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АНГЛІЙСЬКА МОВА

Методичний посібник для аудиторної та самостійної роботи студентів II курсу денної форми навчання за напрямом 6.090101 „Агрономія”

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Англійська мова: методичний посібник для аудиторної та самостійної роботи студентів II курсу денної форми навчання за напрямом 6.090101 «Агрономія» Т.А.Ганніченко – Миколаїв : МНАУ, 2015. – 112 с.
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Мета посібника забезпечити розвиток навичок професійного спілкування, роботи з фаховою літературою та усного мовлення на теми, передбачені програмою з англійської мови для студентів спеціальності «Агрономія». Складається з 11 розділів. Призначений для студентів агротехнологічних спеціальностей.

ЗМІСТ

ПЕРЕДМОВА

Процес оновлення змісту освіти, вихід її на новий якісний рівень потребує створення нових методичних напрацювань для підготовки фахівців різних галузей народного господарства, зокрема це стосується й фахівців аграрного профілю. 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.

Методичні посібник з англійської мови призначений для роботи студентів ІІ курсу денної форми навчання за напрямом 6.090101 „Агрономія”. 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. Граматичні вправи спрямовані на закріплення знань і контроль вироблення граматичних умінь і навичок. Усні

розмовні теми, що пропонуються до вивчення, сприятимуть вдосконаленню навичок усної комунікації і підвищення рівня мовної культури студентів.

Навчальній посібник складається з 11 розділів, кожен з яких містить фахові тексти, різноманітні вправи та завдання на знання фахової лексики.

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.

На опрацювання кожного розділу відводиться по 2 години аудиторної та 4 години самостійної роботи.

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.

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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	Cotton
Agronomy	Crop growing
Application	Crop rotation
Branches of agriculture	Equilibrium
Cattle breeding	Feed

Flax	Pig growing
Food crops	Plant protection
Foodstuff	Poultry breeding
Grain crops	Protein
Herbicide	Raw materials
Industrial crops	Soil
Intensification	To breed
Liming	To cultivate
Mechanization	To disturb
Mineral fertilizers	To irrigate
Nutrient substances	Utilization of fertilizers
Organic 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.)

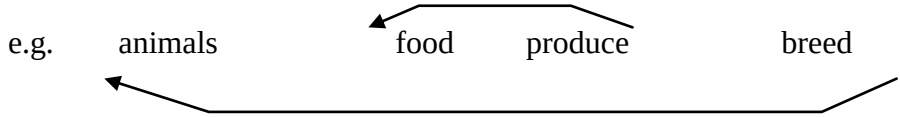
5.What are these words derived from? Notice the different suffixes, indicating different parts of speech.

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

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. Ask questions to the text, retell the text.

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 . FERTILIZATION

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

agrochemicals	arable
calcium	magnesium
carbondioxide	chlorophyll
compensate	concentration
constituent	decomposing
degradation	eliminate
emit	enzyme
exhaust	imbalance
impact	insect
liquid	metabolism
mineral	nitrogen

nucleic acids	nutrients
pesticide	pests
phosphorus	plough
potassium	protein
raw materials	reduce
release	residue
root	solid
solution	storage
sulphur	tillage
to protect	topsoil
weeds	

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
* surrounding
* to bring together
* to extend

* drastic changes
* to imply
* to improve
* 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

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.74]

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 /	a) burning of fossil fuel

oceans	
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.

on local soil conditions. 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.

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