer. Hydrocarbon fuels are required in quantity both as raw material and as fuel to create the high temperature and pressure conditions needed for ammonia synthesis. As a result nitrogen fertilizer costs sharply reflect changes in petroleum prices. Alternative techniques of obtaining hydrogen such as the electrolytic breakdown of water molecules, at present used only in a few plants, also have high energy costs.

Much of the nitrogen fertilizer produced is applied as anhydrous ammonia a liquified gas. It is also converted to a number of other ammonium salts, nitrates, and other compounds

for use as fertilizer. These materials applied to the soil ecosystem create major changes in ecosystem dynamics.

The recent comprehensive estimates of the transfer occurring in the nitrogen cycle at the global level show that industrial fixation of nitrogen (about 30 tons per year) is still well below the rate of biological fixation (175 million tons).

A second intervention by man is the increased rate at which nitrogen oxides are introduced into the atmosphere by combustion. Most of these oxides are returned to the land surface by precipitation.

Intensive cultivation and livestock production have significantly increased the outflow of nitrogen from agroecosystems. We know that food harvests and accelerated erosion deplete the original soil nitrogen pools; two other factors also contribute to this depletion: the application of large quantities of inorganic fertilizers and the development of feedlots; poultry factories, and other sources of concentrated animal wastes.

Because of their toxicity, however, high concentrations of particular nitrogen compounds in crops and in water supplies can be a direct concern to health (when nitrate in the blood combines with hemoglobin and thus reduces its oxygen carrying capacity).

The growing use of nitrogen fertilizers has recently become a matter of concern in relation to the ozone layer of the

stratosphere. Some scientists believe that the ozone layer might be reduced by roughly 20 per cent during the first quarter of the twenty-first century as a result of current and future use of nitrogen fertilizers.

The ozone layer of the stratosphere acts as a shield to absorb incoming ultraviolet radiation. Among other effects, increased ultraviolet radiation raises the incidence of skin cancer. A significant harm to health could thus be created, and close attention must be given to the movement of nitrogen compounds through the atmosphere as well as other parts of the biosphere [6, p.15].

1. What kinds of inorganic fertilizers greatly affect the crop yields in modern

intensive agriculture?

a) containing potash;
b) containing nitrogen;
c) containing phosphorus;
d) containing manure.

2. Due to what techniques did American farmers try to improve soil fertility?

a) application of manure;
b) application of fertilizers;
c) return to grass and woodland;

d) land reclamation.

3. What is the serious problem that has developed in fertilization?

a) the increasing energy costs;

b) raw material shortage;

c) the increasing cost of nitrogen fertilizers.

4. What are the results of man's interventions into ecosystem dynamics?

a) the increased amount of nitrogen in atmosphere;

b) the increased rate at which nitrogen oxides are introduced into atmosphere;

c) the reduction of the ozone layer;

d) the increase of the ozone layer.

5. What reflects changes in petroleum prices?

a) the availability of nitrogen fertilizers;

b) the amount of nitrogen fertilizers used by farmers;

c) the cost of nitrogen fertilizes.

## *UNIT 9. ECOLOGICAL PROBLEMS*

***1.Memorize the words and word-combinations:***

excepting – крім

exhaustion – виснаження

calamity – лихо

to occur – траплятися, виявлятися

excessive exploitation – надмірна експлуатація

an explosion – вибух

a threat – загроза

to approach – наближатися

a destruction – руйнувати

to impoverish – виснажувати, збіднювати;

pernicious - згубний, шкідливий

negligent, prodigal relation – недбалість, марнотратне ставлення;

versatile - багатосторонній, непостійний, мінливий

famine – гостра нестача, недолік, голод;

to multiple – розмножуватися, збільшуватися;

to perish – гинути, губити, псуватися

scraps – відходи

surrounding – оточення, навколишнє середовище

“holistic” approach – цілісний підхід

interdependence – взаємозалежність

pursuit – пошук

to extend – розширювати, збільшувати

existence – існування

drastic changes – корінні зміни

to integrate – інтегрувати

to imply – мати на увазі

value – цінність

to assess – оцінювати

sustainable – витривалий

***2. Read and translate the text:***

**ECOLOGICAL PROBLEMS**

Mankind have no enemies excepting themselves, calamities of mankind occur from their own irrationalism. Therefore for the present it is impossible to name as «a noosphere» - that is to say the world, where the mind is ruling - the thin layer of space on a surface of Globe, where a man dominates. Now this still rich and perfect world collapses because of excessive exploitation of it by mankind economic activity that has increased enormously in connection with demographic explosion that has taken place. However the world is in crisis and the problems of mankind are not solved by their intellectual

leaders. The threat of ecological catastrophe approaches simultaneously from the different directions: pollution and impoverishing of the seas, oceans, rivers, underground waters, pollution and destruction of woods and agricultural grounds, pollution and change of an atmosphere, reduction of the protective ozone layer, pernicious changes of a climate, the rise of the ocean level, accumulation of deadly radioactive substance made by uncountable atomic power stations, the impoverishing of the vegetative and animal world, exhaustion of resources of the planet. Obviously the reason is not simply, as speak, «in the negligent, prodigal relation of a man to a nature». Global and versatile character of the ecological crisis point out on fundamentality of its reasons and, accordingly, requires fundamental, radical changes in life of mankind. «Love and famine rule the world» it is the main law of biosphere, the main law of ecology. Because the ecology is not «a science about pollution» as many people think. It is unnecessary to confuse ecology and sanitation. Ecology is a BIOLOGICAL science, the science about interaction of a population of any biological species (it is unessential just of a human) - and the environment of its living. At this interaction the main characteristic of a population is its number and the main characteristic of environment is amount of vital resources necessary for life of this biological species. For

example, if in closed volume the bacteria live, and they do not have enemies, they will multiplied and then will perish - or from famine, by having exhausted resources, necessary for their life, or, if they find new resources, they will multiplied further and will perished from poisoning of the environment with their own scraps [5, p. 66].

***3. Read the story and choose the sentences which are true to it.***

1. Calamities of mankind occur from human rationalism.
2. Now our planet is still a rich and perfect world.
3. The problems of mankind are not solved by their intellectual leaders.
4. The threat of ecological catastrophe approaches from one direction.
5. The reason of ecological catastrophe is simple.
6. «Love and famine rule the world» it is the main law of biosphere.
7. Ecology is the science about interaction of human beings.
8. The main characteristic of environment is amount of vital resources necessary for people's life.

***4. Match the columns:***

| | |
|---|---|
| Impoverishing | Enriching |
| Negligent | Constant |

| | |
|---|---|
| Versatile | Healthy |
| Excessive | Protective |
| Pernicious | Helpful |
| Prodigal | Vital |

***5. These sentences are written in the wrong order. Try to recollect their succession in the text.***

1. The threat of ecological catastrophe approaches simultaneously from the different directions.
2. Mankind have no enemies excepting themselves, calamities of mankind occur from their own irrationalism.
3. Global and versatile character of the ecological crisis point out on fundamentality of its reasons and, accordingly, requires fundamental, radical changes in life of mankind.
4. Ecology is a biological science, the science about interaction of a population of any biological species and the environment of its living.
5. Now this still rich and perfect world collapses because of excessive exploitation of it by mankind economic activity that has increased enormously in connection with demographic explosion that has taken place.
6. «Love and famine rule the world» it is the main law of biosphere, the main law of ecology.

7. At this interaction the main characteristic of a population is its number and the main characteristic of environment is amount of vital resources necessary for life of this biological species.
8. Obviously the reason is not simply, as speak, «in the negligent, prodigal relation of a man to a nature».

***6. Answer the following questions:***

1. Does mankind have any enemies?
2. Is it possible it to name our planet as «a noosphere» for the present?
3. Why do collapses take place nowadays?
4. Are the problems of mankind solved by their intellectual leaders?
5. From what directions does the threat of ecological catastrophe approach?
6. What is the reason of ecological catastrophe?
7. How do you understand the main law of biosphere and ecology?
8. Are there any ways to save the planet?

***7. Discuss ecological problems in small groups and the way to solve these problems.***

***8. Can you agree with all these definitions? If you can't, read the following text and try to answer the question: "What is ecology?"***

The dictionaries tell us that ecology is a scientific study of the natural relations of plants, animals, and people to each other and their surroundings. Ecology is more than a branch of biology. It brings together natural and social sciences, philosophy and it studies nature as a whole. This "holistic" approach makes it a broader subject. Its main theme and major idea is interdependence of all living beings.

For centuries people have been in the pursuit of their "proper role" on Earth – extending their power over nature as far as possible. As a result of it people have become a threat to their own existence. And ecological situation needs drastic changes in its treatment. That is why ecological thinking has to be integrated into politics. All policy- making must take the environment into account in order to avert global disaster.

Ecology implies global solidarity – that we are all responsible for everyone alive today, for future generations, and for the Earth as our home. It implies a different set of values: we must stop to assess people by their "efficiency", "productivity" and start thinking about health, harmony, beauty, nature, justice,

equality. It implies "sustainable development", improving the quality of human life while preserving and supporting ecosystems.

***9. Complete the sentences using the text.***

1. Ecology is a scientific study of ….
2. It brings together natural and social sciences…
3. Its main theme and major idea is …
4. For centuries people have been in the pursuit of …
5. As a result of it people have become …
6. Ecological situation needs …
7. Ecology implies …

***10. In the text find the synonyms to the following words and phrases.***

* natural relations
* to bring together
* drastic changes
* to imply
* to improve
* surrounding
* to extend
* to take into account
* sustainable development
* to preserve

***11. Argue the following statements (agree or disagree)***.

1. Ecology is protection and preservation of plants and animals and their habitat.

2. Ecological situation needs drastic changes in its treatment.
3. Ecology can provide exact guidelines and analytical tools to farm intensively all the Earth's recourses.
4. Ecology task is to extend human power over nature as far as possible.
5. Ecology implies global solidarity – that we are all responsible for everyone alive today, for future generations, and for the Earth as our home.

***12. Answer the following questions to the text.***

1. How do dictionaries define ecology?
2. Why does ecology bring all sciences together?
3. Why is so important to understand the way nature works?
4. Why has ecological thinking to be integrated into politics?
5. What is sustainable development?

***13. Give the summary of the article in 5-7 sentences using as many new words as possible.***

***14. Make up either a written story or an oral report about ecology, ecological situation and problems that the world faces nowadays.***

## *UNIT 10. EROSION OF SOIL*

***1. Translate and memorize the words and word-combinations:***

erodible land, excessive erosion, bare soil, water infiltration, eroding channels, velocity of water flow, water density, flood frequency and destructiveness, water interception, mulching, terracing.

***2. Read and translate the text:***

Soil erosion is the removal of soil from the land through the action of wind or water. It is a natural process that occurs even without human intervention. However, most forms of agriculture increase the erosion potential, especially practices that leave the surface of erodible land unprotected. Excessive erosion is a matter for serious concern. In a sustainable agriculture, soil erosion should not exceed the slow process of soil formation, and the prevention of soil erosion is a key issue in increasing the sustainability of agriculture.

Excessive erosion occurs with large variations in extent and causes between and within regions. It is difficult to measure and evaluate the gravity of the problem, but erosion is of special concern in areas such us the humid tropics, along the deserts and in parts of North America. In Europe, erosion is most serious in the Mediterranean regions.

Soil erosion by water generally begins where raindrops strike bare soil. Soil aggregates are broken up, the surface compacted, and water infiltration into the soil obstructed. Water with suspended fine soil particles runs off as surface water, giving sheet erosion, where a thin layer of surface soil is removed. The water flowing over the soil surface can form networks of eroding channels that cut into the topsoil. In the worst cases deep gullies are formed. Suspended particles increase the water density and channeling increases the velocity of water flow. Consequently, erosion starts gently and then rapidly accelerates.

The removal of forests has reduced water infiltration into soil in catchment areas and increased flood frequency and destructiveness. Floods enhance erosion.

Eroded material eventually settles out, filling up water reservoirs and estuaries. The silt deposit can improve the fertility of the receiving areas, but in general soil erosion degrades agricultural land.

Wind erosion occurs when bare soil is exposed to drought and wind, e.g., the dust bowl in the USA in the thirties and more recently in the USSR.

It follows from the mechanism of erosion that:

-sloping land is at greater risk than flat land, sloping land left fallow during the winter is at special risk

-erosion risks vary with soil type and structure

-vegetation reduces erosion, as leaves intercept raindrops and roots prevent channeling.

Overgrazing has damaged fragile grasslands and caused serious erosion, e.g., in Africa.

Ploughed land is at greater risk to erosion than grasslands. Specialized arable cropping generally suffers more erosion than mixed farming because with mixed farming part of the land is under grass and more organic matter is available for return to the arable part of the land. This gives some protection against erosion.

The extent of erosion is greatly influenced by soil management.

Techniques are available for reducing soil erosion, e.g.,

-water interception with soil banks, strips of grass or forests

-contour ploughing

-use of winter or catch crops, intercropping

-mulching

-no-till practices

-drainage

-terracing, forming horizontal patches of land on steep hills, a characteristic man-made landscape feature both in South-East Asia and elsewhere.

Proper fertilizer use can help minimize erosion by ensuring an ample supply of roots and plant residues. Where erosion has removed topsoil, liming and fertilization help the reestablishment of a good plant cover [ 7, p. 75].

***3. Decide which of the following statements you agree or disagree with:***

a) Erosion of soil gives cause for concern in agriculture.
b) Erosion is of special concern in areas such us the humid tropics and the deserts.
c) Plants play a very important part in conservation and protection of soil.
d) There is no way to reduce erosion of soil.

***4. Read information given in the text and find how the use of fertilizers influence erosion of soil.***

***5. Write your own opinion on how to prevent the erosion of soil.***

***6. Here are some of the greatest threats to the world's environment and their causes. Match them. Sometimes there are two or three effects for one cause.***

| Threats | Causes |
|---|---|
| 1) pollution of rivers / lakes / oceans | a) burning of fossil fuel |
| 2) global warming (greenhouse effect) | b) rapid industrial development |
| 3) damage to the ecological balance | c)overuse of natural resources |
| 4) acid rain pollution | d) too much traffic |
| 5) changes in the local climate | e) use of pesticides |
| 6) extinction of plant and animal life | f) unsatisfactory waste disposal |
| 7) destruction of rainforests | g) motorway construction |
| 8) air pollution | h) intensive tourism |
| 9) energy shortage | i) uncontrolled cutting of forests |
| 10) human and industrial waste | j) uncontrolled hunting and fishing |

***7. Read and translate the text:***

**SOIL CONSERVATION**

Modern soil conservation is concentrated in three major areas: controlling soil erosion; stopping soil pollution; and

regulating land use to ensure that all land is used as efficiently as possible.

A few years ago, soil erosion was thought a farm problem that did not concern anyone but farmers. Today, this type of thinking has nearly disappeared and many people have begun to understand the problems of erosion in urban and recreational areas. Simply stated, erosion is the transportation of soil from one place to another by either wind or water. To the farmer, this usually means losing topsoil from his productive lands and the possible siltation of his farm ponds and streams. To the urban land user, it means eroded areas in urban developments, muddy streets, and siltation in sewage lines and reservoirs. To the naturalist, erosion means siltation of lakes with soils, pollutants carried in the soils, and ugly scars on the landscape.

Water erosion takes place whenever flowing water passes over a loose soil and carries sonic of it away. There are four basic types, of water erosion:

- splash erosion: raindrops strike the soil surface and break soil into fine particles that can be carried away;

- sheet erosion: water moves across the soil surface and removes thin sheets of soil;

- till erosion: water moves across the soil surface and cuts many small ditches a few inches across;

- gully erosion: water flows across one spot long enough to cut large gullies.

Although all of these types of erosion are important, the sheet and till types are especially dangerous because they are not always obvious until all of the topsoil is gone. To understand better how all these types of water erosion take place, let us briefly review the factors that are responsible for them.

