



**МІНІСТЕРСТВО ОСВІТИ І НАУКИ  
УКРАЇНИ**

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**Факультет менеджменту,  
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Кафедра європейських мов**

## **АНАЛІЗ І ПЕРЕКЛАД ФАХОВИХ ТЕКСТІВ**

### **Методичні рекомендації**

**для аудиторної та самостійної роботи**

**з дисципліни “Англійська мова за професійним  
спрямуванням” для здобувачів першого  
(бакалаврського) рівня вищої освіти  
спеціальностей**

**015 Професійна освіта 101 Екологія 133 Галузеве  
машинобудування 141 Електроенергетика,  
електротехніка та електромеханіка  
142 Енергетичне машинобудування  
208 Агроінженерія, 274 Автомобільний  
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денної та заочної форми навчання**

**Харків, 2024**

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**НАВЧАЛЬНЕ ВИДАННЯ**

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## Unit 1

### Intensive and Extensive Agriculture

1. When most people think of agriculture, they picture farmers in the field, producing animals and crops. Agriculture is often thought of as ‘cows, sows, and plows’ or ‘weeds, seeds, and feeds’. This may be a depiction of how agriculture used to be in the past, but times have changed. Today, most agriculture is seen as a technology-based industry that includes production, agriscience, and agribusiness.

2. *Agri* is from Latin *ager*, meaning ‘a field’, and *culture* is from Latin *cultura*, meaning ‘cultivation’ in the strict sense of *tillage of the soil*. A literal reading of the English word agriculture is *tillage of the soil of a field*. In modern usage, the word *Agriculture* covers all activities essential to food, feed and fiber production, including all techniques for raising and processing livestock. 42% of the world’s laborers are employed in agriculture, making it by far the most common occupation.

3. The twentieth century saw massive changes in agriculture including hydroponics, plant breeding, hybridization, gene manipulation, better management of soil nutrients, and improved weed control. Genetic engineering has yielded crops which have capabilities beyond those of naturally occurring plants, such as higher yields and disease resistance. Modified seeds germinate faster, and thus can be grown in an extended growing area. Engineers may develop plans for irrigation, drainage, conservation and sanitary engineering, particularly important in normally arid areas which rely on constant irrigation, and on large scale farms. The packing, processing, and marketing of agricultural products are closely related activities also influenced by science. Methods of quick-freezing and dehydration have increased the markets for farm products.

4. Mechanization has enormously increased farm efficiency and productivity in agriculture. According to the National Academy of Engineering in the United States,

agricultural mechanization is one of the 20 greatest engineering achievements of the 20th century. Early in the century, it took one American farmer to produce food for 2.5 people. Today, due to advances in agricultural technology, a single farmer can feed over 130 people. Airplanes, helicopters, trucks and tractors are used in agriculture for seeding, spraying operations for insect and disease control, aerial topdressing and transporting perishable products. Radio and television disseminate vital weather reports and other information such as market reports that concern farmers. Computers have become an essential tool for farm management.

5. In agricultural economics, intensive agriculture is a system of cultivation using large amounts of labour and capital relative to land area. Large amounts of labour and capital are necessary to the application of fertilizers, insecticides, fungicides, and herbicides to growing crops, and capital is particularly important to the acquisition and maintenance of high-efficiency machinery for planting, cultivating, and harvesting, as well as irrigation equipment where that is required. Optimal use of these materials and machines produces significantly greater crop yields per unit of land than extensive agriculture, which uses little capital or labour. As a result, a farm using intensive agriculture will require less land than an extensive agriculture farm to produce a similar profit. On the level of theory, the increased productivity of intensive agriculture enables the farmer to use a relatively smaller land area that is located close to market, where land values are high relative to labour and capital, and this is true in many parts of the world. If costs of labour and capital outlay<sup>1</sup> for machinery and chemicals, and costs of storage (where desired or needed) and transportation to market are too high, then farmers may find it more profitable to turn to extensive agriculture.

6. Extensive agriculture is a system of crop cultivation using small amounts of labour and capital in relation to area of land being farmed. The crop yield in extensive agriculture depends primarily on the natural fertility of the soil, terrain, climate, and the availability of water. Extensive agriculture is distinguished from intensive agriculture in that the latter, employing large

amounts of labour and capital, enables one to apply fertilizers, insecticides, fungicides, and herbicides and to plant, cultivate, and often harvest mechanically. Because extensive agriculture produces a lower yield per unit of land, its use commercially requires large quantities of land in order to be profitable. This demand for land means that extensive agriculture must be carried on where land values are low in relation to labour and capital, which in turn<sup>2</sup> means that extensive agriculture is practiced where population densities are low and thus usually at some distance from primary markets.

7. However, in practice many relatively small-scale farmers employ some combination of intensive and extensive agriculture, and many of these operate relatively close to markets. Many large-scale farm operators, especially in such relatively vast and agriculturally advanced nations as Canada and the United States, practice intensive agriculture in areas where land values are relatively low, and at great distances from markets. However, in such societies overproduction (beyond market demands) often results in diminished profit as a result of depressed prices.

*Notes:*

<sup>1</sup> *capital outlay* – основні витрати

<sup>2</sup> *in turn* – у свою чергу

## **Exercises**

*1. These are questions and unfinished statements about the text, each with 3 suggested answers or ways of finishing. You must choose the one best answer A, B or C according to the text.*

1. Modern agriculture is

A. a simple and boring process of raising plants and animals.

B. all the activities involved in the production, processing and distribution of food and fibre products.

C. soil cultivation.



2. What properties are characteristic of crops produced by genetic engineering?
  - A. High yield and disease resistance.
  - B. Traits of naturally occurring plants.
  - C. An ability to grow without being watered.
3. What is one of the 20 greatest engineering achievements of the 20<sup>th</sup> century?
  - A. Gene manipulation.
  - B. Hydroponics.
  - C. Agricultural mechanization.
4. How many people can a farmer feed nowadays?
  - A. 2.5.
  - B. 20.
  - C. More than 130.
5. Intensive agriculture is a kind of agriculture that
  - A. uses large amounts of labour and capital relative to land area.
  - B. uses small amounts of labour and capital relative to land area.
  - C. does not apply fertilizers.
6. When is it reasonable to turn from intensive agriculture to extensive agriculture?
  - A. When machinery, chemicals, storage of agricultural products and their transportation to market are very expensive.
  - B. When costs of transportation of agricultural products to market are low.
  - C. When costs of storage of agricultural products are not too high.
7. The crop yield in extensive agriculture mainly depends on
  - A. market demands.
  - B. natural characteristics of the soil.
  - C. overproduction.

*2. Decide if these statements are true (A), false (B) or not given in the text (C).*

1. The word 'agriculture' was borrowed from the Latin language.
2. Agriculture is the process of producing food, feed, fiber and other goods by the systematic raising of plants and animals.
3. The quality of soil can be improved by means of gene manipulation.
4. In the 20<sup>th</sup> century a great deal of changes occurred in agriculture.
5. Mechanization, aviation, computer technologies have increased farm efficiency and productivity in agriculture.
6. The more fertilizers and herbicides are applied, the higher crop yields are.
7. Hydroponics is crop production with mineral nutrient solutions instead of soil.
8. In practice there are 2 distinct kinds of farms: farms of intensive agriculture and farms of extensive agriculture.
9. Intensive agriculture uses highly efficient agricultural machinery for planting, cultivating, and harvesting.
10. Aerial topdressing was developed in New Zealand in 1940s and was rapidly adopted elsewhere in the 1950s.
11. Extensive agriculture is used in areas where population density is high.

3. Look through the text again and do the following tasks.

1. The word *they* in paragraph 1 refers to
  - A. people.
  - B. farmers.
  - C. animals.
2. The word *picture* in paragraph 1 is closest in the meaning to
  - A. paint
  - B. photograph
  - C. imagine.
3. The word *those* in paragraph 3 refers to
  - A. crops.
  - B. plants.
  - C. capabilities.

