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АНГЛИЙСКИЙ ЯЗЫК

AGRICULTURE:
SCIENCE IN THE NEWS

*Пособие по обучению чтению и говорению
для студентов, обучающихся по всем специальностям
углубленного высшего образования*

Рекомендовано методической комиссией
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Пособие имеет своей целью совершенствование навыков и развитие умений чтения текстов по специальности, а также расширение активного и пассивного словарного запаса в рамках профессиональной терминологии. Каждый урок пособия содержит текст, рассказывающий о научном исследовании в области сельского хозяйства, предтекстовые и послетекстовые упражнения, контролирующие степень сформированности лексических навыков и навыков чтения.
     Для студентов, обучающихся по всем специальностям углубленного высшего образования.

ВВЕДЕНИЕ

Настоящее пособие имеет своей целью развитие умений чтения текстов по специальности и предназначено для магистрантов сельскохозяйственного вуза. Пособие подготовлено на материале текстов о научных исследованиях, проводимых в различных отраслях сельского хозяйства. Статьи подобраны из популярных и авторитетных журналов «The Economist» и «New Scientist», а также с сайта www.Sciencedaily.com, где размещается информация о научных разработках в разных странах мира. Таким образом, материал учебного пособия подобран как с учетом профессиональных интересов магистрантов, так и с точки зрения его новизны и интереса, что способствует расширению кругозора учащихся и стимулирует их к работе над иностранным языком. Работая с текстами пособия, магистранты не только совершенствуют свои языковые умения и навыки, но и приобретают страноведческие сведения, знакомятся с проблематикой научных исследований за рубежом.

Пособие состоит из 17 уроков, в каждом из которых содержится статья и задания к ней. Упражнения каждого урока построены на основе лексического материала статей и отличаются достаточным разнообразием. Урок начинается с перечня ключевых слов и словосочетаний, знакомство с которыми снимает лексические трудности чтения. Среди предтекстовых упражнений имеется задание, направленное на отработку произношения отдельных слов, как правило, интернациональных терминов, которые фонетически значительно отличаются от аналогичных слов в русском языке, а также упражнения на формирование потенциального словаря обучаемых. Подробные вопросы после каждого текста, которые имеют своей целью проверку понимания прочитанного, могут также использоваться как план пересказа основного содержания статьи или же для развития диалогической речи.

Хотя пособие ориентировано главным образом на магистрантов, оно может использоваться и в работе со студентами младших курсов. Порядок работы с уроками может быть произвольным.

UNIT 1
ELECTROCULTURE

ACTIVE VOCABULARY

Ex. 1.1. Read the words, expressions and sentences, translate them.

the grid – энергетическая система, высоковольтная система электропередачи

to generate ['ʤenəreɪt] – генерировать, вырабатывать энергию

generator ['ʤenəreɪtə] – генерирующее устройство

to generate electricity; to generate electricity from wind and rainfall

to draw electricity from the grid – черпать электроэнергию из сети

Scientists used a small device *to generate electricity* from wind and rainfall. A windmill could pump water and *generate electricity*.

electric field

a high-voltage electric field – электрическое поле высокого напряжения; *static electric fields* –статические электрические поля; *to create an electric field*; *to be exposed to an electric field* – подвергаться воздействию электрического поля; *peas exposed to an electric field*; *to grow crops with an electric field*; *under the electric field* – под действием электрического поля

Electric fields affect crops. One set of peas in a greenhouse was exposed to an electric field.

energy ['enəʤɪ] – энергия

wind and raindrop energy; *wasted energy* – потраченная впустую энергия; *wasted wind and raindrop energy*

power ['paʊə] – электроэнергия, сила, питание

wind-powered ['wɪnd ˌpaʊəd] – ветряной, ветровой, ветросиловой; *wind-powered device*; *self-powered system* – система с автономным питанием; *to harness* ['hɑːnɪs] *wind power* – использовать энергию ветра

Denmark is a pioneer in commercial wind power and produces half of the world's wind turbines. Many developing countries have major plans for harnessing wind power.

to germinate ['ʤɜːmɪneɪt] – прорастать, давать всходы; **germination** ['ʤɜːmɪ'neɪʃ(ə)n] – прорастание, всхожесть; *seed germination*

Static electric fields promote seed germination and plant growth.

to boost – повышать, стимулировать; *to boost crop yield*

Programs to boost crop yields and food production have helped to provide more food in poverty-stricken lands.