Amount and distribution of rainfall: the amount of erosion that will take place is determined by both the amount of a given rain and the duration of the rain. Large amounts of rainfall in a short period of time can serve erosion, but the same amount of rainfall over a long period may not cause any erosion.

**Slope of the land:** the slope of the landscape controls the velocity of runoff water. Thus, steep slopes erode more rapidly than flat areas.

**Size of the watershed:** the rate at which a drainageway erodes depends greatly on the size of the watershed behind the drainageway. Certain steep slopes can stand fairly high velocity rains provided these slopes drain only small areas. Similarly, severe erosion can occur on 2 to 3 per cent slopes if they are long and drain large acreages.

Soil characteristics: those soil characteristics that affect infiltration and percolation (soil texture, structure, and

consistence) also control erosion. Water runoff is increased as infiltration decreases. This increase in runoff causes increased erosion.

**Vegetative cover in the watershed:** even on steep slopes, heavily vegetated watersheds seldom erode. The erosion potential is greatly increased as the use of row crops increases and when the soils are not vegetated during some portion of the year.

All of the previous factors determine how much erosion will take place. Thus, they should all be considered in developing an erosion-control program.

Wind erosion is usually a sheet erosion that leaves behind drifts of soil and holes. Until a few years ago, this type of erosion was not important. With the Incorporation of small farms into large units and the creation of large fields, this problem is becoming important, because many windbreaks have been removed.

**Mechanical control measures:**

Establish vegetated waterways.

Use contour tillage.

Construct terraces (works on slopes up to about 12 per cent).

Use diversion ditches and dead furrows to remove water across rather than down the slope.

Use sediment traps in catchment basins.

Use sedimentation ponds to entrap sediments at the head of major drainageways.

**Vegetative control measures:**

Crop according to the intensity determined by the land capability class.

Use strip crops.

Use soil mulches and no-tillage planting techniques.

Increase soil structure, if possible.

Add organic matter to the soil whenever possible.

Grow cover crops in the winter.

Plant wind breaks.

Plant annual grasses on construction sites that cannot be permanently seeded.

The sol acts as a purification system that is capable of holding many pollutants and tying them up so that they become inactive. However, the soil's holding capacity can quickly be saturated and the soil sterilized to a barren, polluted, unproductive area that can erode and become a further source of pollution. Soil pollution is not limited to any one phase of soil use. Agriculture, industry, and urban development all contribute to soil pollution.

In agriculture, soil pollution can result from improper use of agricultural chemicals (including fertilizers) and the improper

management of waste products. The previous does not mean that agricultural chemicals are posing a threat to our soil when they are handled properly. Pollution is caused by improper applications because of poor equipment, neglect on the part of the applicator, improper disposition of chemicals.

In addition to pollution from agricultural chemicals, agricultural pollution also results from soil erosion and animal waste management problems. Animal manures are an excellent source of nutrients. However, concentrations of livestock in small areas can cause excessive accumulations of waste materials. If these waste materials are returned to the soil, they are quite useful as fertilizers. If they are allowed to erode or move into streams, they can become harmful to the environment.

It should be remembered that animal wastes are usually a concentration of useful nutrients that may be beneficial if they can be redistributed to the soil. These wastes are easier to handle than industrial, urban, and municipal wastes that may contain toxic substances harmful to the soil.

The problem of industrial waste is very complex. It ranges from waste consisting of warm water to biological and organic materials to toxic inorganic components. Strong social concern over the environment has demanded through legislation that these wastes be contained or neutralized by the industries responsible

for them. Waste-treatment facilities range from simple holding ponds for evaporation to complex chemical systems designed to remove toxic components from waste water, smoke, and sludge. Once the toxic substances are removed, the remaining water and sludge are usually returned to the soil to complete the removal of nitrogen, phosphates, and other plant nutrients. The installation and operation of these facilities are quite expensive.

Today, most solid waste is contained in landfills. The landfill consists of a mass of compacted solid waste encased in clayey materials so that water cannot percolate into or out of the waste. In areas of deep, well-drained soil, the waste is placed in a trench, compacted, and covered daily with 4 to 6 inches of soil. When the trench is full, a layer of clayey materials is applied and compacted. Topsoil is then graded over the clay, and the area is reseeded to grass, crops, or trees. On low, poorly drained areas, the landfill is often placed on top of the soil to avoid water-table contamination.

A detailed knowledge of soil properties is very important in selecting landfill sites and determining operational specifications.

Although the landfill is a satisfactory method of waste confinement, it uses valuable land and is subject to failure resulting from construction techniques. It is probably a short-lived

technique that will be replaced by waste - management technology capable of recycling the waste products.

The disposal of human wastes is handled by septic tanks in rural and urban areas and by the municipal sewage system within towns and cities. The average septic tank receives the household wastes from the bathroom, laundry room, and kitchen sink. These wastes are held in the septic tank until anaerobic microorganisms break down the organic components into solid, which settle to the bottom of the tank, and liquids, which are pushed into a filter field for aerobic degradation.

Soil characteristics of the filter field determine the field size and efficiency. Filter fields seldom work satisfactorily in clayey soil. The effluent (waste water) will rise to the surface and become a source of pollution. On sandy soils, the effluent will percolate through the soil and may contaminate wells and ground water supplies.

If the water-purification facility does not remove all nutrients, the waste water is often irrigated on land areas and purified as it percolates through the soils. The characteristics of the soil receiving the sludge and waste water are very important, because they determine the acceptable rates of application. If these materials are overapplied, severe problems may result. It should be obvious that soils play an important role in waste

disposal and management. If the role of soils in these areas is taken lightly, our soils may become severely polluted from many sources.

With the ever-increasing population-growth pressure, the need to use all land very efficiently becomes increasingly important. Formerly, lands such as mountain peaks, inland swamps, and tidal marshes were thought of as worthless. However, it has been shown that all of these areas greatly contribute to our ecological system. Furthermore, these areas are often very fragile, and disturbances such as cutting timber, draining swamps, and dredging marshes often temporarily – or even permanently – destroy them.

In addition to the destruction of fragile ecological systems in some land-use areas, the United States, for example, is faced with the problem of urban and industrial development competing with agriculture for prime land. Prime agricultural soils are rarely used again for food production once they have been taken for highways and or urban and industrial uses. This competition for agricultural lands is depleting our food-production base as well as forcing marginal lands into agricultural production. Although the short-term effects of diverting prime agricultural lands to other uses may greatly help certain portions of our society, the longterm effects are higher food prices and insufficient food production.

To combat these problems – the destruction of fragile areas and a decreasing agricultural base – governments at all levels are looking at land-use regulations schemes. The following methods of land-use regulation – or a combination thereof – are the most common:

Zoning

Differential taxation

Land-use legislation

Zoning is the land-use regulation tool that is most often used to regulate the use of land in and around towns and cities. Essentially, zoning is the allowable uses for certain parcels of lands. If the landowner wishes to use these lands for other purposes, he must request permissio*n* from the local government, present an explanation of these uses.

Differential taxation is a land-use regulation tool often used by countries to keep prime lands in agriculture. It is customary for the land values around cities to inflate, as the cities expand, to the point where the owner must sell or subdivide to pay the property taxes. By allowing the owners of prime farm lands an agricultural tax base, growth and development is often forced to less than prime agricultural lands. Of course, most differential taxation plans contain provisions that specify that the owner of

lands that have been declared agricultural must pay a penalty if they are later used for other purposes.

Land-use legislation is the tool most often used by state and federal government to protect certain fragile areas from destruction. Nearly all land-use legislation is more general than zoning and aim at enforcing certain ideals rather than at protecting or regulating given parcels of land.

All land-use regulation techniques have much in common. For the benefit of society, they restrict the landowner's right of land-use. These regulations are rapidly being enacted throughout the nation; they will ultimately become part of the broad field of soil conservation.

## SUMMARY

This article presents the broad areas of soil conservation, soil pollution and waste management, and land-use regulation. It is everyone's duty to become involved in the political process of land-use regulation. It is our hope that all will base decisions on sound principles of soil science [7, p.93].

## QUESTIONS:

1. What is soil erosion?

a) siltation of farm ponds and lakes;

b) siltation in sewage lines and reservoirs;

c) losing topsoil;

d) transportation of soil from one place to another.

2. What are the possible types of soil erosion according to its source?

a) surface erosion;

b) sheet erosion;

c) water erosion;

d) splash erosion;

e) wind erosion;

f) rill erosion;

g) gully erosion.

3. What are the most dangerous types of water erosion?

a) rill erosion;

b) gully erosion;

c) splash erosion;

d) sheet erosion.

4. Which is the usual type of wind erosion?

a) gully erosion;

b) sheet erosion;

c) splash erosion;

d) ri11 erosion.

5. What are the factors responsible for water erosion?

a) annual precipitation;

b) amount and distribution of rainfall;

c) farm practices;

d) slope of the land;

e) size of the watershed;

f) soil characteristics;

g) vegetative cover in the watershed;

h)type of soil.

6. What are the characteristics of soil that affect infiltration?

a) soil texture;

b) soil compaction;

c) soil structure;

d) soil consistence;

e) soil salinity.

7. Which of the following control measures belong to mechanical ones?

a) use of soil mulches and no-tillage planting techniques;

b) constructing terraces;

c) establishing vegetated waterways;

d) adding organic matter to the soil;

e) planting windbreaks;

f) using dead furrows across the slope.

8. What are the possible sources of pollution from agriculture?

a) chemical plants,

b) soil erosion;

c) animal-waste management;

d) poor municipal sewage systems;

e) improper use of agricultural chemical.

## *UNIT 11. LAND RECLAMATION*

***1. Read and translate the text:***

### *STORAGE AND DISTRIBUTION OF WATER FOR IRRIGATION*

The regime of most great rivers is irregular. Frequently, they carry their greatest volume of water in spring and in late autumn and winter they may be reduced to mere trickles of water. To control these rivers and to regularize their regimes by storing water in the dry seasons, dams and reservoirs are constructed.

Dams, known also as barrages and weirs, are barriers built across rivers or streams to control the flow of water. Today most dams have several functions, which may include the storage and diversion of water for irrigation, the raising of water for generating hydroelectricity, and the provision of flood control. Dams have been constructed for thousands of years, at first of earth and later of stone.

Sometimes, the source of water may be lower than the area to be irrigated, especially if the river runs in a canyon, and the water itself often has to be transported considerable distances from the river to the fields. In such cases, complex systems of pumping stations and canals may be necessary to lift and move the water from the reservoir to the fields.

A large-scale system of irrigation requires a complex network of dams, pumping stations and canals. In addition to the main dam, whose reservoir is the main storage unit, smaller diversion dams are needed to direct the water into an intricate canal system. The water is led from the dams into broad canals by gravity, and where these major canals, because of local physical conditions, are unable to receive their required water by gravity, pumping stations may be installed. These plants frequently receive their power from energy generated from power stations at the main storage dam.

From the main canals, water is diverted into a system which will distribute it throughout the farm. The most common means by which this is done is with open ditches or laterals, and the flow of water into them is controlled by head- gates or regulators. They are frequently earth ditches, which may suffer from excessive losses owing to seepage and evaporation, especially in arid regions or in areas of porous, sandy or gravelly soils. To eliminate such wastage, the use of tubing in place of open ditches to carry water from the canal to the land has recently been introduced. Tubing also prevents the loss of land otherwise used for ditches.

Leading from the permanent open ditches are secondary or field ditches. They are ploughed in at the end of the growing

season, as they would otherwise act as obstacles during harvesting. Water is delivered from these ditches to the areas to be irrigated by means of check structures or turn-outs. Increasingly, however, water is being transferred from the ditch over the ditch bank into individual fields or furrows by means of siphons. These may be plastic, metal or rubber, and depending upon the size and volume of the water supply, may have flow capacities from as little as one gallon per minute to over 1,000 gallons per minute.

A very efficient way of conveying and distributing irrigation water is by means of pipe-lines. This method has many advantages: it practically eliminates losses due to evaporation and seepage; it reduces maintenance work, makes water control easier, eliminates the problem of weeds which grow along the banks of the open ditches, and makes it possible for water to be carried by gravity or under pressure. Such pipelines may be permanent installations or portable. The former usually consists of buried concrete supply and distribution lines, while the latter consist of metal or flexible surface pipes. Because of the very high cost of installation, however, pipe-lines are still relatively uncommon, and they are generally found in areas where water is scarce and crops are valuable [6, p.48].

***2. Find in the text terms relate to:***

1) water storage for irrigation;

2) distributing irrigation water.

***3. Find in the text the paragraph, which describes:***

- method of transmitting and distributing water for irrigation;
- find the propositions and positive estimation of the method.

***4. Write abstract to the text «Storage and Distribution of Water for Irrigation».***

***5. Read and translate the text:***

***FROM THE HISTORY OF DAM CONSTRUCTION***

Less than thirty miles from Cairo, in the Wadi-el-Garrawi one can still see the abutments of a huge dam. Its failure was so catastrophic that nothing of the sort was attempted again till over 3,000 years passed. It is supposed to have been built from 2950 to 2750 B.C. by some unknown Pharaoh with an architect far ahead of his time.

For an initial experiment in dam construction the size of the structure is surprising. It is 348 feet long at the top and about 265 feet at the base. It originally had a height of 40 feet. The

construction of so huge a dam must have occupied the energies of many hundreds of men and animals for a whole season in this desert place. Quite possible the construction took place in summer to avoid interruption by floods. The dam was faced on the upstream side with a carefully laid covering of limestone blocks of about 50 lb weight.

Except for the carefully laid upstream face, the dam appears to have been built in haste, particularly the downstream portion or, rather, what remains of it. One obtains the impression that the architect was pressed for time. He didn't think that the impounded water might one day overflow the dam and ruin the structure.

One observes, too, no spillways were provided to carry off surplus water. This absence of spillways leads us to the conclusion it was never intended to fill the reservoir completely. The problem before the ancient engineer was to build a dam large enough to withstand and contain any flood that was likely to come down the Wadi-el-Garrawi. The ancient Egyptians had an empirical formula for computing the volume of a cylinder and may have had some rough idea of how much water their reservoir would hold, if filled.

Evidently the dam had been erected to provide drinking water for the workers and beasts at alabaster quarries.

How much rain was it reasonable to expect? We, moderns, have an advantage over the designer of the Wadi-el-Garrawi dam. We know the area of the catchment upstream the dam and we have rainfall records for over forty years. To estimate the proportion of runoff to rainfall is always difficult since it depends on the intensity as well as the actual amount of the fall. The slope of the catchment is very important, as well as absorption on a parched desert surface, the latter being a diminishing factor.

A rainfall of 10 millimetres or over in a single day occurs on the average in three years out of four in that place. During forty years there were 20 such falls, 10 of which exceeded 20 millimetres.

The ancients were obviously ignorant of the fact that a single millimetre of runoff from the catchment area of the Wadi-el-Garrawi is represented by a volume of water of 185,000 tons.

And so we came to the catastrophe. Not long after the dam was finished, perhaps with the very first flood to come down the Wadi — there is no silting upstream the dam — a breach took place. A fall of 20 millimetres, of which there have been ten in forty years there, would be quite sufficient. Of that 20 millimetres, 8 would be immediately absorbed and a quarter of the remainder, between 500,000 and 600,000 tons would go rushing down the Wadi, fill the reservoir and overflow the dam. In a thundering

cataract it was pouring down the downstream face and in a few hours the dam was destroyed. The contents of the dam would then rush down the Wadi to the cultivated lands and the Nile. So, in a few hours and probably at night were destroyed all the results of the labour of many hundreds of men and animals and the reputation of the engineer.

For us, situated at the distance of 5000 years, it is hard not to feel sympathy with the unknown engineer who so boldly attempted the impossible — for that age. Had he made use of mortar, had he provided a spillway, had he chosen a wadi with a gentler slope, how different might have been the history of Egyptian irrigation [6, p.51].