4. Look at paragraphs 1, 2 and 3. Match the words in A with the words or word combinations which have similar meaning in B.

A

1. To picture
2. depiction
3. tillage
4. to cover
5. essential
6. laborer
7. capability
8. to germinate
9. arid
10. constant

B

- A. worker
- B. to start growth
- C. picture
- D. most important
- E. to imagine
- F. cultivation
- G. to include
- H. quality
- I. unchanging
- J. dry

5. The word *latter* in paragraph 6 refers to

- A. extensive agriculture.
- B. intensive agriculture.
- C. labour and capital.

6. Look at paragraphs 4, 5, 6 and 7. Match the words in A with their opposites in B.

A

1. Intensive
2. essential
3. perishable
4. profitable
5. vast
6. true
7. to increase
8. to depress
9. availability

B

- A. small
- B. extensive
- C. false
- D. to raise
- E. unavailability
- F. to decrease
- G. durable
- H. unimportant
- I. unprofitable

4. Match a word in A with its definition in B.

A

1. Agribusiness

B

A. the natural or artificial removal of surface and sub-surface water from a given area

- |                       |   |
|-----------------------|---|
| 2. Irrigation         | B. the spreading of fertilizers over farmland with the use of aircraft  |
| 3. Hybridization      | C. a generic term that refers to the various businesses involved in food production, including farming, seed supply, agrichemicals, farm machinery, distribution, processing, marketing, wholesale and retail sales |
| 4. Drainage           | D. natural or artificial substance containing the chemical elements that improve growth and productiveness of plants  |
| 5. Fertilizer         | E. any toxic substance used to kill or inhibit the growth of fungi  |
| 6. Insecticide        | F. the replacement or supplementation of rainfall with water from another source in order to grow crops or plants   |
| 7. Herbicide          | G. any toxic substance that is used to kill insects   |
| 8. Fungicide          | H. the process of mixing different species or varieties of organisms to create a hybrid   |
| 9. Aerial topdressing | I. a pesticide used to kill unwanted plants   |

5. Choose the word which best completes each sentence.

A. agriculture (2)    B. agricultural    C. agriculturalist

- Intensive \_\_\_\_ (1.1) is a kind of \_\_\_\_ (1.2) which involves large fields, large numbers of animals, large resource input (pesticides, fertilizers, etc.) and a high level of mechanization.
- An \_\_\_\_ is a person who deals with the science of cultivating the soil.

3. \_\_\_\_ literacy is important to everyone because it is very much a part of our daily life.

D. economics    E. economy    F. economic    G. economical

4. The \_\_\_\_ (4.1) system of a country is usually called the national \_\_\_\_ (4.2).

5. \_\_\_\_ is the study of the behaviour of human beings in producing, distributing, and consuming material goods and services in a world of scarce resources.

6. It is more \_\_\_\_ to use herbicides produced by the neighbouring plant.

*6. In each sentence, select the **one** correct answer.*

1. It is interesting \_\_\_\_ horticulture.

A. to study    B. study    C. studying

2. He likes \_\_\_\_ to the agricultural exhibition.

A. to be invited    B. be invited    C. being invited

3. By \_\_\_\_ the use of synthetic fertilizers or pesticides organic farmers minimize the environmental pollution.

A. to avoid    B. avoid    C. avoiding

4. He can \_\_\_\_ a tractor.

A. to drive    B. drive    C. driving

5. The Common Agricultural Policy of the EU aims \_\_\_\_ (5.1) quality products at competitive prices and \_\_\_\_ (5.2) the position of agriculture on world and internal markets.

5.1 A. to provide    B. provide    C. providing

5.2 A. to consolidate    B. consolidate    C. consolidating

6. Organic farming is a way of \_\_\_\_ food which recognizes the essential connections between the soil, plants, animals and people.

A. to produce    B. produce    C. producing

7. In agriculture chemicals are used to kill the target pests without \_\_\_\_\_ any useful animals.  
A. to harm                      B. harm                      C. harming
8. Would the professor mind \_\_\_\_\_ some time talking to me after the examination?  
A. to spend                      B. spend                      C. spending
9. Organic farmers must \_\_\_\_\_ that 90% of the cow's daily dry food is organically grown.  
A. to ensure                      B. ensure                      C. ensuring
10. Combine harvesters are used \_\_\_\_\_ crops.  
A. to harvest                      B. harvest                      C. harvesting
11. The agronomist advised me \_\_\_\_\_ winter wheat.  
A. to grow                      B. grow                      C. growing
12. Most people enjoy \_\_\_\_\_ to different parts of the world.  
A. to travel                      B. travel                      C. traveling
13. We are planning \_\_\_\_\_ several historical sites in London.  
A. to visit                      B. visit                      C. visiting
14. All the employees decided \_\_\_\_\_ overtime.  
A. to work                      B. work                      C. working
15. I am interested in \_\_\_\_\_ my communication skills.  
A. to improve                      B. improve                      C. improving
16. We hope \_\_\_\_\_ record harvests.  
A. to achieve                      B. achieve                      C. achieving

## Unit 2

### Sustainable Development

1. Answer the following questions:

1.1. What is sustainable development?

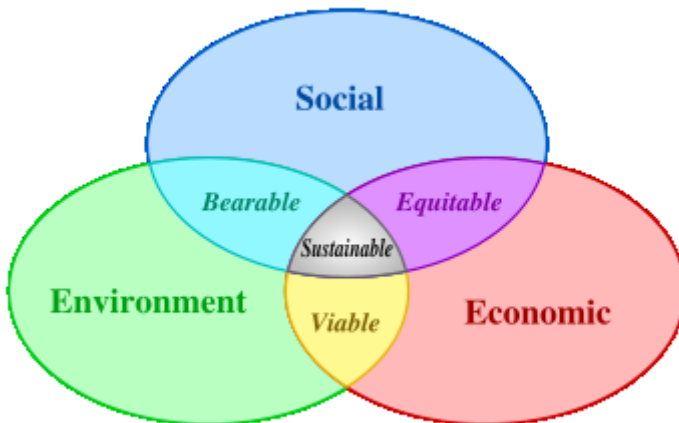
1.2. What fields of human life does sustainable development involve?

1.3. Do the terms 'green development' and 'sustainable development' mean the same?

1.4. Why is the concept 'sustainable development' sometimes criticized?

2. Read the text:

The term 'sustainable development' was first used by the Brundtland Commission which gave the most often-quoted definition of sustainable development as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs.'



Sustainable development ties together concern ecology, economy and social aspect. As early as the 1970s 'sustainability' was employed to describe an economy 'in equilibrium with basic ecological support systems.' Ecologists have pointed to the limits to growth, and presented the alternative of a 'steady state economy' in order to address environmental concerns.

The field of sustainable development can be conceptually broken into three constituent parts: environmental sustainability, economic sustainability and sociopolitical sustainability.

Sustainability is a process which combines all aspects of human life. It means resolving the conflict between the various competing goals, and involves the simultaneous pursuit of economic prosperity, environmental quality and social equity famously known as three dimensions with is the resultant vector being technology, hence it is a continually evolving process; the 'journey' (the process of achieving sustainability) is of course vitally important, but only as a means of getting to the destination (the desired future state). However, the 'destination' of sustainability is not a fixed place in the normal sense that we understand destination. Instead, it is a set of wishful characteristics of a future system.

Green development is generally differente from sustainable development, because Green development prioritizes what its proponents consider to be environmental sustainability over economic and cultural considerations. For example, an environmentally ideal plant that is shut down due to bankruptcy is obviously less sustainable than one that is maintainable by the community, even if it is somewhat less effective from an environmental standpoint.