***6. Define the words:***

flood, rainfall, dam, catchment, runoff

1. The amount of rain, usually expressed in millimetres or inches; depth of water on an area that reaches the surface of the earth. 2. A barrier across a watercourse for the purpose of impounding water barriers built to raise water-level, to divert water, to create a hydraulic head 'which can be used to generate power. 3. A relatively high flow in a river, markedly higher than usual; a body of water, rising and overflowing land. 4. The area from which a lake stream or reservoir receives surface flow which originates as

precipitation. 5. Portion of total precipitation from a given area that appears in natural or artificial streams.

***7. Write abstract to the text «From the History of Dam Construction ».***

***8. Read and translate the text:***

***METHODS OF IRRIGATION***

The methods by which irrigation is applied to the land should depend, under ideal conditions, on individual land features such as the slope of the land, the crops to be irrigated, the nature of the water-supply and the ability of the soil lo absorb and hold water.

There are four general methods of applying water: 1) by flooding, thus wetting all the land surface; 2) by furrows, thus wetting only part of the ground surface; 3) by sprinkling, in which the soil is wetted with a spray; 4) by subirrigation, in which the soil is wetted only a little if at all, but in which the subsoil is saturated. The first three methods conic under (he general heading of surface irrigation.

Flood irrigation generally requires large streams or canals, gentle topography (ground slopes should usually be no greater than three per cent) and careful levelling of the land. In theory, it

should be possible to ensure that every part o the area to be irrigated absorbs the predetermined amount of water; but in practice, although all parts usually receive an adequate amount, some receive too much. For this reason, flood irrigation is more suited to close-growing crops like rice.

Furrow irrigation is a method by which water is run in furrows, normally made by cultivating between crop rows. The earth is thrown up into ridges between the furrows and the seeds are planted in the centre of the ridges. Furrow irrigation is very common because it is adaptable to a great variety of land slopes and soil textures and can be used with either large or small streams of irrigation water.

Difficulties may arise with the use of furrow irrigation on unsuitable soils. If the soil is very pervious, the water running along the furrows may sink vertically into the soil without ever reaching the centre of the ridges where the seeds are sown. On the other hand, the soil may be so impervious that the water does not reach the centre of the ridge and the seeds do not germinate anyhow. A more general disadvantage of furrow irrigation is that to ensure that the whole of the irrigation area receives enough water, it is almost always necessary to overwater some parts.

Sprinkler or spray irrigation applies water to the surface of the soil in the form of a spray, and is a form of artificial rain. A

common type of sprinkler head is the revolving one, which distributes water radially. This form of irrigation has advantages over other surface irrigation. It can be adapted for use on almost all types of soil, especially sandy soils which absorb water rapidly. It enables erosion to be controlled on steep land and can often be used on soils that are too shallow, too steep or too rolling to be irrigated by surface methods. Small streams of water can be used efficiently with this method, and it is adaptable to all the major crops with the exception of those, like rice, that require standing water. A uniform application of water is made possible, and the amount and timing of the irrigation can be easily controlled. Land is not needed for irrigation structures, and so larger areas are available for cropping.

There are, however, a number of disadvantages of sprinkler systems. The water distribution is easily affected by the wind, which may disturb the pattern of wetting so that some parts get too much water and some too little. The power requirements necessary to maintain the water pressure are usually greater than for other methods of irrigation, and the water used must be clean and free from debris. To ensure the most economical use of the equipment, a constant supply of water is needed. Most important of all, the initial costs of installing such systems are very high. It is especially popular as a form of supplemental irrigation in areas

with adequate rainfall, as it requires the least alternation of normal techniques of cultivation.

Subirrigation or subsoil irrigation applies water beneath the ground rather than on the surface. By means of lateral ditches or mole or tile drains, a water-table is maintained at some predetermined depth below the soil surface. From the water-table the water seeps upwards to the plant roots through capillary action. This method of irrigation requires complete control of the elevation of the water-table to ensure that the plant root zone in the soil is kept free from excess water. Lands suitable for this method of irrigation are rather limited, since it requires a special combination of natural conditions. It needs a layer of permeable soil immediately below the surface to allow the free movement of water, and a level surface which should be approximately parallel to the water- table [6, p. 53].

***9. Name four methods of irrigation related to:***

1) watering of plants by applying the water below the ground surface; 2) a method of irrigation in which water un¬der adequate pressure is sprinkled over the land; 3) a method of irrigation in which water is made to cover the surface of the land to a considerable depth for a considerable period after which it is drawn off; normally one such flooding is enough for the whole

growing period; 4) a method of surface irrigation in which water is run in furrows between crops.

***10. Write abstract to the text «Methods of Irrigation».***

***11. Translate the text and answer the question:***

«Why must sandy soils be irrigated more frequently than heavy soils? ».Soil erosion is much less severe with sprinkler irrigation than with furrow irrigation. Even with sprinkler irrigation, however, serious erosion can occur particularly on a sandy soil that is kept cultivated. Sprinkled water may produce deep furrows and heavy sprinkling or rains may cause erosion on a bare soil.

The sandier or shallower the soil, the less moisture it holds after an irrigation. As plants seem to use water from a sandy soil at about the same rate as from a heavy soil, the sandy soil needs to be irrigated more frequently

***12. Read and translate the text:***

***AUTOMATION IN IRRIGATION METHODS***

In order to form one kilogram of dry matter, wheat draws out of the soil 300-400 litres of water, maize 200-300 litres and cotton 500-600 litres. With a cotton yield of 3,5-4.0 tons per

hectare, 5,000-6,000 tons of water have to be delivered to every hectare of the plantation during the vegetation period. In those areas of the USSR where cotton is grown, the summer is dry and all the water necessary for the harvest has to be delivered to the fields over a network of artificial canals and ditches. Many large hydrotechnical developments are fitted with devices for mechanizing and automating the gate controls. The operator has but to press a button on the control panel to make the water flow into the lake-off canal.

The water that comes to the field must get to the roots of every plant. There are as many as 100,000 cotton shrubs, 3-5 million rice and wheat plants on a hectare of land. There are machines operating on the rain principle. Water is elevated to the height of one or two metres and sprinkled over the plot. Such machines are adequate for supplying fields with small quantities of water — 300-400 cubic metres for every watering.

But what about the arid conditions of the south of the Ukraine, the Caucasus and Central Asia, where 6,000-10,000 cubic metres of water have to be delivered to every hectare of crops? In these conditions the use of sprinkling machines does not always pay.

Many scientists and specialists worked hard at the problem of irrigation mechanization. A new system of a combined irrigation network has been developed by Soviet scientists.

What is this system like? The combined gravity-head irrigation network consists of permanent underground delivering and watering pipe-lines and of movable flexible watering hoses. The pipe-lines and hoses are made of polyethylene or similar material. The stationary watering pipe-lines may be made of asbestos cement.

The underground delivering pipe-lines are laid along the whole length of the plot to be watered. To both sides of the pipe-line, watering pipes and movable watering hoses are provided. On a plot 2,000 metres long and 1,000 metres wide it is sufficient to have two delivering mains spaced 500 meters from each other.

Flexible watering hoses are attached to water hydrants of the delivering pipe-line. The hoses and underground watering pipe-lines are perforated, the holes matching the row width. The furrow method of irrigation is the most suitable one for the combined irrigation network.

Water is fed from the canal directly into the underground delivering pipe-lines via the water take-off facilities. The necessary head is created in the network by taking advantage of the natural slope of the area.

In the elevated part of the plot, where there is no adequate head in the delivering pipe-line yet, watering is carried out with the aid of movable flexible watering hoses placed on the field surface. In the lower part of the plot, it is sufficient to open the gates in the distributing wells to make the water rush into the underground watering pipe-lines. Flowing out of holes in these pipe-lines, the water finds its way through a 25-30 centimetres layer of soil, as little springs it flows into the furrows, moistens the soil around and reaches the roots of the plants.

The ends of the delivering and watering pipe-lines are fitted with special flushing valves which serve to free the pipe-lines of silt. When they are opened, the force of the water stream hurls the silt beyond the network.

The characteristic feature of the combined irrigation network is that it distributes water uniformly among the furrows through underground watering pipe-lines and flexible hoses. A turn of the gate changes the spurt simultaneously in 300- 500 furrows within a few minutes. Besides, fertilizers may be supplied to plants together with water. The combined watering system makes it possible to water a 10-15 hectare plot simultaneously. The production of a ton of cotton takes 15-20 per cent less irrigation water than with conventional watering methods.

A stable 15 per cent increment in cotton crop yields has been obtained on plots irrigated by the new system. And, last but not least, the soil is made fuller use of due to the removal of the temporary irrigation network and the efficiency of tractors is increased by 20-25 per cent [6, p.56].

***13. Give definions to the following words and word-combinations:***

suitable, simultaneous, stationary, automatic, flexible, movable, conventional fixed, not movable; self-acting, working by itself; done at the same time; that can be moved or carried from place to place; that will bend without breaking; correct for occasion; traditional, not new or original

***14. Complete the sentences.***

1. In the elevated part of the plot watering is carried out by means of... . 2. In the lower part of the plot water is applied to the soil through .... 3, From the canal water is fed to the underground delivering pipe-lines via ... . 4. To free pipe-lines of silt delivering and watering pipe-lines are fitted with ... .5. The characteristic feature of the combined irrigation network is uniform ... of water among the furrows. 6. One of the advantages of the system is that ... may be supplied to plants together with water. 7. This method

has several advantages over ... irrigation methods. 8. Due to the removal of the temporary irrigation network the ...of tractors is increased. 9. The combined irrigation system makes it possible to replace ... irrigation methods by automatic ones.

***15. Put the words and word-combinations in right order according to water rush process in combined irrigation network***

field furrow, canal, take-off, delivering pipe-line, flexible watering hoses, roots of the plant

***16. Write abstract to the text «Automation in Irrigation Methods».***

***DRAINAGE***

Getting the water onto the land is only part of the problem that faces the farmer; of almost equal importance is the disposal of water after use. Too much water in the soil can be worse than not enough, while inadequate planning and improper irrigation frequently result in salination and water logging. Salination occurs because the roots of the plants absorb the irrigation water but exclude most of the salt it contains. The salt remains in the soil zone upon which the plant depends for growth and eventually renders the soil sterile.

To prevent catastrophic consequences, which are too common in many areas, there must be complete and efficient control of irrigation water. It is difficult to overestimate the harm caused by salination and water logging; indeed, reclaiming lands ruined through faulty or misused irrigation is almost as important as bringing new lands under irrigation for the first time.

If reclamation is to be successful, the basic problem is to lower the water-table so that it is kept below the root zone. This may be achieved in a number of ways: a grid of deep ditches may be laid along the boundaries of the fields, or lines of tiles laid in the fields to collect the water and convey it to a collector ditch.

Many areas, particularly in the arid parts of Asia, cannot be conveniently or economically recovered by normal drainage processes. One method of restoration in these circumstances requires the installation of tube wells for pumping the areas to be drained and using the pumped water for further irrigation elsewhere. This method is of growing importance in some countries, but it can be very costly, sometimes proving more expensive than bringing in new irrigated areas. The use of tube wells for this purpose is likely to increase when cheap hydroelectric power becomes available on a larger scale.

However, it is necessary not only to reclaim areas that have already been spoiled, but also to prevent further ruin. This

can only be done by a more efficient use of water, and one way of ensuring this in the future will doubtless be by using automatic control systems. Soviet scientists have recently developed an experimental system at the Kirghizia Automation Institute in Central Asia. There an irrigation canal is parted into separate sections, and in each section a stable water level is maintained automatically. It is held that this system will eliminate disastrous local shortages of water by maintaining stable levels of water in the irrigation canals serving a large area. Such a system is very expensive, but it is claimed, doubtless under favourable conditions, that the capital costs can be regained in less than two years. Ultimately, it is hoped that large canal systems will be controlled by computers. Data on the condition of the irrigated areas, including the humidity of the air and soil, the density of the soil and the nature of the crop, would be fed into a computer, which would then estimate the water requirements for given areas and select optimum water regimes for each section of each canal and for the system as a whole. The first results of recent experiments along these lines suggest that they bring about considerable savings both in the consumption of water and in the cost of irrigation.

To summarize, an efficient, modern irrigation system should properly perform the following functions: 1) store water so

that it is available in sufficient quantities whenever required; 2) deliver water to all parts of the cultivated area, in amounts needed to meet crop demands during peak use periods; 3) provide complete control of water; 4) divide water into required amounts for use in different fields; 5) dispose of waste water after use; 6) allow for the free movement of farm machinery. Properly utilized, such a system allows for the most efficient use of water and makes irrigation possible without soil erosion, saline or alkaline accumulation, or water logging [6, p. 59].

***17. Write abstract to the text***

***18. Translate the text and answer the question*** Who demands a Purer Water?

Since rain-water is very good for plants, and sea-water is very bad, we may ask whether there is some intermediate kind of water that the plant will just tolerate. The question is likely to be of great importance in arid regions where the only available irrigation water comes from underground sources. During its long staying and slow movement deep below the surface, the water dissolves minerals' salts from the rocks that surround it. Suppose this mineralized water is now offered to (1) human beings, (2)

animals, (3) food-plants, and (4) machines; how will they respond?

Men will drink water containing 1 part in 1,000 of dissolved salt, animals will drink water that is much more saline, while food-plants demand a purer water.

This is not only because the salt is harmful to the plant but mostly due to the fact that after long periods, the land irrigated with saline water becomes saturated with salt and in the end becomes unfit for cultivation. The water itself drains away or is transpired and the salt stays in the ground. The irrigation water should not be more than about one fifteenth as salt as sea water, its mineral content should be much less than 1 part in 1,000. But if the local climate and the nature of the ground are favourable, some plants will grow on water that is much more saline than this.

As for machines, they demand water of the quality of rain-water.

## *TASKS FOR INDIVIDUAL WORK:*

*PART 1*

***1. Read and translate the text:***

### The Parts of a Plant and their Functions

A plant is a living organism. It is made up of different parts, each of which has a particular purpose, or specialized function. If one part of the plant is not functioning properly the whole plant will suffer. But we may cut flowers off the plant or prune the roots. Such damage is only temporary and so the plant will continue to grow.

The basic parts of a plant are the root system, which is below the ground, and the shoot system above. The root of a plant has two main functions. It takes in, or absorbs, water and minerals from the soil through the root hairs, which are single cells near the tip of each root. The other main function of the root is to hold, or anchor, the plant firmly in position in the soil.

Plants such as sugar beet and carrots are able to store food in their roots. "In this way they can keep growing for more than one season. In addition, plants such as clover and lucerne, known as 'legumes', have special bacteria which live on the roots. These simple forms of life take nitrogen out of the air which is in the

soil. Such leguminous plants are usually ploughed under the soil. By doing this the soil is made more fertile.

The shoot system above the ground consists of the stem, the leaves, flowers and fruit. One of the functions of the stem is to support the plant. Another important function is to enable water and minerals to pass up from the roots to the leaves and flowers. Organic materials such as sugar travel down the stem to the roots. The leaves grow out of the side of the stem. Their main job is to make food for the plant by the process known as photosynthesis. For this process sunlight is necessary. Water from the soil and carbon dioxide from the air are converted into sugars and other carbohydrates. During the process oxygen is formed and released into the air. The flower contains the reproductive organs of the plant. The stamens produce the male sex cells, or spermatia, which are carried in the pollen grains. The carpel produces the female sex cells, or ovules. The fruit, the ripened ovary of the flower, encloses the seeds and protects them while they are developing. The seed itself consists of an embryo and foodstore. The embryo is the part which will develop into another plant and the foodstore is necessary to provide nourishment for the young plant while it is growing.

***2. Answer the following questions:***

1. Do different parts of a plant have specialized functions?
2. What are the basic parts of a plant?
3. What are absorbed through the root hairs?
4. What is the plant anchored in the soil by?
5. What plants are able to store food in their roots?

***3. Define the terms:***

Photosynthesis, a soil profile, aerobic bacteria, osmosis, a leaf, chloroplasts, stomata of plants, chlorophyll.

***4. Fill in the blank with appropriate words:***

Osmosis Stomata of plants Chlorophyll A leaf Chloroplasts Aerobic bacteria Photosynthesis A soil profile

1. _____the process which transforms light energy from the sun into chemical energy.
2. _____a succession of soil horizons which extends from the surface of the soil to the patent rock.
3. _____organisms which can live in the presence of air.
4. _____biophysical process which takes place through the tissues of living plants.
5. _____complex structure which utilizes energy from the sun in the manufacture of food.

6. _____bodies which absorb sunlight and manufacture food.

7. _____minute openings on the surface of a leaf which lead to the interior of the leaf and the chloroplast.

8. _____the chemical which enables sunlight to convert carbon dioxide into food and other substances.

***5. Write down the passive version of the following active sentences.***

EXAMPLE

***Active:*** *The tiny root hairs absorb water and minerals.*

***Passive:*** *Water and minerals are absorbed by the tiny root hairs.*

***Active:*** *An increase in the number of root hairs increases the power of absorption.*

***Passive:*** *The power of absorption is increased by an increase in the number of root hairs.*

Water and minerals are absorbed by the tiny root hairs. Therefore, the power of absorption is increased by an increase in the number of root hairs.

1. ***Active:*** *The fruit encloses the seeds.*

***Passive:*** *The seeds……by the fruit.*

***Active:*** *The fruit protects them while they are developing.*

***Passive:*** *They……by the fruit while they are developing.*

The seeds …… by the fruit. Consequently, they…… while they are developing.

2. ***Active:*** *The plant takes in oxygen.*

   ***Passive:*** *Oxygen is……in by the plant.*

   ***Active:*** *The plant uses oxygen to break down carbohydrates.*

   ***Passive:*** *Oxygen is……by the plant to break down carbohydrates.*

Oxygen…… in by the plant and……to break down carbohydrates.

3. ***Active:*** *Wind and insects transfer pollen from one flower to another.*

   ***Passive:*** *Pollen……..by wind and insects from one flower to another.*

   ***Active:*** *They deposit the pollen on the stigmas of the other flower.*

***Passive:*** *The pollen……on the stigmas of the other flower.*

When pollen……by the wind and insects from one flower to another, it……on the stigmas of the other flower.

4. ***Active:*** *The human body requires small quantities of several minerals.*

   ***Passive:*** *Small quantities of several minerals……by the human body.*

   ***Active:*** *The human body obtains these minerals from plants.*

   ***Passive:*** *These minerals……by the human body from plants.*

Small quantities of several minerals which are……by the human body……from plants.

5. ***Active:*** *We can use some roots to reproduce the species.*

   ***Passive:*** *Some roots……to reproduce the species.*

   ***Active:*** *We should remove the whole root of harmful weeds such as docks instead of ploughing them in lightly.*

   ***Passive:*** *The whole root of harmful weeds such as docks……instead of……in lightly.*

Some roots……to reproduce the species. Thus, the whole root of harmful weeds such as docks instead of……in lightly.

6. ***Active:*** *Soil texture influences all aspects of root development.*

   ***Passive:*** *All aspects of root development……by soil texture.*

   ***Active:*** *A heavy compact soil creates a physical barrier to root growth.*

   ***Passive:*** *A physical barrier to root growth……by a heavy compact soil.*

All aspects of root development……by soil texture. For example, a physical barrier to root growth by a heavy compact soil.

7. ***Active:*** *Too much cultivation destroys the soil structure.*

   ***Passive:*** *Soil structure……by too much cultivation.*

   ***Active:*** *A pasture phase under grass can improve the structure.*

   ***Passive:*** *The structure……by a pasture phase under grass.*

Since soil structure……by too much cultivation, the structure……by a pasture phase under grass.

8. ***Active:*** *The plant manufactures food from chemical substances present in the soil and air.*

   ***Passive:*** *Food……by the plant from chemical substances present in the soil and air.*

   ***Active:*** *The roots take in chemical substances from the soil.*

   ***Passive:*** *Chemical substances……in from the soil by the roots.*

   ***Active:*** *The leaves take in carbon dioxide from the air.*

   ***Passive:*** *Carbon dioxide is……from the air by the leaves.*

Food is …….by the plant from chemical substances……from the soil by the roots and from carbon dioxide ……from the air by the leaves.

9. ***Active:*** *We can use a unit called a soil profile to describe soils.*

   ***Passive:*** *A unit called a soil profile……to describe soils.*

   ***Active:*** *When we wish to compare two soils, we examine their profiles.*

***Passive:*** *When we wish to compare two soils, their profiles……*

***Active:*** *We can define a soil as having an individual profile.*

***Passive:*** *The soil can be……as having an individual profile.*

A unit called a soil profile……to describe soils. So when we wish to compare two soils, their profiles……, and each soil can thus……as having an individual profile.

10. ***Active:*** *Ploughing 'turns in' the whole surface of a field.*

    ***Passive:*** *The whole surface of the field is '……' by ploughing.*

    ***Active:*** *It buries and kills the weeds.*

    ***Passive:*** *The weeds ..... and……*

    ***Active:*** *It loosens and exposes the soil to the air.*

    ***Passive:*** *The soil……and……to the air.*

The whole surface of the field '…… 'by ploughing, with the result that weeds……and……and the soil……and ..... to the air.

***6. Complete the following text by filling in the blank spaces with the expressions given below.***

| | | |
|---|---|---|
| Roots | shoot system | soil |
| Soil air | carbon dioxide | photosynthesis |
| Made up of | ripened ovary | water and minerals |
| Seed | living | such as |
| Function | specialized | more fertile |
| By | reproductive organs | consists of |
| Their roots | organic materials | process |
| conversion | are produced | carbohydrates |

A plant is a living organism _____different parts each of which has a_____ function. The basic parts of a plant are the root system and the _____. The root absorbs water and minerals from the_____ Plants such as sugar beet and carrots store food in _____. Leguminous plants _____clover and lucerne have special bacteria_____ on their roots which take nitrogen out of the _____. Consequently, when they are ploughed under, the soil is made _____.The shoot system _____ the stem, the leaves, flowers and fruit. An important_____ of the stem is to enable_____ to pass up to the leaves and flowers and _____such as sugar to travel down to the_____. In the leaves _____ takes place. The process results in the _____ of

water from the soil and _____ from the air into sugars and other_____. During the _____ oxygen is formed and released into the air. The plant's _____ are contained in the flower. The spermatia _____ by the stamens and the ovules are produced _____ the carpel. The fruit, the _____of the flower, encloses and protects the_____.

***7. Read and memorize the following words:***

seed-bed – насіннєве ложе
ploughing – оранка
tilth – придатність ґрунту до обробітку
capping – утворення кірки на ґрунті
crust – кірка
drilling – рядкове внесення
combine-drilling – комбінована сівба
spinner – відцентровий розкидувач
nitrogen – азот
previous cropping – попередній врожай
manuring – внесення органічних добрив (угноювання)
stiff-straw – жорстка солома
dressing – внесення добрив
germination – проростання

grain – зерно

ripeness – стиглість

binder – сніп

ear – колос

***8. Read and translate the text:***

**WHEAT**

Wheat-growing was extensively practiced throughout Europe in prehistoric times and this cereal was pf great importance in the ancient civilizations of Persia; Greece arid Egypt. It spread to all the temperate countries where it now plays a major part in the food supply of many nations and it is also widely cultivated in tropical and subtropical areas.

Cultivation. It is often said that winter wheat does best on a well-formed seed-bed. Ploughing should be done as early as possible and the normal depth would be in the region of 6 inches. The type of seed-bed required for winder wheat can be described as one with a reasonable tilth in the top 2-3 inches, with a surface containing a high proportion of clods, the largest of these being about the size of a man's hand. This is to prevent capping ,a condition which can easily arise with heavy rain, when the soil surface runs together forming a crust.

Manuring. With all crops it is essential to ensure that adequate supplies of phosphate and potash are available during the first few weeks of growth. Once observed it is not possible to correct properly any deficiency and both of these major elements are required either in advance of drilling or they may be combine drilled with the seed. Combine-drilling is the most economical way of applying these fertilizers, but with winter wheat time of sowing being of prime importance, the laster method of application using fertilizer spinners is more often preferred. For average conditions 30 units (one unit is equal to 1.12 lb. and is the same as 1% on analysis) each of phosphate and potash will be sufficient. If the soil is rich in nitrogen, then 30 units/acre of fertilizer nitrogen would suffice, but under average conditions levels up to 60 units are considered economic rising to 80 units in the low rainfall areas. Previous cropping, local environment and to some extent cultural techniques can also influence the optimum level of this nutrient. When the soil is likely to supply some nitrogen for early growth of a winter crop, then it is unlikely that any autumn fertilizer nitrogen would be required.

The short, stiff-strawed varieties of wheat can stand high levels of fertilizer nitrogen whereas the taller ones used to produce quality straw will only tolerate moderate amounts. Of all the cereals winter wheat will give the highest response to his fertilizer

and to obtain the best return the proper dressing should be applied at the correct time.

As far as spring wheat is concerned up to 60 units of nitrogen can be economic. It should be applied prior to drilling or combine-drilled with the seed.

Seeding Rates. The amount of seed required for autumn wheat will vary between 1 and 2.5 cwt/acre. Early sowings need the least since the temperatures for germination are higher than those later on and a larger number of the seeds produce plants. As one goes north the autumn temperatures become significantly lower and hence to obtain the optimum number of plants it is necessary to sow larger quantities of seed.

Harvest. Winter wheat is normally harvested from August to October (in Britain), depending on the type of summer experienced and also the geographical location. Spring wheat matures much later than winter wheat and later than the other cereals.

Following a hot, dry summer grain may be combine-harvested under very good conditions; and if the moisture does not exceed 14% then it can be stored without drying. Moisture tests can be carried out at harvest and these are often used to vindicate the stage of ripeness or readiness for combining.

Most of the wheat being cut by combine harvester, there is still a small, but significant acreage which is bindered to satisfy the demand for long straw. It is said to be binder-ripe when the grain is fairly firm, has a cheesy texture and does not exude any milky fluid when pressed. This stage is usually reached between 1 and 2 weeks before it can be combine-harvested. The actual binding should not take place until the morning dew has disappeared. Once cut the grain will mature in the ear and the straw will dry out.

***9. Translate into English:***

1. Вирощування пшениці грає головну роль у забезпеченні їжею багатьох народів. 2. Для запобігання утворення кірки необхідно, щоб поверхня ґрунту мала велику кількість грудок. 3. Комбіноване внесення – найбільш економічний засіб для внесення органічних добрив. 4. З усіх зернових злаків озима пшениця буде давати найвищі врожаї, якщо вчасно внести добрива. 5. Ярова пшениця стигне набагато пізніше, ніж озима та інші злакові культури. 6. Як тільки зерно дозріє в колосі, солома висохне.

***10. Find synonyms of the following words and word-combinations in the text:***

widely, area, to grow best, important, to see, rightly, enough, fertilization, to be high in, before, local conditions, to withstand, to use (fertilizers), as to, to differ, stand, yield, to ripen, to show.

***11. Fill in the blanks with necessary words from the text:***

The time and method of ... the land for wheat depends principally on the ... that is followed by it. Unless the rainfall is high it is desirable to have the land prepared ... of of seeding to permit settling of the ... and accumulation of ... . When the land is to be be plowed after a small grain there should be a month ... plowing and seeding.

***12. Read the following fragment and answer the question:*** When is spring wheat sown? Why?

Where spring wheat is grown, it will usually yield better if seeded early. It needs to make its growth largely before hot weather. Since spring wheat can stand a great deal of cold weather there is little, if any danger from low temperatures when seeding is done early.

***13. Ask questions on the text and do short retelling of it.***

*PART 2*

***1. Read and translate the text:***

## THE LIFE CYCLE OF A PLANT

The life cycle of a typical annual plant can be divided into several stages. The first stage is germination, Seeds remain dormant, or in a resting state, if they are kept cool and dry. When the amount of moisture and the temperature level are right, the seeds germinate and start growing.

Certain conditions are necessary for this to happen. An essential condition is that the seeds must be alive. Sometimes seeds are dried at a temperature which is too high. This has two effects: the water content in the seeds is reduced too much, and certain essential proteins are destroyed. As a result, the seeds die. Other conditions for germination concern the amount of moisture in the soil. If dry seeds are planted in a dry soil, they will not germinate until it rains. 0n the other hand, if there is too much water in the soil, the seeds will not germinate either. This is because wet soils remain cold for a longer period of time than drier, well-drained soils. If the soil is too cold germination will not occur. An additional reason for seeds not germinating is that badly drained soils may lack sufficient oxygen. Dormant seeds require

very little oxygen in order to stay alive, but when they start to germinate they require more.

In the first stage of germination the primary root, or radicle, emerges. Then the stem pushes its way upward until it appears above the surface of the soil. At the same time the root system grows downward, and begins to spread through the soil. In the early stages of development the seedling depends entirely on the foodstore in the seed but as soon as the first leaves are produced, it is able to manufacture food for itself. The seedling begins photosynthesis.

Next, the plant enters the stage of rapid growth. In this stage of the life cycle, the plant begins to grow to its full size. When it is mature enough, it flowers, and when this happens pollination and fertilization are ready to take place. In the process of pollination the pollen is carried by wind or insects from the stamens to the stigma of the carpel. It germinates on the stigma and grows down the style into the ovary, where fertilization takes place [8, p. 12].

***2. Answer the following questions:***

How can the life cycle of a typical annual plant be divided?

What will seed do when the temperature level is right?

When will seeds not germinate?

Can dormant seeds stay alive in a badly drained soil?

When does the root system form?

***3. Define the terms:***

germination, rootradicle, emerges. foodstore, pollination, fertilization, stamens, stigma of the carpel, ovary.

***4. Match the name of the processes in the list on the left to the identifying descriptions of their course of action in the list on the right.***

Name Of Process

(a) transpiration (b) germination (c) pollination
(d) fertilization (e) osmosis

Description of Course of Action

1. one of the male gametes unites with the female gamete in the ovule.
2. pollen grains are transferred from the stamen to the stigma of the female parts.
3. water passes through the leaf cells and evaporates into the air.
4. nutrients in the soil pass through the cell membranes into the root hairs.

5. the seed 'awakens' from its dormant state and starts growing.

***5. Put in correct order:***

a) the stages of the life cycle of a plant:

- fruit and seed production;
- photosynthesis begins;
- plant flowers;
- stage of rapid vegetative growth;
- decay of vegetative parts;
- seed dispersal;
- germination;
-pollination and fertilization.

b) the stages of the germination of a broad bean:

- secondary root develop;
- root system spreads through soil;
- split testa;
- photosynthesis can begin;
- plumule;
- radicle;
- curved to protect growing point;
- leaves sprouting;
- main shoot.

***6. Choose the correct form of the verb:***

The seedling (to begin) to manufacture food for itself. But first it (to use up) the food stored in the seed.

The young shoot (to appear) above the surface of the ground. Then it (to begin) the process of photosynthesis.

Before the oxygen (to combine) with and (to break) down the various complex sugars, energy (to release).

Dormant seeds (to be) inactive. During this time they (to use) very little air.

The young rice plants (to transplant) to the paddy fields. But first they (to grow) in nurseries for a few weeks where proper care can (to give) to the seedlings.

Once the shoot (to appear), the plant then (to grow) both above and below the ground.

During the time the seedlings (to be) small, there are few leaves present to use sunlight for photosynthesis.

A crop of nitrogen-fixing legumes (to plough) in. As a result the next crop produced a higher yield.

The spores of disease organisms land on the plant. At the same time they (to kill) by the fungicide which (to spray) or (to dust) on to the plant surfaces.