This concept is sometimes criticized. Sustainable development is said to set limits on the developing world. While current first world countries polluted significantly during their development, the same countries encourage third world countries to reduce pollution.

Others have criticized the overuse of the term: "The word 'sustainable' has been used in too many situations today, and



ecological sustainability is one of those terms that confuse a lot of people. You hear about sustainable development, sustainable growth, sustainable economies, sustainable societies, sustainable agriculture. Everything is sustainable.”

3. Say whether the following statements are true or false:

3.1. The concept ‘sustainable development’ was developed to save the planet for future generations. True / False

3.2. ‘Sustainable’ means the same as ‘ecological’. True / False

3.3. The sustainable development policy can limit the economical development of some countries. True / False

3.4. The term ‘sustainable’ is used to describe too many phenomena. True / False

4. Render the main idea of the text in 2-3 sentences in your native language.

5. Write an abstract of the text in English.

### **Unit 3**

### **Sustainable Agriculture**

1. Sustainable agriculture integrates three main goals – environmental health, economic profitability, and social and economic equity. Sustainability rests on the principle that we must meet the needs of the present without compromising the ability of future generations to meet their own needs. Therefore, stewardship of both natural and human resources is of prime importance. Stewardship of human resources includes consideration of social responsibilities such as working and living conditions of laborers, the needs of rural communities, and consumer health and safety both in the present and the future. Stewardship of land and natural resources involves maintaining or enhancing this vital resource base for the long term.

2. The transition to sustainable agriculture is a process. For farmers, the transition to sustainable agriculture normally requires a series of small realistic steps. The key to moving forward is the

will to take the next step. It is important to point out that reaching toward the goal of sustainable agriculture is the responsibility of farmers, laborers, policymakers, researchers, retailers, and consumers. Each group has its own part to play, its own unique contribution to make to strengthen the sustainable community-supported agriculture.

3. When the production of food and fiber degrades the natural resource base, the ability of future generations to produce and flourish decreases. The decline of ancient civilizations in Mesopotamia, the Mediterranean region and Central America is believed to have been strongly influenced by natural resource degradation from non-sustainable farming and forestry practices.

4. Modern agriculture is heavily dependent on non-renewable energy sources, especially petroleum. The continued use of these energy sources cannot be sustained indefinitely, yet to abruptly abandon our reliance on them would be economically catastrophic. In sustainable agricultural systems, there is reduced reliance on non-renewable energy sources and a substitution of renewable sources to the extent that is economically feasible. Many agricultural activities affect air quality. These include smoke from agricultural burning; dust from tillage, traffic and harvest; pesticide spray drift<sup>1</sup>; and nitrous oxide emissions from the use of nitrogen fertilizers. Options to improve air quality include incorporating crop residue into the soil, using appropriate levels of tillage, and planting windbreaks, cover crops<sup>2</sup> or strips of native perennial grasses to reduce dust. Water is the principal resource that has helped agriculture and society to prosper, and it has been a major limiting factor when mismanaged. Periodic droughts, some lasting up to 50 years, have occurred in California. In drought years, limited surface water supplies have prompted overdraft<sup>3</sup> of ground water and consequent intrusion of salt water, or permanent collapse of aquifers. Several steps should be taken to develop drought-resistant farming systems even in 'normal' years, including both policy and management actions: improving water conservation and storage measures, providing incentives for selection of drought-tolerant crop species, using reduced-volume

irrigation systems, managing crops to reduce water loss, or not planting at all.

5. A common philosophy among sustainable agriculture practitioners is that a ‘healthy’ soil is a *key (1)* component of sustainability. The soil is viewed as a fragile and living medium that must be protected *to ensure (2)* its long-term productivity and stability. Sustainable production *practices (3)* involve *a variety of (4)* approaches. Specific strategies must take into *account (5)* topography, soil characteristics, climate, pests, local availability of inputs and the individual grower’s *goals (6)*. Several general principles can be *applied (7)* to help growers select appropriate management practices:

- selection of species and varieties that are well suited to the site and to conditions on the farm;

- diversification of crops (including livestock) and cultural practices *to enhance (8)* the biological and economic stability of the farm;

- management of the soil to enhance and protect soil quality;
- consideration of farmers’ goals and lifestyle choices.

Diversified farms are usually more economically and ecologically reliable. While monoculture farming has advantages *in terms of (9)* efficiency and ease of management, the loss of the crop in any one year could put a farm out of business and seriously disrupt the stability of a community dependent on that crop. By growing a variety of crops, farmers spread economic risk and are less *susceptible (10)* to the radical price fluctuations *associated (11)* with changes in supply and demand.

6. In addition to strategies for preserving natural resources and changing production practices, sustainable agriculture requires a commitment to changing public policies, economic institutions, and social values. Strategies for change must take into account the complex, reciprocal and ever-changing relationship between agricultural production and the broader society. The ‘food system’ extends far beyond the farm and involves the interaction of individuals and institutions with contrasting and often competing goals including farmers, researchers, input suppliers, farm

workers, unions, farm advisors, processors, retailers, consumers, and policymakers.

*Notes:*

<sup>1</sup> *pesticide spray drift* – знесення пестициду під час розпилення

<sup>2</sup> *cover crops* – покривні культури

<sup>3</sup> *overdraft* – перевитрата

## Exercises

*1. These are questions and unfinished statements about the text, each with 3 suggested answers or ways of finishing. You must choose the one best answer A, B or C according to the text.*

1. What is sustainable agriculture?
  - A. A profitable system of farming.
  - B. Farming practices that make efficient use of renewable resources.
  - C. An ecologically sound, economically viable, socially just, and humane agricultural system.
2. Who is responsible for the transition to sustainable agriculture?
  - A. Farmers.
  - B. The whole society.
  - C. Scientists.
3. Modern agriculture mostly depends on
  - A. non-renewable energy sources.
  - B. renewable energy sources.
  - C. water.
4. How do agricultural activities influence air quality?
  - A. They improve air quality.
  - B. They deteriorate air quality.
  - C. They do not exert any influence on air quality.
5. Why is it important to manage the soil in the right way?
  - A. To preserve the long-term fertility of the soil.
  - B. To minimize adverse effects on the environment and people.
  - C. To produce food and fiber.

6. Why is diversified farming more economically reliable than monoculture farming?
- A. Because monoculture farming is easier to manage.
  - B. Because optimum diversity may be obtained by integrating both crops and livestock.
  - C. Because diversified farming does not depend on one crop.

*2. What can be inferred from paragraph 3?*

1. Ancient civilizations were more dependent on the natural resources than the modern civilization.
2. Non-sustainable farming and forestry practices negatively affect the natural resource base.
3. The current generation must produce food and fiber without damaging the ecosystem.

*3. Decide if these statements are true (A), false (B) or not given in the text (C).*

1. Agriculture has changed dramatically since the end of World War II.
2. Sustainable agriculture meets the needs of the current generation while conserving resources for the use of future generations.
3. Different groups of people, from farmers to consumers, should contribute greatly to the development of the sustainable agriculture community.
4. The concept of sustainable agriculture is still being developed.
5. Sustainable agricultural systems rely on irreplaceable resources.
6. Drought-tolerant crops can negatively affect the environment.
7. In drought years limited surface water supplies result in destruction of aquifers.
8. To move towards sustainable agriculture it is important to maintain the soil in such a condition so that it will continue to be productive indefinitely.
9. Every level of organization, from the local neighborhood to the entire globe, can influence sustainability.