Sometimes there is too much water in the soil. On these occasions it must (to drain) off.

***7. Complete the following text by filling in the blank spaces with the expressions given below.***

| | | |
|---|---|---|
| root system | rapid growth | may be reduced |
| colder | too high | sufficient air |
| seeds | too much | temperature level |
| temperature | testa | food manufacture |
| germination(3 times) | photosynthesis | well-drained soils |
| downwards | little moisture | dependent on the |
| not | in the soil | foodstore |
| life | water and air | secondary roots |
| up | destroyed | surface of the soil |
| | | mature |

The first stage in the life cycle of a plant is_____. Certain conditions are necessary for ____to occur. Firstly, the _____must be alive. If seeds are dried at ____a temperature, the water content in the seeds ____too much and certain essential proteins____. Secondly, the amount of moisture in the soil must be right. If there is too ____in the soil, seeds will not germinate. However, if there is ____water in the soil, seeds will _____germinate either because wet soils tend to be _____than drier,_____. This is the third condition necessary for germination to occur. The _____of the soil must be right. A

fourth condition concerns the amount of air_____. A wet, badly drained soil may lack _____for seeds to germinate. Thus, we may say that _____only happens under the right conditions; when there is_____, sufficient_____, and the right_____.

The first stage in the germination of, for example, a bean is the splitting of the_____ . The radicle emerges and starts to grow _____. Next, the curved plumule begins to grow_____ towards the light. Meanwhile, the _____is beginning to spread through the soil. In these early stages of development, the seedling is entirely _____in the seed. After the young plant has broken the _____and the first leaves are produced_____ by _____can begin. By this time, below the soil surface…… are developing. The plant is ready to begin the stage of _____during which it grows to its full _____size.

***8. Read and translate the text:***

**MAIZE**

Types of Maize. Several thousand varieties of maize are now grown throughout the. world and most of these can be allocated to one of the seven most important groups: dent maize, flint maize, sweet corn, soft maize, popcorn, waxy maize, pod maize.

Soil Requirements. Successful maize cultivation is more frequently and more easily achieved on soils which are of medium

texture. As the soils become lighter the greater is the chance of their "drying out" in midsummer and although there is really nothing else against them, the very light sandy soils should be avoided.

Having suggested light to medium textured soils for maize, it must also be stressed that organic status and fertility should be high.

The maize land should be free draining in order that as much of the heat as possible is employed in raising soil temperatures and not removing excess of soil moisture. The soil should be naturally free draining to enable a full rooting system to develop in a plentiful supply of oxygen.

Maximum yields are believed to be obtained between pH 4 and 9. Some scientists believe maize to be successfully cultivated on the moderately acid soils (pH 6-7 as optimal).Others say that maize growing can be successful under alkaline conditions provided there are no serious deficiencies of the micro-nutrients.

Application of Fertilizers. It has been-suggested that phosphate and potash should be applied to the land well in advance of drilling and the nitrogen incorporated into the seedbed just prior to drilling, otherwise much of it would be lost by leaching.

One should remember that germination is much retarded by fertilizers in contact with the seed.

Cultivation. With a more extensive and deeper rooting system than the other cereals, maize will require deeper ploughing, cultivations and seed-beds to obtain, maximum growth. Autumn ploughing is advisable on stronger soils and it may be left until the early spring when textures are light. Cultivations which follow should be to a depth of 4-5 inches. They kill the weeds after germination; inter-row cultivation can follow crop emergence to obtain further weed control. Chemical means, are often preferred. Seed-beds should be uniform and fine to obtain a quick germination and to assist the action of herbicides in their control of weeds.

Seeding. Minimum temperatures for growth of maize arc around 50° F (10° C) and thus early spring sowings are of little value except when the soils are warmer than usual. Under cool conditions seeds rot.

When the average t° is over 50 F the emergence of maize will take approximately two weeks. Late spring frosts can also be damaging to seedling maize, although with the cold tolerant varieties being introduced, there is every chance that this crop may now survive the first few degrees of frost.

Sunshine and Solar Energy. Little is said and written about sunshine and solar energy requirements with this cereal. It is, however, assumed that for satisfactory growth and ripening of the crop high levels of bright sunshine are required.

Maize is quite unique in its mode of growth and extent and duration of its leaves. They grow in a manner which facilitates efficient use of radiant energy by trapping most of the sun's rays and since the duration of full leaf extends almost to grain maturity, the sun's energy can be transferred to grain yield throughout the whole life of the plant. A point close to optimum leaf area is obtained early and maintained almost to grain maturity thus making maize one of the most efficient utilizers and converters of solar energy into plant energy particularly when the whole plant is considered as the economic yield.

***9. Fill in the blanks with necessary words from the text:***

1. When there is not enough potassium in the soil, we say the soil is ... in potassium. 2. ... is the process which removes excess of soil moisture. 3. Best yields of maize are achieved on soils of medium ... and high .... 4. Nitrogen fertilizer should be ... into the soil, otherwise much of it will be lost by .... 5. Cultivations and ... help to control ... . 6. The average temperature for the ... of maize is over fifty degrees F.

***10. Check the false sentences and correct them:***

1. It's advisable that nitrogen be applied long before plowing. 2. They recommend that maize land should be free

draining. 3. It's necessary that the students know different varieties. 4. It is not desirable that maize be planted in warm soil. 5. Chemical means are seldom used in weed control. 6. To obtain quick germination the seed-bed must be fine.

***11. Read the fragment and answer the following question:*** When and how are fertilizers applied for maize?

Maize can be fertilized at three different times. A corrective broadcast application is done before plowing. Soil deficiencies are corrected with large amounts of fertilizers.

A starter fertilizer is applied with the planting equipment. The purpose of this application is to aid a small maize plant to get a more rapid start. It is best to place fertilizer about 1 inch below and 2 inches at the side of the seed.

When maize follows a good legume crop no additional nitrogen may be required. But when maize follows maize additional nitrogen is usually needed. This may be applied before the crop is planted or between the rows until the crop is 15 to 18 inches tall.

***12. Ask questions on the text and do short retelling of it.***

*PART 3*

***1. Read and translate the text:***

## THE ORIGIN AND COMPOSITION OF SOIL

Soil is a residue composed of two main ingredients: mineral material and organic material. Organic material originates from dead plants and animals and materials other than this are derived from rocks of various kinds. These rocks are broken down into small particles by mechanical disintegration and chemical decomposition, This breaking down process, known as weathering, may thus be both physical and chemical. When weathering processes are largely physical - by heat or wind, for instance - the composition of the soil is very similar to that of the parent rock. In arid regions weathering is mostly by physical means. But in humid regions chemical processes of weathering are equally important. In such regions rock particles are affected by water which may contain carbonic or other weak acids. These acids dissolve some of the particles in the rocks. The mineral material that is left behind is insoluble. Consequently, the insoluble mineral residues in the soils have less resemblance to the original rock. There are larger amounts of organic matter in the soil, too.

The process of soil formation results in the development of the soil profile. This is made up of a succession of horizontal

layers, or 'horizons', o varying thickness, from the surface to the parent rock..

Generally speaking, there are three distinct horizons, known as A, B and C. A. is the top soil, which is coarse-grained, and dark in colour because of the presence of humus. B is known as the sub-soil which contains some of the products leach washed, or washed, out of the A horizon. The C horizon consists of parent material which has been weathered in the upper part, and unweathered rock below.

Any sample of soil contains particles of different sizes. These have been divided into the following size groups:

Table 1

| Material | Diameter (mm) |
|---|---|
| gravel | more than 2·0 |
| coarse sand | 2·0-0·2 |
| fine sand | 0·2-0·02 |
| silt | 0·02-0·002 |
| clay | less than 0·002 |

Soil range from pure clays to pure sands. Most of them contain various proportions of sand, silt and clay and these varying proportions make up soil's textural class. The principle classes in order of increasing fineness of material are sand, loamy sand, loam, silt loam, silty clay loam, clay loam, silt and clay.

Any soil contains both mineral and organic matter. Clay particles are the most important of the mineral particles because they are the smallest. Smaller sized particles have a greater exposed surface area than larger sized particles. The smaller the size of a particle, the greater is its reactivity. That is to say, smaller sized particles can react or combine with water, nutrients and humus more easily than larger sized particles. Thus, a clay soil is more reactive than any other type of soil. Humus from decomposed organic matter is vital to a soil as it makes a heavy soil lighter. In addition, it helps to bind the mineral particles together in 'crumbs' [8, p.28].

***2. Answer the following questions:***

1. What are derived from various kinds of rocks?
2. What is weathering?
3. What are the reasons of weathering?
4. What are soils of humid region similar to?
5. What is the soil profile?

***3. Complete these sentences with the comparative form of an appropriate adjective, or more/less.***

Soils show great variations in their sizes and arrangements of their constituent particles. A sandy soil has larger particles than

a clay soil. A sandy loam has_____particles than a clay loam.

Soils also vary greatly in colour. A brightly colored soil indicates a higher degree of oxidation. So, a red soil has been_____oxidized than a black soil.

As agriculture becomes more intensive, the soil may be modified by those who form it. A soil can be made less alkaline by adding sulphur. Any soil can be made_____ acid by adding lime.

The sulphur content of certain soils in Western regions is less than 0-15%. On average in Ukraine soil contains several times this amount. We may say then that most soils contain_____sulphur than those of Western regions.

e) All the spaces, or pores, in between the solid soil particles are filled with air and water. The proportions of air and water which are contained in these pores are determined mainly by the size of the pores. The bigger the size of the pores the more air and_____water the soil will contain. Thus, sandy soils contain larger pore spaces, but the total amount of pore space is_____ because the particles are _____. On the other hand, clay soils contain smaller pore spaces but the total amount of pore space is_____because the particles are much

As a result, clay soils are generally than sandy soils.

***4. Study the following short passages and complete the statement about them below.***

(a) Granites and other igneous rocks are usually divided into acidic, intermediate and basic rocks depending on their silica content. This may vary between 40% for basalts, which are dark, glassy basic rocks, to twice that percentage in granites.

Write less or more in the spaces provided.

A granite rock contains___silica than a basic rock.

There is___silica in basalt than in granite.

Acid rocks contain_____silica than basic rocks.

Basalt is not an acidic rock because it contains____than 75% silica.

Granite is very acidic because it contains___than 75% silica .

(b) The colours of soils are closely related to their condition of aeration. In well-drained soils iron compounds are oxidized to their ferric state, which is indicated by reds, yellows and browns. When good drainage is absent, soils tend to be grey, often with greenish grey or mottled sub-soils.

Write less or more or better or poorer in the spaces provided.

A red soil is_____drained than a grey soil.

A grey soil has been_____ oxidized than a yellow soil.

Greenish grey soils are_____well drained than brown soils.

A red soil has____conditions of aeration than a grey soil.

Well-drained soils are____aerated than badly drained soils.

Grey and greenish soils have_____drainage than oxidized red soils.

There is___air in a well-drained soil than in a badly drained soil

(c) The soil microbes which decompose organic materials grow best at pH 6-5. Near this pH, conditions are best for the availability of most plant nutrients. As the acidity increases, the availability of nearly all important nutrients diminishes. Phosphorous, in particular, is held as insoluble compounds in highly acid soils. As acidity decreases (i.e. as pH rises) iron, manganese, copper and zinc grow scarce. Most upland soils developed under forests in humid regions are too acid for the best growth of pasture grasses, vegetables and many other plants.

Write less or fewer or more or not as good or higher in the space provided.

At a pH value of below 4 there are ___important nutrients in the soil.

There is ___soluble phosphorous in highly acid soils.

Iron, manganese, copper and zinc are ___available in ___alkaline soils.

Vegetables prefer conditions of ____acidity than is found in most upland soils.

5. Conditions are____for the decomposition of organic materials by soil microbes at low pH soil values.

***5. Complete the following text by filling in the blank spaces. Some of the expressions you will require are given below.***

| | |
|---|---|
| is derived from | mixture property |
| composition | composed of sizes |
| non-solid | therefore solids |
| chemical decomposition | sub-soil smaller particles |
| organic matter | |

The soil system is made up of mineral particles which are mixed with decomposed _____. The top soil consists of this , which is so vital for plant growth. Below the top soil is the _____which is largely _____ mineral matter. In addition to the mineral and organic matter, called the soil _____, there are spaces between the _____ which are taken up by……..to make up the part of the soil.

Soil solids consist mainly of particles of various_____. All particles between 0-002 mm and10-02 mm are _____ . Particles _____ 0-02 mm are sand parties, coarse sand and _____. Particles smaller than silt are _____. Clay is able to absorb a great deal of _____ owing to the amount of pore space between _____. Sand does not have this . _____, a soil which contains more clay is able to hold more_____ than a_____ with _____.

The mineral material in all soil _____ parent materially the process of _____which breaks down rocks into _____ by mechanical disintegration and _____.

***6. Read and translate the text:***

**SOIL**

Soil plays a vital and important role in the life of the world and mankind. It is in fact a highly organized physical, chemical and biological complex all of us are dependent on. As the supporter of vegetable life, soil plays the most fundamental of roles in providing food for all animals and men.

Soils develop under the influences of climate, vegetation, slope and drainage, time, the nature of the parent material, and the culture. Climate influences plants, animals and soil directly. Plants influence the soil, the animals and the climate near the ground.

Animals play a considerable role in soil development, the type of soil often influences the animals which are present in it, while the animals also influence the vegetation which is growing in the soil.: Finally climate, through weathering, influences the rocks, which in time become part of the soil through the processes of soil formation.

All soils do not have the same utility, but man uses different soils in different ways. "Good" land for the production of food-stuffs must lie well and have good depth, for yields are dependent upon the ability of the soil to take up and use fertilizers and water. Man has done much to adapt crops to

the soil and to provide various kinds of fertilizers for plant growth and development. Soils that are not good for the production of food-stuffs may be valuable in other ways. For example, podzols in high elevations are poor for crops but they comprise excellent forest soils.

Each soil series requires skilful handling if it is to produce to its maximum potential; but no two series make the same demands. From season to season conditions of temperature and moisture change, so the farmer must change the management to produce better drainage, improve tilth, prevent erosion, and test the soil to identify the proper kind and the correct proportion of fertilizer needed. Only by careful study of the soil, resulting in an

understanding of the complexity of its nature and uses, will man be able to provide food for all the people who will inhabit the earth. The soil cannot reproduce itself. Therefore, man should improve it through good management and treatment so that future generations can farm more efficiently than their fathers and grandfathers have done. Man can improve the soil now in use and even discover how more kinds of soils can be utilized more productively.

So, the results obtained in soil science can be applied to practical problems in agriculture, horticulture, forestry, engineering, and in planning the future use of land.

***7. Answer the following questions:***

1) What role does soil play?

2) What do soils develop under?

3) How do climate, plants and animals influence to each other?

4) How does man use different soils?

5) How should man improve the soil? Why?

***8. Define the false sentences, correct them and explain your answer:***

1. Soil science is only of theoretical value. 2. Different soils have the same utility. 3. To improve the soil one should study it thoroughly. 4. Soil requirements are always the same. 5. Soils that are not valuable for grain crops may be very good for some other purpose. 6. Climate is influenced by soil.