*4. Look through the text again and do the following tasks.*

1. Look at paragraphs 1-3. Match the words in A with the words or word combinations which have similar meaning in B.

A

1. Equity
2. decline
3. researcher
4. ancient
5. to enhance
6. to maintain
7. to degrade
8. to flourish
9. to strengthen
10. stewardship

B

- A. very old
- B. to prosper
- C. decay
- D. management
- E. fairness
- F. to improve
- G. investigator
- H. to make stronger
- I. to conserve
- J. to worsen

2. The word *compromising* in paragraph 1 is closest in the meaning to

- A. agreeing      B. endangering      C. determining

3. The word *integrates* in paragraph 1 is closest in the meaning to

- A. includes      B. consists of      C. combines.

4. Look at paragraph 4. Match the words in A with their opposites in B.

A

1. Renewable
2. feasible
3. tolerant
4. loss
5. dependent
6. indefinitely
7. to include
8. to reduce
9. to improve
10. to prosper

B

- A. gain
- B. independent
- C. non-renewable
- D. impossible
- E. definitely
- F. intolerant
- G. to enlarge
- H. to worsen
- I. to decay
- J. to exclude

5. Look at paragraph 5. What italicized words and word combinations could you replace with the words given below?

- A. connected
- B. sensitive
- C. as regards
- D. major
- E. to guarantee
- F. aims

- G. to strengthen
- H. used
- I. consideration
- J. methods
- K. a number of

5. Match a word in A with its definition in B.

- | A                                  | B  |
|------------------------------------|--|
| 1. Sustainable agriculture         | A. naturally occurring substances that are valuable in their unmodified form   |
| 2. Food system                     | B. a merchant who sells goods at retail  |
| 3. Community-supported agriculture | C. a person who uses goods or services   |
| 4. Natural resources               | D. an entire system of agricultural production, processing, marketing, and distribution of food together with related activities in government and education |
| 5. Retailer                        | E. a farm specialized on growing different crops and/or raising livestock  |
| 6. Consumer                        | F. the physical movement of a pesticide through air at the time of application or soon thereafter, to any site other than that intended for application      |
| 7. Windbreak                       | G. an environmentally sound, productive, economically viable, and socially desirable farming method  |

8. Pesticide spray drift      H. a relatively new socio-economic model of food production, sales, and distribution aimed at both increasing the quality of food and the quality of care given the land, plants and animals
9. Diversified farm      I. a plantation usually made up of one or more rows of trees or shrubs planted in such a manner as to protect soil from erosion

6. *Choose the word which best completes each sentence.*

A sustainable (2)      B sustainability      C non-sustainable

1. \_\_\_ is an economic, social, and ecological concept.
2. It is necessary to transfer research funding to \_\_\_(2.1) methods of growing crops and phase out research into \_\_\_(2.2) agriculture.
3. \_\_\_ agriculture includes methods of farming or ranching that serve to maintain ecological balance and avoid depletion of natural resources.

D profit      E profitable      F profitability

4. \_\_\_ is a technical analysis term used to compare performances of different trading systems or different investments within one system.
5. Pure economic \_\_\_ is the increase in wealth that an investor has from making an investment, taking into consideration all costs associated with that investment.
6. In this book the author provides the building blocks and tools that can put a business on the path of \_\_\_ growth.

7. *Complete the text using the following words and word combinations.*

A. Fertility      F. neighbouring  
B. weeds      G. pests



- C. polyculture
- D. ecological
- E. perennial

- H. cover crop
- I. factors
- J. fibre

### Cover Crops

A cover crop is any annual, biennial, or \_\_\_(1) plant grown as a monoculture (one crop type grown together) or \_\_\_(2) (multiple crop types grown together), to improve any number of conditions associated with sustainable agriculture. Cover crops are fundamental, sustainable tools used to manage soil \_\_\_(3), soil quality, water, \_\_\_(4) (unwanted plants that limit crop production potential), \_\_\_(5) (unwanted animals, usually insects, that limit crop production potential), diseases, and diversity and wildlife, in agroecosystems. Agroecosystems are \_\_\_(6) systems managed by humans to produce food, feed or \_\_\_(7). To a large degree, humans shape the ecological structure and function of natural processes that occur in agroecosystems. As agroecosystems often interact with \_\_\_(8) natural ecosystems in agricultural landscapes. Cover crops that improve the sustainability of agroecosystem attributes may also indirectly improve qualities of neighbouring natural ecosystems. Farmers choose to grow specific \_\_\_(9) types and to manage them in specific ways based on their own unique needs and goals. These needs and goals are influenced by biological, environmental, social, cultural, and economic \_\_\_(10) of the food system within which farmers operate.

## Unit 4 Organic Farming

1. Organic farming is a way of producing food which recognises the essential connections between the soil, plants, animals and people. Organic food is ecologically produced which means that farmers use methods which mimic and enhance natural systems. *The role of organic agriculture, whether in farming, processing, distribution, or consumption, is to sustain and*

*enhance the health of ecosystems and organisms from the smallest in the soil to human beings.* For food to be sold as organic there is a legal requirement for it to be produced and handled according to a set of standards and each farm is independently inspected every year.

2. There is often a great diversity of farming operations on organic farms. This includes the growing of cereal crops, fruit and vegetables and rearing beef and dairy cattle, pigs, sheep, goats and poultry. Other activities such as growing hops, apples and vines for organic beer, cider and wine, or beekeeping (for honey), may also be part of an organic farm.

3. Fields tend to be smaller than those on conventional farms and boundaries such as hedges, ditches and dry stone walls<sup>1</sup> are valued for providing homes for predatory insects and animals which help control crop pests. This in turn tends to give the farm a more traditional landscape. Organic farmers strive to conserve natural resources and, by avoiding the use of synthetic fertilizers or pesticides, keep pollution to a minimum. The countryside and its wildlife are an integral part of an organic farming system and indeed the care of the natural environment is crucial if the farm is to operate successfully.

4. Due to the increased labour costs involved in organic farming and other factors, organic food is generally more expensive than that produced conventionally. However, the price we pay for conventionally produced food does not reflect the real cost of its production. For example, £120 million is spent each year to remove pesticide residues resulting from conventional farming from our drinking water.

5. The most valuable natural resource on an organic farm is soil and so it is not surprising that organic farmers place great emphasis on building up a healthy and fertile soil. A healthy, fertile soil is rich in a huge variety of living things. Fungi and microbes help to rot and decompose dead plants and animals, recycling organic material back into the soil. Humus is that part of the soil made up of this partially decomposed plant and animal material. Organic farmers add composted manure and other farm

wastes to soil in order to increase humus content which, in turn, ensures that more nutrients are available for plant growth. Such applications occur on some conventional farms, but often not to the same degree.

6. To 'rest' the soil and build up nutrients, farmers use rotations; growing a variety of crops in different places and at different times. Clover is especially helpful in building up soil fertility as it has special 'nodules' on the roots which contain bacteria. These bacteria are able to change nitrogen gas into nitrate (a chemical form of nitrogen that plants can use easily). Animals are often involved in rotations as they can graze on the 'resting land', which would be sown with grass or clover. Sheep or pigs may feed on the root crops in a rotation and their manure feeds the soil and enriches it.

7. Organic farmers make best use of natural predator-prey relationships, rather than using chemical pesticides to destroy the flora and fauna that may damage a crop. For example, those insects that are beneficial include ladybirds feeding on aphids. Other predators, such as birds, bats, beetles are encouraged by providing them with good habitats. This practice of rotating farm crops helps to break the life cycles of weeds and pests that may thrive if only one crop was grown over a large area of land.