***9. Retell the text "Soil".***

## REVISION TESTS FOR AGRONOMISTS

### Revision Test № 1

1. … land use has shifted significantly since Ukraine declared independence from the Soviet Union in 1991.

    a) agriculturalist

    b) agriculturist

    c) agricultural

    d) agriculture

2. In the early 1990s approximately 27% of the total land area of the United Kingdom … to crops.

    a) is devoted

    b) will be devoted

    c) was devoted

    d) had been devoted

3. About 95 per cent of Ukrainian wheat is winter wheat planted in the … and harvested during July and August of the following year.

    a) spring

    b) winter

    c) autumn

d) summer

4. Today Scottish agriculture … three per cent of Scotland's working population.

a) employ

b) employs

c) employed

d) will employ

5. Sunflowers and sugar beets are the main … crops.

a) industrial

b) vegetable

c) grain

d) fruit

6. Corn is … third important feed grain in Ukraine.

a) the

b) a

c) an

d) –

7. Sunflower seed is Ukraine's chief … crop.

a) cottonseed

b) oilseed

c) linseed

d) soybean

8. Sugar beets … primarily in central and western Ukraine.

a) has grown

b) grows

c) is grown

d) are grown

9. The conditions are suitable for both winter … spring crops.

a) but

b) and

c) but also

d) as well as

10. Organic farming … artificial chemicals that can damage the environment and human health.

a) does not use

b) do not use

c) not uses

d) does not uses

11. In the south-east of England and the lowlands of Scotland grain, potatoes and sugar beet … .

a) growed

b) grows

c) is grown

d) are grown

12. In 1984 there … more than 2.3 million farms in the country.

a) are

b) is

c) was

d) were

13. The hand work … by machines.

a) are forced out

b) is forced out

c) is forcing out

d) will be forcing out

14. The weather is suitable for both winter … spring crops.

a) but

b) and

c) but also

d) as well as

15. The UK is the fourth largest … of cereal and oilseed crops in the EU.

a) producer

b) produce

c) productive

d) productivity

16. … the one hand it is explained by the generousity of the nature.

a) in

b) from

c) for

d) on

17. American farmers are famous all over the world … big crops.

a) of

b) for

c) about

d) in

18. … most important farm crops are wheat, barley, oats, sugar beets, potatoes, and green fodder crops.

    a) a

    b) the

    c) an

    d) –

19. The enormous … in the production of basic foods has created problems of oversupply in Europe and the USA.

    a) increased

    b) increasingly

    c) decrease

    d) increase

20. They stress the big role of family farms in American history, and assure that the … corporations care only about high profit.

    a) no family

    b) not family

    c) non-family

    d) non family

## Revision Test № 2

1. Organic farming has demonstrated the … of the ecological approach.

    a) validating

    b) validity

    c) validation

    d) valid

2. Organic farmers may not grow as much corn or soybeans … their industrialized neighbours, but their costs are far lower, the soil generally richer, and their crops healthier.

    a) but also

    b) and

    c) so

    d) as

3. In the soils area, specialties … soil microbiology, soil conservation, soil physics, soil fertility and plant nutrition, chemistry, chemistry, biochemistry and mineralogy.

    a) disclose

    b) exclude

    c) conclude

d) include

4. A hundred years ago half of the labour force … on the farms.

a) work

b) worked

c) works

d) had worked

5. Agriculture of the USA and the UK … many differences.

a) are

b) is

c) has

d) have

6. Due to the constant selective-breeding, the increase of productiveness and stableness of cereals … .

a) were achieved

b) was achieved

c) achieved

d) achieves

7. The art of making land more productive … throughout the world.

a) practiced

b) practices

c) is practiced

d) practice

8. In 1984 there … more than 2.3 million farms in the country.

a) are

b) is

c) was

d) were

9. The success of American farmers is caused … the considerable investments in the agriculture and the rise of workers` qualification.

a) by

b) for

c) from

d) in

10. Corn is … third important feed grain in Ukraine.

a) the

b) a

c) an

d) –

11. Agriculture in Great Britain is … and highly mechanized.

a) intensify

b) intension

c) intensity

d) intensive

12. Agronomy embraces the branch of agriculture that deals … 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.

a) of

b) with

c) about

d) in

13. The term “agronomy” represents the disciplines of soils, … and related sciences.

a) breeds

b) cultures

c) crops

d) standards

14. The peasant farms of the past … largely self-sufficient, producing just enough foodstuffs for their cultivators, with perhaps a small surplus for the local market.

a) are

b) were

c) has been

d) had been

15. Agronomists who work as soil scientists play extremely … roles in helping preserve water quality and preserve natural environment.

a) more important

b) important

c) the most important

d) an important

16. In prehistoric times, humans … from foraging to cultivating specific crops, probably wheat or barley, for their food value.

a) shift

b) were shifting

c) are shifting

d) shifted

17. This natural … eventually made these food plants better adapted to continued cultivation because they were more easily harvested.

    a) choice

    b) election

    c) selection

    d) pick

18. More, than 40% of all agricultural production in Ukraine is grown without using of any pesticides and, as a result, Ukrainian food is the … and safely in Europe.

    a) most natural

    b) more natural

    c) natural

    d) naturalest

19. Ukraine is also famous because … corn, watermelon, tomato, apple and pear.

    a) for

    b) of

    c) off

d) in

20. Molecular components of soil constituents … to determine basic interactions affecting plant growth and nutrition, and soil and water quality.

a) studies

b) study

c) is studied

d) are studied

**Revision Test № 3**

1. Management techniques developed by agronomists … terracing, strip cropping, and reduced tillage methods to reduce soil erosion.

a) conclude

b) include

c) exclude

d) exclusion

2. The creation of … conditions for the manufacturers of cotton in the USA results in decrease of the incomes in Egypt and Mexico.

a) favour

b) favourable

c) favourite

d) favourer

3. Plowing with … did allow the colonist to farm more land but it did increase erosion and decreased soils fertility.

a) oxess

b) oxen

c) oxs

d) oxes

4. In the U.S., farms … from the colonies westward along with the settlers.

a) spread

b) spreaded

c) spred

d) spreads

5. Agricultural soil scientists study ways to make soils more … .

a) productive

b) productively

c) productiver

d) productivity

6. Soybeans were not … cultivated in the United States until the 1950s, when soybeans began to replace oats and wheat.

a) wide

b) wild

c) wildly

d) widly

7. The largest … of grains making up 2,3% of total of farms, produce about 50% of wheat in the country.

a) manufacturers

b) manufacture

c) manufacturer

d) manufacturing

8. In 1987 the target price for wheat … $4,38 per bushel.

a) is

b) will be

c) were

d) was

9. Thus policy of support of sugar manufacturers in the advanced countries results in decrease of the producers incomes in the … advanced countries.

a) less

b) little

c) few

d) a little

10. High percentage of humus (more than 7%) helped farmers to gather high harvest without any … .

a) fertility

b) fertilization

c) fertilize

d) fertilizers

11. There are problems of land degradation, technological problem, pollution of environment and … using of lands.

a) rational

b) irrational

c) rationality

d) irrationality

12. GIS is also extremely … in identifying type and extent of pest infestations.

    a) use

    b) useless

    c) usefulness

    d) useful

13. Agronomists play a crucial role in assessing land quality to assure an environmentally … use of land.

    a) friendly

    b) friend

    c) friendship

    d) friendless

14. Numerous agronomy graduates are also involved in the sale of agricultural products, which are … to today's economy.

    a) vitality

    b) vital

    c) vitals

    d) vitalize

15. Plant breeding has increased crop yields and has improved the nutritional value of several crops, … corn and wheat.

a) include

b) includes

c) including

d) included

16. In the early colonial south raising tobacco and cotton … common, especially through the use of slave labour until the Civil War.

a) is

b) was

c) will be

d) were

17. Erosion … remove all or part of the topsoil and subsoil, leaving weakly developed soil.

a) have to

b) should

c) must

d) can

18. … offers excellent career opportunities for individuals with appropriate collegiate training.

a) Agronomic

b) Agrarian

c) Agronomist

d) Agronomy

19. Agronomy involves selective breeding of … to produce the best crops under various conditions.

a) fish

b) birds

c) plants

d) animals

20. Agronomists … plant and soil scientists who work to improve crops and agricultural productivity while effectively managing pests and weeds.

a) is

b) are

c) be

d) was

**Revision Test № 4**

1. A career in agronomy will keep you … the center of efforts to increase the supply of high-quality food, feed, fiber, fuel, and even pharmaceuticals while protecting and preserving the environment.

a) out

b) inar

c) on

d) under

2. It may take hundreds of years to form one inch of soil from paternal material. Only the top of few inches are … in the sense being able to sustain plant growth.

a) productive

b) production

c) product

d) productivity

3. The “life” cycle of soil is influenced by at … five classic soil forming factors: regional climate, biotic potential, topography, parent material, and the passage of time.

a) lest

b) least

c) last

d) lost

4. Agronomists come from many different backgrounds, urban and … , and include those with both farm and nonfarm experiences.

a) city

b) rural

c) village

d) country

5. There … different soils throughout the world.

a) is

b) are

c) is not

d) are not

6. Beginning … new products development, agronomists play a pivotal role as a liaison between the farmer and the company.

a) with

b) on

c) in

d) without

7. Large, diversified agricultural industries with increasing investments in other countries also count on agronomists to help … .

a) those

b) their

c) they

d) them

8. Customer-oriented agribusiness firms … to farmer's needs for products and management information.

a) responding

b) was responding

c) is responding

d) are responding

9. Five important factors … the specific soil that develops.

a) influence

b) influences

c) had influenced

d) was influencing

10. The … and ongoing development of agriculture, enabled by science, is the focus of agronomy and agronomists.

a) revolution

b) evolution

c) evolvement

d) development

11. In many areas, moist, poorly drained soils … in low areas, and depressions of the land.

a) locate

b) is located

c) are located

d) located

12. Both plants and animals … to create a soil.

a) help

b) helps

c) is helping

d) was helping

13. Agronomists have many opportunities for working … .

a) international

b) internationally

c) internationale

d) internationalization

14. My future in agronomy is extremely … .

a) promise

b) promising

c) promised

d) promisingly

15. … is the hilliness, flatness, or amount of slope of the land.

a) Genetics

b) Plant pathology

c) Topography

d) Biochemistry

16. Soil … minerals and water to plants.

a) provided

b) provide

c) provides

d) providing

17. In prehistoric times, humans shifted … foraging … cultivating specific crops, probably wheat or barley, for their food value.

a) of; to

b) from; to

c) with; into

d) so; as

18. As early as 7000 BC wheat and barley … at Jarmo, in present-day Iran.

    a) are grown

    b) is grown

    c) was grown

    d) were grown

19. Agricultural soil scientists examine the … of roots and their relation to the soil.

    a) developed

    b) develop

    c) development

    d) developing

20. Soil is the habitat for … organisms.

    a) a few

    b) few

    c) much

    d) many

## Revision Test № 5

Choose the best answer.

1. Unfortunately, our garden is now … by a block of flats
a) looked over b) overlooked c) overseen d) seen over
2. He kicked the ball over the … .
a) garden wall b) garden's wall c) wall garden d) wall of garden
3. My garden gives me great …, especially in spring-time.
a) appreciation b) benefit c) enjoying d) pleasure
4. The spade is a garden … .
a) instrument b) machine c) piece d) tool
5. Mr Careful kept the … round his garden neatly clipped.
a) fence b) flowers c) hedge d) plants
6. It's raining hard now. Let's stand in that shed to … .
a) dry b) protect c) save d) shelter
7. "Get out of my garden, you nasty creatures!" the man shouted, shaking his … at the children.
a) ear b) fist c) hand d) head
8. One … of their new house is that it has no garden.
a) complaint b) disadvantage c) dislike d) pity
9. Our garden has been … . There are weeds growing everywhere.
a) miscarried b) neglected c) uncared d) unnoticed
10. We'd better … the garden this evening. It hasn't rained for over ten days.
a) damp b) moisten c) water d) wet

11. ..... He had to … the mud off his shoes before coming into the house.

a) clear away b) kick c) scrape d) scratch

12. Mr Clever took ... of the fine weather to do a day's work in his garden.

a) advantage b) chance c) effect d) interest

13. The only problem about sitting in the garden in the evening is that you are likely to be … by mosquitoes.

a) bitten b) eaten c) licked d) scratched

14. He is paving the garden … with flat stones of various shapes.

a) alley b) lane c) path d) way

15. The main disadvantage to our house is that the only … to the garden is through the bathroom.

a) access b) communication c) doorway d) passage

16. He threw the box out of the window and watched it fall to the … outside.

a) fiat b) ground c) plain d) soil

17. The … is his garden was very rich and this enabled him to grow prize-winning lilies year after year.

a) fertility b) ground c) land d) soil

18. .....I am afraid the gate doesn't open; we will have to … over it.

a) climb b) fly c) push d) walk

19. .....The … outside the garden said "PRIVATE".

a) advice b) label c) notice d ) signal

## Revision Test № 6

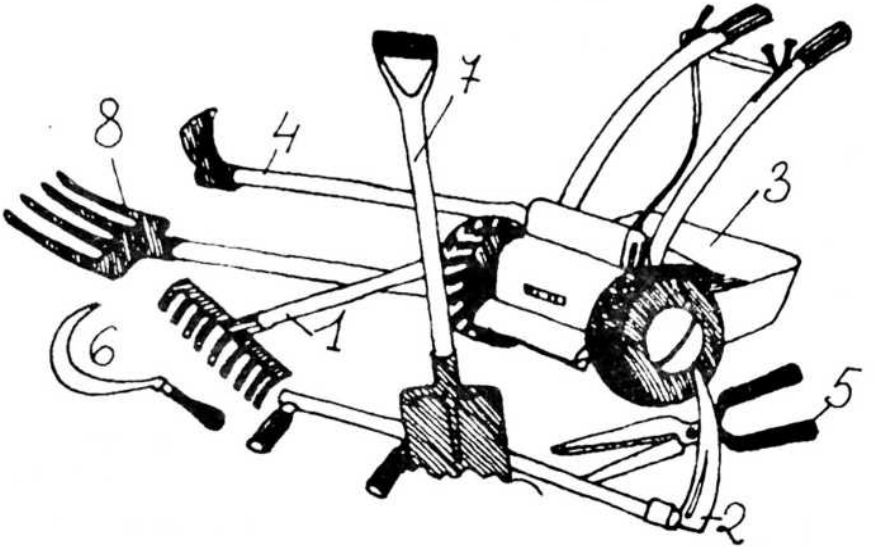
Choose the correct answer.

1. The garden was surrounded by … wire.
   a) barbed b) pricked c) spiked d) scratched
2. Our villa in Greece is on the top of a hill overlooking some olive … .
   a) fields b) groves c) orchards d) meadows
3. The sack with the vegetables was far too heavy for me to carry, so I … it the loor.
   a) dragged b) drew c) trailed d) threw
4. If … I you again in my orchard, looking for pears, you'll be sorry!
   a) catch sight of b) make eyes a, c) see through
   d) take a view of
5. Mrs Lazy's garden had been badly neglected and was completely … with weeds.
   a) coated b) enclosed c) overgrown d) suffocated
6. Digging the garden is a very … task.
   a) conscientious b) exerting c) industrious d) laborious
7. If you want this apple tree to bear good fruit next year, you will have to … it.
   a) axe b) fell c) nip d) prune
8. All the farmers are in a terrible … because of the water shortage.
   a) attitude b) constitution c) disaster d) plight
9. I like sitting over there in the shade in the middle of that … of trees.
   a) bundle b) clump c) scrub d) stack

10. I was startled by the sound of a twig … on the window.
a) creaking b) pattering c) rustling d) tapping
11. If you want a beautiful lawn, you will have to … it.
a) hoe b) mow c) prune d) uproot
12. Our garden has become a … since the house was abandoned, with weeds growing everywhere.
a) desert b) moor c) swamp d) wilderness
13. A last swing of the axe sent the old tree … to the ground.
a) bursting b) crashing c) rushing d) roaring
14. In our garden, we can sunbathe on the … in the summer.
a) field b) flowerbed c) lawn d) meadow
15. I was able to see the garden through a … in the hedge.
a) cleft b) gap c) groove d) slot
16. Keep out! … will be prosecuted!
a) Entrants b) Newcomers c) Transgressors d) Trespassers
17. Can you hold the ladder … while I climb up and pick the apples?
a) firm b) rigid c) solid d) steady
18. The … windows opened onto the garden.
a) Dutch b) English c) French d) Spanish
19. That old apple tree … us from the sun on hot days.
a) fences b) prevents c) shades d) warns
20. How do you … his sudden interest in gardening?
a) account for b) give c) mean d) suggest

## Revision Test № 7

*Mach each of the following name for garden tools with the correct picture below.*




*fork hoe lawnmower rake scythe shears sickle spade*

## Revision Test № 8

*Complete the following sentences. Each letter is represented by one dash (—)*

1. He got his hands _ _ _ t _ working in the garden and had to wash them.
2. "What is the _ _ _ _ of your new garden?" "I don't know exactly, but it can't be larger

than 50 square metres."