8. High standards of animal welfare are *essential* (1) to organic farming. In all cases, animals *provided* (2) with *comfortable* (3), clean shelter and *plenty* (4) of space, will be less stressed, more *content* (5) and able to behave instinctively. Animals on organic farms are *reared*(6) less intensively than on conventional farms, so are less likely to pick up *diseases* (7). On organic farms animals are outside in the *natural light*(8) as much as possible. Pigs and sheep are moved to new *ground* (9) regularly and this prevents a build-up of parasites in the soil so the animals are, in turn, less susceptible to infestation. Organically reared animals are fed a diet of organically grown food of plant origin. To *comply with* (10) the regulations for feeding dairy cattle, for *example*(11), farmers must *ensure* (12) that 90% of the cow's daily dry food is organically grown. The remaining 10% must come

from specified sources and must not *include* (13) any animal protein or genetically engineered products. Similar specifications exist for other farm animals. Many organic farmers use homeopathic and herbal medicines successfully in the treatment of disease, only resorting to vaccines and antibiotics when the situation *demand*s (14). Growth hormones, used in some countries (but illegal in the UK) to make animals grow faster, are not given to organically-reared animals.

*Notes:*

<sup>1</sup> *dry stone wall* – мур із сухої кам'яної кладки

### **Exercises**

*1. These are questions and unfinished statements about the text, each with 3 suggested answers or ways of finishing. You must choose the one best answer A, B or C according to the text.*

1. Organic farming is
  - A. a modern method of growing cereal crops.
  - B. a form of agriculture that excludes the use of synthetic fertilizers and pesticides, plant growth regulators, livestock feed additives, and genetically modified organisms.
  - C. agricultural techniques that reject genetically engineered products.
2. What farming operations are done on organic farms?
  - A. A lot of operations in pig breeding.
  - B. A great deal of operations in rearing dairy cattle.
  - C. Different agricultural operations in plant growing, cattle breeding, poultry keeping, beekeeping and others.
3. How do organic farmers control crop pests?
  - A. They use synthetic pesticides.
  - B. They apply a variety of methods creating natural habitat for beneficial insects and animals.
  - C. They use chemical insecticides.
4. Why does the price of conventionally produced food not reflect the real cost of its production?

- A. Because in most countries government subsidies have focused on mainstream farming, keeping the price of conventional foods low in comparison.
  - B. Because economists do not take into account the costs of scientific research carried out for developing chemical fertilizers and pesticides.
  - C. Because there are hidden costs in conventional farming such as payment for solving the problem of water supply pollution caused by artificial fertilizers.
5. Why do organic farmers add composted manure and other farm wastes to soil?
- A. To control weeds.
  - B. To enrich the soil with humus.
  - C. To develop fungi.
6. What is the purpose of using crop rotation on farms?
- A. To restore soil fertility.
  - B. To take nutrients out of the soil.
  - C. To change nitrogen gas into nitrate.
7. How can rotation of crops assist with fighting against pests and weeds?
- A. It provides favourable conditions for restricting expansion of pest and weed populations over a certain area of land.
  - B. It enables the soil to accumulate substances which destroy the life cycles of pests and weeds.
  - C. It allows to create pest and weed resistant crops.

2. *Which of the sentences below best expresses the essential information in the italicized sentence in paragraph 1?*

- A. Organic agriculture should provide farmers, workers, processors, distributors, traders and consumers with a good quality of life.
- B. Organic agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible.
- C. Organic agriculture should be based on living ecological systems and cycles, work with them and help sustain them.

3. In paragraph 4, why does the author give information about expenditure for removing pesticide residues from drinking water?

- A. To point out that it is necessary to protect the environment.
- B. To argue in favour of organic food.
- C. To argue against expensive organic food.

4. Decide if these statements are true (A), false (B) or not given in the text (C).

- 1. Enhancing soil health is the cornerstone of organic farming
- 2. In recent years both Europe and North America have experienced strong growth in organic farmland.
- 3. Organic agriculture is carried out according to a set of legally defined standards.
- 4. On conventional farms fields are larger than those on organic farms.
- 5. The countryside and its wildlife cannot be part of an organic farming system.
- 6. As organic farming is less labour intensive, organic food costs less to produce and it is cheaper for consumers to buy.
- 7. The overuse of synthetic nitrogen fertilizers causes environmental problems like air and water pollution and health problems like respiratory ailments, heart disease and cancer.
- 8. Organic farmers pay special attention to health and fertility of soil.
- 9. Conventional farming strictly limits the use of artificial chemical fertilizers and pesticides.
- 10. A key characteristic of organic farming is rejection of genetically engineered products, including plants and animals
- 11. Organic farms demand more space for animals and higher welfare standards.
- 12. Growth hormones are widely used in many countries including the UK.

5. Look through the text again and do the following tasks.

- 1. The word *recognises* in paragraph 1 is closest in the meaning to
  - A. thanks
  - B. appreciates
  - C. accepts

2. Look at paragraphs 1 and 2. Match the words in A with the words which have similar meaning in B.

A	B
1. way	A. to improve
2. essential	B. to comprise
3. to mimic	C. lawful
4. to enhance	D. indispensable
5. legal	E. method
6. standard	F. to examine
7. to inspect	G. to imitate
8. diversity	H. criterion
9. to include	I. to breed
10. to rear	J. variety

3. The word *those* in paragraph 3 refers to  
A. fields    B. farms    C. boundaries
4. The word *that* in paragraph 4 refers to  
A. labour    B. farming    C. food
5. Look at paragraphs 5, 6 and 7. Match words in A with their opposites in B.

1. valuable	A. conventional
2. natural	B. helpless
3. organic	C. artificial
4. healthy	D. to compose
5. fertile	E. alive
6. helpful	F. to impoverish
7. to decompose	G. unhealthy
8. dead	H. barren
9. to enrich	I. detrimental
10. beneficial	J. worthless

6. The word *build-up* in paragraph 8 is closest in the meaning to  
A. accumulation    B. strengthening    C. savings
7. Look at paragraph 8. What italicized words and word combinations could you replace with the words given below?  
A. daylight    H. guarantee

- B. needs
- C. necessary
- D. bred
- E. supplied
- F. tract of land
- G. instance

- I. contain
- J. illnesses
- K. a lot
- L. convenient
- M. satisfied
- N. fulfill

6. Match a word in A with its definition in B.

- | A            | B   |
|--------------|---|
| 1. Ecosystem | A. material in the top layer of the surface of the earth in which plants can grow   |
| 2. Flora     | B. the organic component of soil  |
| 3. Fauna     | C. undesirable state of the natural environment being contaminated with harmful substances as a consequence of human activities |
| 4. Soil      | D. all the plant life in a particular region or period  |
| 5. Humus     | E. all the animal life in a particular region or period   |
| 6. Pollution | F. a system formed by the interaction of a community of organisms with their physical environment                               |

7. Look at the sentences given below paying special attention to the meaning of the word **that**. Choose the right meaning of **that** for each sentence.

- A. та                      B. які                      C. що

1. The most valuable natural resource on an organic farm is soil and so it is not surprising **that** organic farmers place great emphasis on building up a healthy and fertile soil.
2. Humus is **that** part of the soil made up of partially decomposed plant and animal material.



3. Healthy soils produce healthy crops *that* foster the health of animals and people.

8. *Look at the sentences given below paying special attention to the meaning of the word as. Choose the right meaning of as for each sentence.*

А. як                      В. коли                      С. оскільки

1. *As* we were applying fertilizers, it began to rain.
2. The organic movement began in the 1930s and 1940s *as* a reaction to agriculture's growing reliance on synthetic fertilizers.
3. *As* I have gained my practical training on an organic farm in the UK, I know methods of producing organic food.

9. *Select the one correct answer for each gap in the text.*

At present 4% of land in the UK \_\_\_\_ (1) organically by approximately 3,995 producers. There \_\_\_\_ (2) a growth of 400% since 1998. This increase can \_\_\_\_ (3) by the increase on consumer demand, changes in agricultural policy and the provision of grants to those farmers wishing to convert to organic farming. The conversion period \_\_\_\_ (4) two years and it is during this time that farmers need grants to help them succeed. In some cases well-managed organic farms can be more profitable than well-managed conventional farms. Organic farms can \_\_\_\_ (5) yields of up to 80% of those achieved by conventional farms, and over a period of years organic yields can \_\_\_\_ (6) conventional yields.

- |                       |                 |              |
|-----------------------|-----------------|--------------|
| 1. A. was farmed      | B. is farmed    | C. farms     |
| 2. A. is              | B. was          | C. has been  |
| 3. A. to be explained | B. be explained | C. explain   |
| 4. A. is              | B. be           | C. will be   |
| 5. A. achieve         | B. to achieve   | C. achieving |
| 6. A. to match        | B. matching     | C. match     |

## Unit 5

### Energy Use in Agriculture

1. Most discussions about sustainable agriculture revolve around organic methods, precision cultivation or integrated pest management. Sustainability requires the maintenance of air, water and soil quality and the efficient and equitable use of resources and energy. There are many activities in agricultural production that consume energy such as tilling, planting and weeding, irrigation, application of fertilizers, harvesting, transport, drying and curing, and processing. There are also substantial energy requirements in livestock activities (feeding, watering, waste disposal, etc.). Agricultural and livestock-related activities use both fuel and electricity. The fuel is mostly used to run tractors and water pumps for irrigation. In some cases, electricity is also used for irrigation, but it is mainly used in livestock activities and in drying and curing of crops and seeds. Food production and distribution in the developed world has become so dependent on petroleum use, it is hard to imagine how agriculture will function without it. *As we approach the peak of world oil production it is time to ask about the social and environmental cost associated with oil dependence and explore sustainable alternatives.* Now many farmers are making use of wind, biofuel, biogas, or solar energy on their own farms.

2. Because agricultural production is a primary economic activity in many developing countries, residues of this production are of considerable quantities. Agricultural residues are not currently utilized to their full potential for energy generation. For this reason, biomass represents a large potential as an energy source. For example, the sugar industry alone can produce electricity via cogeneration or gasification technologies, ethanol for transportation fuel, as well as biogas for energy purposes. The manure from farm animals as well as coffee residues can also be used to produce biogas. Rice husks and other organic residues can also be used as a source for gasification. Energy production derived from agricultural waste will increase both the energy

availability and economic revenues for agricultural production in developing countries.

3. Other renewable energy sources that have not been as widely used but may offer significant potential in agriculture are modern wind turbines for water pumps, solar dryers, and small hydro. All of these renewable energy options have applications in agriculture and can result in substantial economic benefits for rural areas. Fuel cells have also been suggested as an alternative. A fuel cell is an electrochemical energy conversion device. It produces electricity from external supplies of fuel and oxidant. Many combinations of fuel and oxidant are possible. A hydrogen cell, for example, uses hydrogen as fuel and oxygen as oxidant. Electricity is also an ideal long-term sustainable fuel because it can be efficiently generated from renewable sources without causing pollution.

4. More solar energy strikes the earth every day than the energy available from the world's entire petroleum resource. This means that there is a clean, virtually unlimited supply of energy from the sun which can be harnessed to satisfy most of our energy demands. Solar radiation has been used historically as a heat source or to dehydrate food for storage. Wind and rain are also the result of solar radiation and have been harnessed by people for thousands of years. Wind and falling water have been used as a power source for tasks like pumping water for irrigation or milling flour for bread. More recently wind has also been harnessed to generate power and in areas with high average wind speed. Wind generators are the least expensive means of producing electricity. With the invention of photovoltaic (PV) panels solar energy can be converted directly into electricity. The PV panels currently on the market have proven efficiencies of converting over 10% of the solar energy available into electricity. This means that every square meter of photovoltaic panel exposed to sunlight<sup>1</sup> is capable of producing 100 Watts of electricity. Photovoltaics are 30 times more efficient at converting solar energy into electricity than an electric plant powered by biofuels, and millions of times more efficient than fossil fuels. Wind generators and microhydroelectric

turbines are an ideal complement to electricity produced by PV panels for providing power throughout the year.

5. Agriculture as practiced in the developed world today is far from sustainable. Humanity's survival depends on regaining the environmental quality in which we evolved. The only source of energy capable of replacing fossil fuels is the source that made them. The petroleum resource may last another 50 years, the sun will not burn out for 5.5 billion years. Which resource do you think we should use?

*Notes:*

<sup>1</sup> *exposed to sunlight* – який знаходиться під сонячними променями

### **Exercises**

*1. These are questions and unfinished statements about the text, each with 3 suggested answers or ways of finishing. You must choose the one best answer A, B or C according to the text.*

1. What kind of energy is mostly used in agriculture?
  - A. Solar energy
  - B. Wind energy.
  - C. Electrical and fuel energy.
2. Why should the current generation think about sustainable alternatives of oil?
  - A. Because oil resources are not inexhaustible.
  - B. Because agriculture greatly depends on oil products.
  - C. Because oil production pollutes the environment.
3. Agricultural waste can be used as
  - A. a renewable energy source.
  - B. a building material.
  - C. feed for animals.
4. Fuel cells produce electricity converting
  - A. mechanical energy into electrical energy.
  - B. chemical energy into electrical energy.

- C. heat energy into electrical energy.
5. In what cases is electricity considered to be an ideal sustainable fuel?
- A. When electricity is generated from renewable energy sources.
  - B. When electricity is generated from conventional energy sources.
  - C. When electricity is generated from renewable energy sources and does not pollute the environment.
6. How do PV panels generate electricity?
- A. They use wind energy.
  - B. They use water energy.
  - C. They use solar energy.
7. In what areas is wind used as an energy source?
- A. In areas where wind speed is high.
  - B. In areas where wind speed is low.
  - C. In areas where the average temperature is below 0°C.
8. What kind of energy is it reasonable to use in modern agriculture from the author's view point?
- A. The wind energy.
  - B. The solar energy.
  - C. The energy of falling water.

2. *Which of the sentences below best expresses the essential information in the italicized sentence in paragraph 1?*

- A. Aside from oil depletion there are many other concerns raised by our dependence on fossil fuel.
- B. The continued use of oil products as a source of energy cannot be sustained indefinitely.
- C. Humanity's survival depends on sustainable alternative energy sources.

3. *In paragraph 4, why does the author give details about the energy of the sun?*

- A. To explain why people use the solar radiation.
- B. To argue in favour of application of the solar energy.

C. To point out that there are some alternative sources of energy.

4. *Decide if these statements are true (A) or false (B).*

1. In agriculture there are a lot of power-consuming operations.
2. Plant growing and livestock breeding make use of fuel and electricity.
3. Agriculture does not depend on oil products.
4. Agricultural residues are widely utilized to generate energy.
5. Biogas can be derived from manure and coffee residues.
6. Renewable energy sources have huge potential for solving energy problems in agriculture.
7. The sun radiation has been harnessed since times immemorial.
8. The PV panels convert 100% of the solar energy into electricity.
9. Modern agriculture is successfully moving toward sustainable agriculture.