3. We are having an early summer this year. The tulips in my garden came into _ _ _ w _ _ at least three weeks earlier than last year.
4. Our countryside is particularly beautiful in spring, when the _ _ _ h _ _ _ _ are in

bloom.

5. Do you _ _ _ _ turnips in your garden?
6. I have been working very hard, but the ground is frozen so hard that after two hours of _ _ _ g _ _ _ the hole is only 2 feet deep.

## Revision Test № 9

*Give the English names of the following flowers. Each dash (--) represents one letter.*

1. фіалка = v _ _ _ _ _
2. гвоздика = c _ _ _ _ _ _ _ _
3. гладіолус = g _ _ _ _ _ _ i
4. незабудка = f _ _ _ _ _ - _ _ - n _ _
5. маргаритка = d _ _ _ _
6. жовтий нарцисс = d _ _ _ _ _ _ _

## Revision Test № 10

*Choose the correct answer.*

1. .....I am growing some geraniums in my window … .

a) box b) case c) shelf d) tin

2. ..... My mother … very fine roses in her garden.

a) breeds b) develops c) grows d) raises

3. ..... As the flowers had … she threw them away.

a) dead b) discoloured c) faded d) fallen

4. ..... Playing games in the flower garden is … .

a) defended b) dismissed c) forbidden d) refused

5. ..... I'll put the flowers in this … . They'll look nice there.

a) bucket b) crystal c) mug d) vase

6. .....
fter searching for a long time, the children found their ball in the … by the lilac bushes.

a) underground b) undergrowth c) underpass d) underworld

7. .....Look! He has brought you a beautiful … of flowers.

a) branch b) bunch c) bush d) twig

8. .....I am going into the garden to … some flowers.

a) grip b) pick c) seize d) snatch

9. ..... The roses were still … in December when the first snow began to fall.

a) blooming b) blossoming c) fading d) growing

10. He … his rose bushes carefully with insecticide every week.

a) distributed b) spat c) sprayed d) spread

## Revision Test № 11

*Put each of the following words or phrases into its correct place in the passage below.*

| | | | |
|---|---|---|---|
| animals | apple | blossom | |
| | botanists | | |
| cattle | colourless | flowering | food |
| grains | include | man | |
| | mean | | |
| produces | reproductive | roots | |
| | roses | | |
| seeds | sheen | stem | |
| | vegetables | | |

### Flowers

The word *flower* may … either 1) the blossom or 2) the whole plant. … used the word *flower* to mean only the ... of a plant.

Any plant that … some sort of flower, even a tiny, … one, is a flowering plants. Grasses, … , lilies, … trees, and oaks are all flowering plants.

Flowers are the … part of … plants. The plant could not develop and reproduce without them. … depends completely on flowers and flowering plants for his … . Flowering plants … almost all of our … , fruits and … . Even the that we use for food, such as … , pigs and … , live on flowering plants.

## Revision Test № 12

*Give the Ukrainian names of the following vegetables. Each dash (--) represents one letter.*

1. *brussels sprouts* = *к* _ _ _ _ _ _ *б* _ _ _ _ _ _ _ _ _ _ _ _
2. *eggplant/aubergine* = *б* _ _ _ _ _ _ _
3. *garlic* = _ _ _ _ _ _
4. *horse-radish* = _ _ _ _
5. *leek* = _ _ _ - _ _ _ _ _
6. *parsley* = _ _ _ _ _ _ _ _
7. *pepper* = _ _ _ _ _ _ _ _ _ _ _ _ _
8. *radish* = _ _ _ _ _ _, _ _ _ _ _ _ _
9. *turnip* = *p* _ _ _
10. *watermelon* = _ _ _ _ _

*Put each of the following words or phrases into its correct place in the passage*

| | | | |
|---|---|---|---|
| cereal | come | cooked | difficult |
| eat | entire | foods | fruits |
| kingdom | mean | oats | plants |
| processed | raw | roots | |

**Vegetables**

We … vegetables every day, yet it is very … to say exactly what we … by the word *vegetable.* Sometimes the word is used in the phrase "the vegetable …", which means very much the same thing as the … world of plants.

According to another meaning, vegetables are … that we obtain from the leaves, flowers, or … of plants.

Vegetables are usually eaten without first being … or milled as … grains such as wheat and … are.

Vegetables are also considered different from … . Fruits generally may be eaten just as they … from the … while vegetables are more often … . But even this rule is not absolute.

## ADDITIONAL TEXTS:

### TEXT 1

### MULTIPLE CROPPING

In Taiwan, the heavy concentration of people in a limited land area has produced an agricultural phenomenon: never has there been more intensive use of land. Nor only is every bit of crop space used laterally but as far as possible it is used vertically as well. For example, a shaped structure extend over irrigation and drainage channels too deep for rice, and cucumbers are grown in the space over the water. Vegetables are planted under the branches of young fruit trees. Grapes hang freely from a wire structure five or six feet above ground but by no means arc they allowed to occupy the ground alone. In the winter when the grape leaves drop off, letting the sunshine through, a rich crop of tomatoes, cabbages, or some other vegetable comes on.

Two crops of rice a year are standard in Taiwan, one from early March to early July, the other from early August to November. That leaves period of forty days between the crops in summer and ninety days in winter. But the fields are never empty, vegetables take over both times.

It might seem impossible to grow jute, which needs 120 days to mature, in the forty summer days between rice crops. But the farmers of Taiwan do it by letting the plants spend their forty

days in a separate small seeding bed. During the second forty days it is interplanted in the summer rice crop. The last forty days, after the rice is harvested, it grows on the field alone, shooting up to a height of ten or twelve feet before it is hustled off to make way for the next rice crop. It has had its full 120 days, although it occupied the field alone for only forty.

Taiwan probably raises more food per acre than any other place in the world. As a consequence her small farmers eat very well themselves, supply city people with a good diet, and provide the nation with substantial agricultural exports.

The island now provides a surplus of rice and winter vegetables, so many small farmers are turning to other crops — mushrooms, bananas, litchi nuts, citrus fruits, pineapple, guava, pigs, poultry, and pond-grown fish anything that commands a good price.

The small farmers of Taiwan are experts at a technique that has been used for centuries in crowded Asia: multiple cropping.

Multiple cropping means raising three, four, or even five crops a year on the same ground instead of only one or two. This practice uses to the fullest the advantages of the tropics — a twelve-month growing season and more heat and solar energy

than ever reach the temperate zones. Additional heat hastens plant growth.

A year-round warm climate, then, is fundamental to this method; by itself, however, it is not enough — as witnesses the fact that the Chinese and South Asians have been multiple-cropping for a thousand years without exceptional results. What is responsible for phenomenal gains in output is the new technology: new short-season varieties of rice, wheat, and other crops; clever systems for overlapping planting and harvesting dates to exploit land and sunshine to the utmost; and the proper use of fertilizers, insecticides, and other chemicals.

Taiwan has had more experience with modern multiple-cropping than any other area and now practices it almost universally.

The Green Revolution here was based on greatly increased yields of individual crops. The prime examples of varieties responsible for these gain are the dwarf wheats developed in Mexico and the rices from IRRI (the International Rice Research Institute), both of which were soon followed by even better varieties. Multiple-cropping emphasizes a second approach taking in more harvests per year.

To raise five crops a year a farmer must do several things:

-— Choose short-season varieties.

— Interplant crops. A month or so before one is harvested the next is planted between the rows. Interplanting requires that the crops be compatible. Starting a short-season crop like sweet corn with a slow-starting one like sweet potatoes, for example, will conserve space and sunlight, since the fast grower will mature and be taken off by the time the slow starter is well under way. It is also good to grow deep-rooted and shallow-rooted crops together, to avoid varieties that spread excessively, and to avoid planting two crops in succession that are subject to attack by the same insects and diseases.

— Harvest some crops before they mature — sweet corn and green-pod soybeans, for example.

— Include a crop that will ratoon, such as grain sorghum , and get two or three harvests from one sowing.

— Fertilize adequately. Soil that work all year must be well fed.

— Spray as often as necessary. With so much vegetation growing, insects flourish.

Minimize the tillage operation on each crop and use small power machinery for as many of them as possible, for example, a six horse-power walking tractor to complete the work rapidly and on schedule.

India, with its population growing at a rate of more than a million people a month, in 1971 won its long struggle to achieve self-sufficiency in grain. With the world watching anxiously to see whether this success is permanent or only temporary, India is now trying for a new breakthrough in production through multiple-cropping.

Today India has fifty-one multiple-cropping demonstration projects under way in various parts of the country. Some of the most exciting research is being done at the Indian Agricultural Research Institute not far from New Delhi. An irrigated field here formerly yielded one wheat crop a year and lay fallow the rest of the time. The local scientists are now using it to grow four crops in twelve months — wheat, maize, beans, and either mustard or potatoes. In other plots they have various sequences of forage crops, soybeans, grain sorghum, cotton and vegetables.

Some of the irrigated sections of the country can also benefit from multiple-cropping although of course to a lesser extent. Those that receive twenty four inches of rainfall a year may he able to harvest one additional crop and those with fifty inches or more can sometimes get two extra crops. Among the crops best adapted to multiple-cropping in rainfed areas are millet, grain sorghum, peanuts, castor beans and others.

The potential of multiple-cropping for increasing production is beyond question. Its progress in the future will depend not so much on the availability of technology or the industry of farmers as on (a) whether the farmers can get the credit to buy the inputs they need, including water, power, and labour, and (b) whether it will pay them to raise the additional food. The profitability will depend on whether farmers can find an assured market for what they raise, whether they will be able to get their crops to the market, and whether they can get a fair price.

The problem is most serious with vegetables, which are highly perishable. Before he plants, a farmer needs to consider how many vegetables he can sell, to whom, and at what probable price; otherwise he may find a lot of rotting vegetables on his bands.

Grain farmers are not in quite such a risky position because their crops can be stored. Their problem usually is that they have to sell at harvest, when prices are lowest. They need storage facilities and longer-term credit to hold their crop a few months longer. Buyers with storage facilities and capital are making easy profits — after the grain has left the farmers hands.

Because of such problems, farmers who are new to multiple-cropping would do well not to commit all their resources to the system in the first year. They should adopt it gradually as

markets, labour supply, and their own energy allow. Meanwhile they could at least provide their families with more and better food and might begin something. Often they could furnish their own market for grain and forage by feeding their own livestock and poultry — grain chiefly for pigs and chickens and forage for cattle and buffaloes. Usually there is no problem in selling meat, milk, or eggs at any reasonable price, and of course their own families will consume some.

Despite all the problems, multiple-cropping carries more promise of a better life for more people in the tropics and subtropics than anything else now on the horison. These areas could far outperform the temperate zones, where most of the world food is now raised. And these are the areas that need food most — where there are the largest numbers of poor and hungry people [7, p. 127].

QUESTIONS:

1. What are the examples of intensive use of land that are mentioned in the

article?

2. Where was multiple cropping used first and who are considered experts of

this technique now?

3. Which is the fundamental factor to multiple cropping?

4. What must a farmer do to raise several crops a year?

5. What factors will the progress of multiple cropping depend on in the future?

TEXT 2

## MINIMUM TILLAGE SYSTEMS

Minimum tillage is any tillage system that reduces soil loss and conserves soil moisture, as compared with clean tillage. Under this system unincorporated plant residues are left on the soil, and its surface is left as rough as possible.

Crop production using no-tillage methods has been shown to reduce material and energy input and, perhaps more importantly, decrease soil erosion. No-tillage systems also improve the scheduling and reliability of farm operations since many weather-related restrictions are softened. Crops grown by these practices can usually be planted, treated for weeds and harvested when tilled fields would be too muddy to enter.

Other advantages include moisture conservation, reduced soil compaction and an increase in multiple-cropping potential. Furthermore, crop yields from no-tillage systems frequently equal or exceed the yields from conventional methods.

The no-till system causes very little soil disturbance. The one-pass tillage and planting operation tills a furrow approximately five cm wide for seed placement. The furrow is usually opened with a fluted colter placed ahead of the planter unit. Since there is no soil disturbance, more than 95 per cent of the residue is left on the surface.

## Effects on Soil Characteristics and Plant Growth

Soil moisture. Tillage systems leaving 50 per cent or more of the soil surface residue covered after planting generally increase soil moisture throughout the season due to increased filtration and decreased evaporation. In areas with low annual rainfall and soils with low water-holding capacity, the added water should increase yield potential. On poorly drained soils in northern latitudes the extra water may delay planting and reduce yield potential.

Soil temperature. Several studies have shown that increased surface residue slows the rate of soil warming in the spring, therefore delaying germination, emergence and early growth of crops, especially in the northern United States. However, this could be a benefit in the southern United States and in more tropical climates. Differences in soil temperature between no-till and traditional practices can vary from 10 to 40 C.

Soil fertility. Because of the increased residue and reduced tillage, minimum tillage systems produce different levels of moisture, temperature, organic matter content and rate of decomposition and microbial population. All these factors influence the availability of nutrients and thus the need for fertilizer. Leaving residues on the surface causes organic matter to build up near the soil surface, with positive effects on soil

physical properties. Some evidence suggests that surface residues left the first year after the adoption of no-tillage will exert a strong demand on available nitrogen and may cause deficiencies or at least lower nitrogen availability. However, after several years of minimum tillage, the system stabilizes and nitrogen fertility no longer varies from traditional tillage.

There is disagreement about the availability of potassium under no-tillage. Phosphorus seems to have equal or greater availability under no-till compared with the traditional system, regardless of whether the fertilizer is broadcast or banded.

Soil activity. Soil activity becomes a greater factor under no-tillage. In general, soil fertility under no-tillage is strongly influenced by the interacting effects of increased soil moisture, high levels of slowly decomposing organic matter in the soil, higher acidity and lower temperatures in the spring.

EFFECTS OF PESTS

Weed control. Conservation tillage systems depend on heavy application of herbicides. Surface residue intercepts and inactivate part of the applied herbicide. Eliminating tillage causes shifts in weed species.

Disease control. The degree of influence on plant diseases by residue generally relates to the amount of residue remaining after planting.

Crop rotation is especially important for controlling diseases with surface tillage. Another way to reduce diseases associated with reduced tillage is to rotate tillage systems. Inclusion of tillage rotation with crop rotation is an excellent method of disease management. This could be done in a manner to al1ow retaining of 20 to 30 per cent of the surface residue, thus providing the benefits of surface tillage while reducing the potential of disease outbreak.

Insect dynamics. Entomologists working in no-till agriculture have found that the mulch-litter layer of no-tillage soil provides a favourable microhabitat for some insects that attack corn. The loss of reliable mechanical destruction methods in no-tillage corn increases the survival of insect pests inhabiting crop residue or living on or near the soil surface. Two pest trends are often associated with no-tillage systems: 1) the level of pest activity is related to the previous crop type, and 2) no-tillage systems commonly supported a higher diversity of pest insects than traditional tillage systems.

Increased moisture and reduced temperature can increase development of insect pathogens. But almost exclusive reliance has been placed on broad spectrum insecticides.

Crop Yields

Minimum tillage systems may produce greater yields on droughty soils and in well-drained soils, or in more southerly climates. No-till systems have a long-term yield advantage on soil highly subject to erosion.