5. *Look through the text again and do the following tasks.*

1. The italicized word *it* in paragraph 1 refers to

A. food production    B. petroleum    C. agriculture.

2. Look at paragraph 1. Match a word in A with its definition in B.

- | A                  | B   |
|--------------------|---|
| 1. Agriculture     | A. gas produced by fermentation of organic matter under anaerobic conditions          |
| 2. Tilling         | B. control of pest populations through a variety of science based technologies        |
| 3. Planting        | C. the gathering of a ripened crop  |
| 4. Irrigation      | D. simultaneous generation of electrical and heat energy from the same source of fuel |
| 5. Pest management | E. putting seeds or young plants in the ground to grow                                |
| 6. Harvesting      | F. a process that converts carbonaceous   |

materials, such as coal, petroleum or biomass, into carbon monoxide and hydrogen

7. Curing                      G. treatment of agricultural products in order to keep them in good condition by salting, smoking, etc
8. Biogas                      H. supplying dry land with water
9. Cogeneration              I. the practice of cultivating the land and raising stock
10. Gasification              J. cultivation of the land in order to raise crops

3. Look at paragraphs 2 and 3. Match the words in A with the words or word combinations which have similar meaning in B.

A

1. significant
2. currently
3. to utilize
4. to suggest
5. renewable
6. rural
7. modern
8. to cause
9. purpose
10. as well as
11. benefit

B

- A. inexhaustible
- B. in addition to
- C. presently
- D. to use
- E. important
- F. to propose
- G. to induce
- H. agricultural
- I. profit
- J. aim
- K. contemporary

4. Look at paragraphs 4 and 5. Match the words in A with their opposites in B.

A

1. clean
2. to satisfy
3. unlimited

B

- A. limited
- B. cheap
- C. indirectly

- |                 |                  |
|-----------------|------------------|
| 4. heat         | D. contaminating |
| 5. to dehydrate | E. inefficient   |
| 6. expensive    | F. undeveloped   |
| 7. directly     | G. to dissatisfy |
| 8. efficient    | H. to hydrate    |
| 9. developed    | I. close         |
| 10. far         | J. cold          |

6. Complete the text using the following verbs:

- |                 |               |
|-----------------|---------------|
| A are removed   | E is called   |
| B must be       | F can be used |
| C can utilize   | G can replace |
| D is cleaned up |               |

### Renewable Natural Gas

If biogas \_\_\_\_ (1) sufficiently, it has the same characteristics as natural gas. In this instance the producer of the biogas \_\_\_\_ (2) the local gas distribution networks. The gas \_\_\_\_ (3) very clean to reach pipeline quality. Water (H<sub>2</sub>O), hydrogen sulfide (H<sub>2</sub>S) and particulates \_\_\_\_ (4) if present at high levels or if the gas is to be completely cleaned. Carbon dioxide is less frequently removed, but it must also be separated to achieve pipeline quality gas. If the gas is to be used without extensively cleaning, it is sometimes cofired with natural gas to improve combustion. Biogas cleaned up to pipeline quality \_\_\_\_ (5) renewable natural gas. In this form the gas \_\_\_\_ (6) in any application that natural gas is used for. Such applications include distribution via the natural gas grid, electricity production, space heating, water heating and process heating. If compressed, it \_\_\_\_ (7) compressed natural gas for use in vehicles, where it can fuel an internal combustion engine or fuel cells.

7. Choose the word which best completes each sentence.

- A develop    B development    C developing    D developed



1. \_\_\_\_ countries are in general countries which have not achieved a significant degree of industrialization relative to their populations, and which have a low standard of living.
2. Scientists \_\_\_\_ new methods of using solar energy.
3. The beginning of the \_\_\_\_ of wind technology can be dated back to the late 19th century.
4. Japan in Asia, Canada and the United States in North America, Australia and New Zealand in Oceania, and Western Europe are considered ‘ \_\_\_\_ countries’.

E cultivate

F cultivation

G cultivator

5. Garden \_\_\_\_ can be used to mix soils with fertilizers in preparation for planting.
6. Different agricultural machines are used to \_\_\_\_ the soil.
7. For soils that are not compacted, without problem weeds, and which have a good organic matter content, shallow \_\_\_\_ may be enough.

## Unit 6

### Drip Irrigation

1. Answer the following questions:

1.1. How does drip irrigation work?

1.2. How can drip irrigation help save water resources on the farm?

1.3. Where is drip irrigation applied?

2. Read the text:

Drip irrigation (trickle irrigation, micro irrigation, localized irrigation) is a method which saves water and fertilizer by allowing water to drip slowly to the roots of plants, either onto the soil surface or directly onto the root zone, through a network of valves, pipes, tubing, and emitters. It is done with the help of narrow tubes which deliver water directly to the base of the plant.

Most large drip irrigation systems employ some type of filter to prevent clogging of the small emitter flow path by small waterborne particles. New technologies are now being offered that minimize clogging. Some residential systems are installed without additional filters since potable water is already filtered at the water treatment plant.

Drip systems often mix liquid fertilizer with the irrigation water. This is called fertigation; fertigation and chemigation (application of pesticides).

Properly designed, installed, and managed, drip irrigation may help achieve water conservation by reducing evaporation and deep drainage when compared to other types of irrigation such as flood or overhead sprinklers since water can be more precisely applied to the plant roots. In addition, drip can eliminate many diseases that are spread through water contact with the foliage. Finally, in regions where water supplies are severely limited, there may be no actual water savings, but rather simply an increase in production while using the same amount of water as before. In very arid regions or on sandy soils, the preferred method is to apply the irrigation water as slowly as possible.

Pulsed irrigation is sometimes used to decrease the amount of water delivered to the plant at any one time. Pulsed systems are typically expensive and require extensive maintenance. Therefore, the latest efforts by emitter manufacturers are focused toward developing new technologies that deliver irrigation water at ultra-low flow rates, i.e. less than 1.0 liter per hour. Slow and even delivery further improves water use efficiency without incurring the expense and complexity of pulsed delivery equipment.

Drip irrigation is used by farms, commercial greenhouses, and residential gardeners. Drip irrigation is adopted extensively in areas of acute water scarcity and especially for crops such as coconuts, containerized landscape trees, grapes, citrus, strawberries, sugarcane, cotton, maize, and tomatoes.

3. Say whether the following statements are true or false:

- 3.1. Drip irrigation is done with the help of narrow tubes which deliver water directly to the top of the plant. True / False
  - 3.2. Drip systems often mix liquid fertilizer with the irrigation water. True / False
  - 3.3. Manufacturers are developing new technologies that deliver irrigation water at ultra-high flow rates True / False
  - 3.4. Drip irrigation is used only on large farms. True / False
4. Render the main idea of the text in 2-3 sentences in your native language.
5. Write an abstract of the text in English.

## **Unit 7**

### **GPS on Tractors for Precision Farming**

1. Answer the following questions:

- 1.1. How can GPS technologies be applied in agriculture?
- 1.2. What is the principle of tractor GPS navigation?
- 1.3. Why is accuracy so important tractor GPS navigation?
- 1.4. What are the advantages of tractor Real Time Kinematics (RTK –based) GPS navigation?

2. Read the text:

GPS on tractors can help steer them very accurately to make precision farming possible. The benefits of precision agriculture include increased productivity and more economical farming. These benefits accrue from the fact that the farmer is able to carry out his operations night or day and in difficult visibility conditions such fog, rain, or dust. Along with precision GIS mapping of soil conditions, data collection and analysis, he is also able to know his farm conditions very accurately and apply chemicals in the form of pesticides or herbicides, and arrange planting and harvesting so accurately that it can save him quite a bit of money. No areas get skipped or done more than once. Yield data can be monitored very

accurately so that even more accurate inputs can be applied next season.

All this is possible with an accurate GPS receiver and using it for steering the farming platform or tractor. Use these in conjunction with accurate GIS map and you are in business. The productivity increases can easily pay for the cost of the additional equipment you are going to need.

Commercially available GPS receivers provide you with 3 meters to 5 meters accuracy. However, this is not good enough to let the tractor drive itself. You would also miss soil areas where adjustments in chemical application or planting need to be done. There is a way around this problem: RTK or real time kinematic GPS systems can provide accuracy up to a centimeter. A base station sends out a corrective signal that can be used by several moving stations to arrive at accurate positions.

The RTK-based GPS systems can compensate for atmospheric delay, orbital errors, and other variables in GPS geometry. Because of the accuracy that can be derived, it is used by engineers, topographers, surveyors, and others in applications in civil engineering and dredging, and now in precision farming. RTK systems use the Wide Area Augmentation System (WAAS) to generate initial corrections. The base station receives the corrections transmitted by the WAAS system and corrects them further. Typically you can get 1.0 metre laterally and 1.5 meters vertically correct data. RTK provides differential corrections to produce the most precise GPS positioning. Typical corrections derived by current RTK systems are up to 1 cm.