Energy Requirements

Less energy is required for tillage operations in many no-tillage systems. Since plowing, disking and other trips over the field are eliminated, these systems result in 34 per cent to 76 per cent reduction in fuel for tillage operations. However, the requirements for additional herbicides in no-tillage systems may balance some of these gains. In general, total production costs for corn in the midwest US rise slightly with the intensity of tillage [7, p. 130].

QUESTIONS:

What is meant by minimum tillage?

What are the effects of using no-tillage methods?

Why is soil disturbance much less under no-tillage system?

What are the disadvantages of minimum tillage?

In what soils and climates may minimum tillage systems produce greater yields?

TEXT 3

## WHAT IS AGROECOLOGY?

The term agroecology has come to mean many things. Loosely defined, agroecology often incorporates ideas about a more environmentally and socially sensitive approach to agriculture, one that focuses not only on production, but also on the ecological maintenance ability of the production system. This might be called the "normative' use of the term agroecology, because it implies a number of features about society and production that go well beyond the limits of the agricultural field. At its most narrow, agroecology refers to the study of purely ecological phenomena within the crop fields, such as predator/prey relations, or crop/weed competition.

The Ecological View

At the heart of agroecology is the idea that a crop field is an ecosystem in which ecological processes found in other vegetation formations — such as nutrient cycling, predator/prey interactions, competition, and successional changes — also take place agroecology focuses on ecological relations in the field, and its purpose is to illuminate the form, dynamics and function of those relations. Implicit in some agroecological work is the idea that by understanding these processes and relations, agroecosystems can be manipulated to produce better, with fewer

negative environmental or social effects, more rationally and with fewer external inputs. As a result, a number of researchers in the agricultural sciences and related fields have begun to view the agricultural field as a particular kind of ecosystem — an agroecosystem — and to formalize the analysis of the ensemble of processes and interactions in cropping systems.

The Social Perspective

Social factors such as a collapse in market prices or changes in land using can break up agricultural system as decisively as drought, pest outbreak or soil nutrient decline. The results of the interplay between endogenous biological and environmental features of the agricultural field, and exogenous social and economic factors, generate the particular agroecosystem structure.

The Stability of Agroecosystems

Under conventional agriculture, humans have simplified the structure of the environment over vast areas, replacing nature's diversity with a small number of cultivated plants and domesticated animals. This process of simplification reaches an extreme form in a monoculture. The objective of this simplification is to increase the proportion of solar energy fixed by the plant communities that is directly available to humans. The net result is an artificial ecosystem that requires constant human

intervention. Commercial seed-bed preparation and mechanized planting replace natural methods of seed dispersal; chemical pesticides replace natural controls on populations of weeds, insects and diseases; and genetic manipulation replaces natural processes of plant evolution and selection. Even decomposition is altered since plant growth is harvested and soil fertility maintained, not through nutrient recycling, but with fertilizers. Although modern agroecosystems have proven capable of supporting a growing population, there is considerable evidence that the ecological equilibrium in such artificial systems is very damaged.

An agricultural system differed in several fundamental ways from a "natural" ecological system in its structure and function. Agroecosystems are semi-domesticated ecosystems that fall on a gradient between ecosystems that have experienced minimal human effect, and those under maximum human control, like cities. Here are four major characteristics of agroecosystems:

1. Agroecosystems include helping sources of energy like human, animal and fuel energy to make better productivity of particular organisms.

2. Diversity can be greatly reduced compared with many natural ecosystems.

3. The dominant animals and plants are under artificial rather than natural selection.

4. The controls on the systems are largely external rather than internal by way of subsystem feedback.

This model is primarily based on modernized agriculture, such as that found in the United States. There are, however, many kinds of agricultural systems, particularly in the tropics, that do not fit well with this definition.

Agricultural systems are complex interactions between external and internal social, biological and environmental processes. The degree of external against internal control can reflect intensity of management over time.

Agricultural strategies respond not only to environmental, biotic and cultural forces, but also reflect human existence strategies and economic conditions. Factors like labor availability, subsidies, risk, price information, family size are often critical to understanding the logic of a farming system.

Agroecology Demand

Traditional agricultural scientists have been concerned primarily with the effect of soil, animal or vegetation management practices upon the productivity of a given crop, using a perspective that emphasized a target problem such as soil nutrients or pest invasions.

Increasingly, however, scientists are recognizing that such a narrow approach could limit agricultural preferences for rural peoples, and that the "target approach" often carries with it unintended secondary consequences that have often been ecologically damaging and had high social costs. Agroecology research does concentrate on target in the agricultural field, but within a wider context that includes ecological and social variables.

Agroecology can best be described as an approach that questions the ideas and methods of several subfields, rather than as a specific discipline. It has roots in the agrocultural sciences, in the environmental movement, in ecology (particularly in the explosion of research on tropical ecosystems), in the analysis of native agroecosystems and in rural development studies [7, p. 132].

QUESTIONS:

What does the term agroecology mean?
What is the central idea of agroecology?
What the major characteristics of agroecosystems?
Is agroecology a specific discipline?

## AGRICULTURAL VOCABULARY:

**A**

advance – просування, успіх, прогрес

aid – допомагати, сприяти

alfalfa – люцерна

amendment – добриво, грунтополіпшувач

approach – наближатися

assess – оцінювати

**B**

be employed – бути зайнятим (на роботі)

beans – боби

beets – буряк

**C**

calamity – лихо

castor oil – касторова олія

cereal grains – зернові культури

clover – конюшина

cocoa beans – какао-боби

coconuts – кокосові горіхи

compaction – щільність, компактність

crop rotation – сівозміна

**D**

decomposition – розпад, розкладання

demand (for) – попит

destruction – руйнувати

device – пристрій, пристосування

diet – раціон, харчування

domestication – одомашнення, приручення

drastic changes – корінні зміни

**E**

excepting – крім

excessive – надлишковий, надмірний, зайвий

excessive exploitation – надмірна експлуатація

exhaustion – виснаження

existence – існування

explosion – вибух

extend – розширювати, збільшувати

**F**

fabric – тканина

famine – гостра нестача, недолік, голод;

feeding trough [tr6f] – годівниця

fibre – волокно

flax – льон

**G**

game – дичина

**H**

hide – шкіра

hog – свиня

holistic approach – цілісний підхід

**I**

imply – мати на увазі

impoverish – виснажувати, збіднювати;

inherit – передаватися у спадок, отримувати у спадок

inhibit – перешкоджати, стримувати, придушувати

inoculate – зробити щеплення

insect pest – комаха-шкідник

integrate – інтегрувати

interdependence – взаємозалежність

irrigation [IrI´geIʃn] – зрошення

linseed oil – лляна олія

**M**

make up – складати

manure [mə´njuə] – гній

milking machine – доїльний апарат

millet – просо

mink – норка

multiple – розмножуватися, збільшуватися;

mussel – мідія

**N**

natural rubber – каучук

negligent, prodigal relation – недбалість, марнотратне ставлення;

nourishment – харчування, поживні речовини  syn. nutrition

**O**

occur – траплятися, виявлятися

oil-bearing crops – олійні культури

ornamental – декоративний

oyster – устриця

**P**

peas – горох

perennial – багаторічний, що триває цілий рік

perish – гинути, губити, псуватися

pernicious - згубний, шкідливий

poultry – домашня птиця

prohibit – забороняти

pulses – бобові культури

pump – насос

pursuit – пошук

**R**

raw materials – сировина

reduce – зменшувати

remain – залишатися

replace – замінювати

retard – затримувати, уповільнювати, відставати

root crops – коренеплоди

**S**

scraps – відходи

seed [si:d] – насіння, зерно

selective breeding – селекційне розведення

shellfish – устричні

shrub – чагарник

silkworms – шовковичні хробаки

smother – придушувати, задихатися

sorghum – сорго

soybeans – соя

spread (spread, spread) – поширювати

subsequent - наступний

sugarcane – цукровий очерет

surrounding – оточення, навколишнє середовище

sustainable – витривалий

**T**

tame – приручати, ручний

threat – загроза

tillage – обробка грунту, оброблена земля

trout – форель

turkey – індичка

**V**

value – цінність

variety – 1) різноманітність, безліч; 2) вид, сорт

versatile - багатосторонній, непостійний, мінливий

wood ash – деревна зола

yarn – пряжа

## GLOSSARY:

**Agribusiness** – Commercial agriculture combined with characterized by integration of different steps in the food-processing industry, usually through ownership by large corporations

**Agricultural origin** – agricultural hearth

**Agriculture** – The deliberate modification of Earth's surface through the cultivation of plants and the rearing of animals to obtain sustenance or economic gain

**Animal domestication** – The process where animals are artificially selected and become accustomed to human provision and control

**Animal husband**ry – An agricultural activity associated with the raising of domesticated animals, such as cattle, horses, sheep, and goats

**Biotechnology** – The use of genetically engineered crops in agricutlure and DNA manipulation in livestock in order to increase production. Example: radiation of meats and vegetables to prolong their freshness

**Capital-intensive agriculture** – Form of agriculture that uses mechanical goods such as machinery, tools, vehicles, and facilities to produce large amounts of agricultural goods - a process requiring very little human labor

**Cereal grain** – A grass yielding grain for food

**Chaff** – Husks of grain separated from the seed by threshing

**Combine** – A machine that reaps, threshes, and cleans grain while moving over a field

**Commercial agricultur**e – Agriculture undertaken primarily to generate products for sale off the farm

**Crop** – Grain or fruit gathered from a field as a harvest during a particular season

**Crop rotation** – The practice of rotating use of different fields from crop to crop each year, to avoid exhausting the soil

**Desertification** – Degradation of land, especially in semiarid areas, primarily because of human actions like excessive crop platning, animal grazing, and tree cutting

**Double cropping** – Harvesting twice a year from the same field

**Extensive agriculture** – An agricultural system characterized by low inputs of labor per unit land area

**Feedlots** – Places where livestock are concentrated in a very small area and raised on hormones and hearty grains that prepare them for slaughter at a much more rapid rate

**Fertile Crescent** – Area located in the crescent-shaped zone near the southeastern Mediterranean coast (including Iraq, Syria, Lebanon, and Turkey), which was once a lush environment and one of the first hearths of domestication and thus agricultural

activity

**First Agricultural Revolution** – Also Neolithic Revolution. The period of time about 12,000 years ago when the humans transitioned from hunting and gathering communities to agriculture and settlement bands due to the use of plant and animal domestication

**Genetically modified foods** – Foods that are mostly products of organisms that have had their genes altered in a laboratory for specific purposes, such as disease resistance, increased productivity, or nutritional value allowing growers greater control, predictability, and efficiency

**Grain** – Seed of a cereal grain

**Green Revolution** – Rapid diffusion of new agricultural technology, especially new high-yield seeds and fertilizers

**Horticulture** – The growing of fruits, vegetables, and flowers

**Hull** – The outer covering of a seed

**Industrial Revolution** – The rapid economic changes that occurred in agriculture and manufacturing in England in the late 18th century and that rapidly spread to other parts of the developed world

**Intensive cultivation** – Any kind of agricultural activity that involves effective and efficient use of labor on small plots of land to maximize crop yield

**Intensive subsistence agriculture** – A form of subsistence agriculture in which farmers must expend a relatively large amount of effort to produce the maximum feasible yield from a parcel of land

**Labor-intensive agriculture** – Type of agriculture that requires large levels of manual labor to be successful

**Luxury crops** – Crops not grown for sustenance to include tea, cacao, coffee, and tobacco

**Mechanization** – In agriculture, the replacement of human labor with technology or machines

**Mediterranean agriculture** – Type of specialized farming occuring only in the areas where the dry-summer Mediterranean climate prevails along the shores of the Mediterranean sea

**Metallurgy** – The technique of separating metals from ores.

**Milkshed** – The area surrounding a city from which milk is supplied

**Organic agriculture** – Crops produced without the use of synthetic or industrially produced pesticides or fertilizers

**Paddy** – Malay word for wet rice, commonly but incorrectly used to describe a sawah

**Pastoral nomadian** – A form of subsistence agriculture based on herding domesticated animals

**Pastoralism** – A type of agricultural activity based on nomadic animal husbandry or the raising of livestock to provide food, clothing, and shelter

**Pasture** – Grass or other plants grown for feeding grazing animals, as well as land used for grazing

**Pesticides** – Chemicals used on plants that do not harm the plants, but kill pests and have negative repercussions on other species who ingest the chemicals

**Planned agricultural economy** – An agricultural economy found in communist nations in which the government controls both agricultural production and distribution

**Plant domestication** – The process where plants are artificially selected and become accustomed to human provision and control.

**Plantation** – A large farm in tropical and subtropical climates that specializes in the production of one or two crops for sale, usually to a more developed country

**Plantation agriculture** – When cash crops are grown on large estates

**Prime agricultural alnd** – The most productive farmland

**Ranching** – A form of commercial agriculture in which livestock graze over an extensive area

**Reaper** – A machine that cuts grain standing in the field

**Ridge tillage** – System of planting crops on ridge tops, in order to reduce farm production costs and promote greater soil conservation

**Salinization** – Process that occurs when soils in arid areas are brought under cultivation through irrigation. In arid climates, water evaporates quickly off the ground surface, leaving salty residues that render the soil infertile

**Sawah** – A flooded field for growing rice

**Second Agricultural Revolution** – The period of time in 17th and 18th century Europe where farming underwent significant changes. Tools and equipment were modified. Methods of soil preparation, fertilization, crop care, and harvesting improved. The general organization of agriculture, food storage, and distribution was made more efficient. Productivity increased to meet rising demands, including the demand from the growing cities.

**Seed agriculture** – Reproduction of plants through annual introduction of seeds, which result from sexual fertilization

**Shifting cultivation** – A form of subsistence agriculture in which people shift activity from one field to another; each field is used for crops for a relatively few years and left fallow for a relatively long period

**Slash-and-burn agriculture** – Another name for shifting cultivation, so named because fields are cleared by slashing the vegetation and burning the debris

**Specialty crops** – Crops including items like peanuts and pineapples, which are produced, usually in developing countries, for export

**Spring wheat** – Wheat planted in the spring and harvested in the late summer

**Subsistence agriculture** – Agriculture designed primarily to provide food for direct consumption by the farmer and the farmer's family

**Sustainable agriculture** – Farming methods that preserve long-term productivity of land and minimize pollution, typically by rotating soil-restoring crops with cash crops and reducing inputs of fertilizer and pesticides

**Swidden** – A patch of land cleared for planting through slashing and burning

**Third Agricultural Revolution** – The period of time approximately 250 years after the start of the Second Agricultural Revolution continuing into the present, with three distinctive features. The lines distinguishing agriculture as primary, secondary, and tertiary activities are removed as the farmers

perform more than just the primary activities. More intensive mechanization and biotechnology are also used.

**Thresh** – To beat out grain from stalks by trampling it

**Thunian patterns** – Each town or market is surrounded by a cet of more-or-less concentric rings within which particular commodities or crops dominated.

**Topsoil loss** – Loss of the top fertile layer of soil is lost through erosion. It is a tremendous problem in areas with fragile soils, steep slopes, or torrential seasonal rains

**Transhumance** – The seasonal migration of livestock between mountains and lowland pastures

**Truck farming** – Commercial gardening and fruit farming, so named because truck was a Middle English word meaning bartering or the exchange of commodities

**Urban sprawl** – The process of urban areas expanding outwards, usually in the form of suburbs, and developing over fertile agricultural land

**Vegetative planting** – Reproduction of plants by direct cloning from existing plants

**von Thunen Model** – An agricultural model that spatially describes agricultural activities in terms of rent. Activities that require intensive cultivation and cannot be transported over great distances pay higher rent to be close to the market. Conversely,

activities that are more extensive, with goods, that are easy to transport, are located farther from the market where rent is less.

**Wet rice** – Rice planted on dryland in a nursery, then moved to a deliberately flooded field to promote growth

**Winnow** – To remove chaff by allowing it to be blown away by the wind

**Winter wheat** – Wheat planted in the fall and harvested in the early summer

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