Auto-steer systems use the corrected GPS signals from base stations that are transmitted to moving tractors. These tractors are then steered automatically to follow a path. The movement commands take into account the roll, yaw, and pitch attitudes of the vehicle.

3. Say whether the following statements are true or false:

3.1. GPS shows a precise geographical position of the vehicle only. True / False

- 3.2. The use of GPS increases productivity. True / False
- 3.3. Commercially available GPS receivers are very precise.  
True / False
- 3.4. RTK-based GPS systems can give an accuracy up to a meter.  
True /
4. Render the main idea of the text in 2-3 sentences in your native language.
5. Write an abstract of the text in English.

## Unit 8

### Conservation Tillage

1. Answer the following questions:

- 1.1. What is the principle of conservation tillage?
- 1.2. What are the basic methods of conservation tillage?
- 1.3. What advantages does conservation tillage have?

2. Read the text:

Conservation tillage practices such methods of soil cultivation that leave the previous year's crop residue (such as corn stalks or wheat stubble) on fields before and after planting the next crop, to reduce soil erosion and runoff. To provide these conservation benefits, at least 30% of the soil surface must be covered with residue after planting the next crop. Some conservation tillage methods forego traditional tillage entirely and leave 70% residue or more. Conservation tillage is especially suitable for erosion-prone cropland. In some agricultural regions it has become more common than traditional moldboard plowing.

Conservation tillage methods include no-till, strip-till, ridge-till and mulch-till. Each method requires different types of specialized or modified equipment and adaptations in management.

No-till and strip-till involve planting crops directly into residue that either hasn't been tilled at all (no-till) or has been tilled only in narrow strips with the rest of the field left untilled (strip-till).

Ridge-till involves planting row crops on permanent ridges about 4-6 inches high. The previous crop's residue is cleared off ridge-tops into neighbouring furrows to make way for the new crop being planted on ridges. Maintaining the ridges is essential and requires modified or specialized equipment.

Mulch-till is any other reduced tillage system that leaves at least one third of the soil surface covered with crop residue.

This technique brings various environmental benefits:

- reduces soil degradation; pieces of crop residue shield soil particles from rain and wind until new plants produce a protective layer over the soil;

- improves soil and water quality by adding organic matter;
- conserves water by reducing evaporation at the soil surface;
- conserves energy due to fewer tractor trips across the field;
- reduces potential air pollution from dust and diesel emissions;
- crop residue provides food and cover for wildlife.

3. Say whether the following statements are true or false:

3.1. Conservation tillage helps reduce soil erosion and runoff.

True / False

3.2. Conservation tillage is used instead of traditional tillage methods. True / False

3.3. Conservation tillage methods mustn't be combined with each other. True / False

3.4. Conservation tillage has mostly economic effect. True / False

4. Render the main idea of the text in 2-3 sentences in your native language.

5. Write an abstract of the text in English.

## Unit 9

### Hydroponics

1. Answer the following questions:

1.1. What is hydroponics?

1.2. What are advantages of application of hydroponics?

1.3. What are disadvantages of application of hydroponics?

2. Read the text:

Hydroponics is originally defined as crop growth in mineral nutrient solutions. The two main types of hydroponics are solution culture and medium culture. Solution culture does not use a solid medium for the roots, just the nutrient solution. The three main types of solution cultures are static solution culture, continuous-flow solution culture and aeroponics. The medium culture method has a solid medium for the roots and is named for the type of medium, e.g., sand culture, gravel culture, or rockwool culture.

Some of the reasons why hydroponics is being adapted around the world for food production are the following:

- no soil is needed;
- the water stays in the system and can be reused - thus, lower water costs;
- it is possible to control the nutrition levels in their entirety - thus, lower nutrition costs;
- no nutrition pollution is released into the environment;
- stable and high yields;
- pests and diseases are easier to get rid of than in soil;
- it is easier to harvest;
- no pesticide damage.

Today, hydroponics is an established branch of agronomy. Progress has been rapid, and results obtained in various countries have proved it to be thoroughly practical and to have very definite advantages over conventional methods of horticulture. There are two chief merits of the soil-less cultivation of plants. First, hydroponics may potentially produce much higher crop yields.



Also, hydroponics can be used in places where in-ground agriculture or gardening are not possible.

But without soil as a buffer, any failure to the hydroponic system leads to rapid plant death. Other disadvantages include pathogen attacks caused by the high moisture levels associated with hydroponics and overwatering of soil based plants. Also, to produce the mineral wool and the fertilizers that are needed to use this method, a large amount of energy is required.

3. Say whether the following statements are true or false:

3.1. Hydroponics means growing plants in nutritive solution. True / False

3.2. It is possible to grow plants absolutely without soil. True / False

3.3. Hydroponics is an economical technique. True / False

3.4. Hydroponics is an experimental method. True / False

4. Render the main idea of the text in 2-3 sentences in your native language.

5. Write an abstract of the text in English.

## **Unit 10**

### **Farm Animals' Welfare**

1. Answer the following questions:

1.1. What does a human attitude to farm animals include?

1.2. What attitude to animals can be regarded as inhuman?

1.3. Why is the concept of animal welfare sometimes criticized?

2. Read the text:

The welfare of an animal includes its physical and mental state and we consider that good animal welfare implies both fitness and a sense of well-being. Any animal kept by man, must at least, be protected from unnecessary suffering.

One believes that an animal's welfare, whether on farm, in transit, at market or at a place of slaughter should be considered in terms of 'five freedoms'. These freedoms define ideal states rather than standards for acceptable welfare. They form a logical and comprehensive framework for analysis of welfare within any system together with the steps and compromises necessary to safeguard and improve welfare within the proper constraints of an effective livestock industry:

1. Freedom from Hunger and Thirst - by ready access to fresh water and food.
2. Freedom from Discomfort - by providing an appropriate environment including shelter and a comfortable resting area.
3. Freedom from Pain, Injury or Disease - by prevention or rapid diagnosis and treatment.
4. Freedom to Express Normal Behaviour - by providing sufficient space, proper facilities and company of the animal's own kind.
5. Freedom from Fear and Distress - by ensuring conditions and treatment which avoid mental suffering.

Legislation in the European Union reduces animal suffering during slaughter. Germany, Sweden, Denmark and Austria have all banned battery cages for egg-laying hens. European Union Council Directive 1999/74/EC came into act on January 1st 2012, meaning that conventional battery cages for laying hens are now banned across the Union.

A hen enters a cage at 20 weeks and will remain in the cage for an average of 52 weeks before slaughter. Each hen has less space than an A4 piece of paper in which to move around, leaving:

- no room to flap and stretch;
- no means to dust bathe;
- no perch on which to roost;
- no nest to lay an egg in (they never actually see what they produce).

But this method doesn't give great economic effect in fact: on average a battery hen lays only 15 more eggs a year than a hen that has been kept in barn or free range conditions.

There are two forms of criticism of the concept of animal welfare, coming from diametrically opposite positions. One view, dating back centuries, asserts that animals are not conscious and unable to experience poor welfare. The other view is based on the position that animals are not a property and any use of animals by people is inhuman.

3. Say whether the following statements are true or false:

3.1. According to the EU legislation, farm animals shouldn't suffer. True / False

3.2. According to the EU legislation, farm animals should be free to leave farm. True / False

3.3. Battery cages for laying hens are prohibited in the EU. True / False

3.4. There are people who criticize the concept of animal's welfare. True / False

4. Render the main idea of the text in 2-3 sentences in your native language.

5. Write an abstract of the text in English.

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