Ex. 1.2. Practise reading the following international words.

colleague ['kɔliːg];
turbine ['tɜːbaɪn];
me**ch**anism ['mekənɪz(ə)m];
te**ch**nician [tek'nɪʃ(ə)n];
chlorophyll ['klɔrəfil]
te**ch**nology [tek'nɔlədʒɪ]
photosynthesis ['fəʊtəʊ'sɪnθɪsɪs];
analysis [ə'nælɪsɪs];
hypothesis [haɪ'pɔθɪsɪs]

Ex. 1.3. Fill in the table with the missing verb forms.

	V1	**V2**	**V3**	**Meaning**
1		showed		
2	tell			
3			grown	выращивать
4	have			
5			drawn	
6		cost		
7	say			
8			led	вести, руководить
9		cut		
10	know			

Ex. 1.4. Complete the sentences with the right form of the verb from the table in Ex. 1.3.

1. The effectiveness of using electric fields to stimulate crop growth is _____ as electroculture.
2. Scientists have _____ two sets of peas in a greenhouse.
3. The rod _____ the electricity from the air.
4. The generator system _____ less than $40.
5. All roads _____ to Rome.
6. No one had _____ them about the drug's side effects.
7. We must _____ our expenses to save money.
9. Research has _____ that giving employees more control over their work makes them happier and more productive.
10. Even today no one knows what that question might _____ been.

Ex. 1.5. Translate the following expressions.

A 1) Wind-powered device, 2) high-voltage electric field, 3) previous tests, 4) self-powered system, 5) agricultural pollution, 6) biological data, 7) novel engineering, 8) main concern.

B 1) Crop yield / pea yields, 2) wind and raindrop energy / wind and rain power, 3) generator system, 4) food production, 5) wind turbine, 6) solar panel, 7) seed germination, 8) plant growth.

READING

Ex. 1.6. Look through the article to find answers to the questions below.

1. What is electroculture?

2. Scientists from what countries expressed their opinion on the effectiveness of electroculture?

3. Which of them spoke in favour of the new technology and who cast doubt on electroculture?

4. What does the word '*one*' in the sentence "*Luo's **one** used a small device…*" (paragraph 3) refer to?

Can Electric Fields Help Plants Grow?

Claims that a wind-powered device can boost crop yield don't convince other scientists

Adam Vaughan

1 A team of researchers claims to have shown that a *high-voltage electric field generated* using wind and rain can *boost* crop yield, but other scientists say the results should be treated with caution.

2 The effectiveness of using *electric fields* to stimulate crop growth, known as electroculture, is far from established, despite being tested in Europe, the US and China. A "golden age" is dawning for the technology, one Chinese scientist told New Scientist in 2019.

3 Now, Jianjun Luo at the Chinese Academy of Sciences in Beijing[1] and his colleagues have grown two sets of peas in a greenhouse, one of which *was exposed to an electric field*. Previous tests *have drawn electricity from the grid* to *create the field*, but Luo's **one** used a small device – a triboelectric nanogenerator[2] – *to generate it from wind and rainfall*.

4 The result: pea yields increased by almost a fifth, and the plants *germinated* faster than the control peas too <…>. "The main advance is that the

self-powered system can *boost crop yield* by harvesting the *wasted wind and raindrop energy* in our daily life," says Luo.

5 He says the *generator* system that the group used cost less than $40. The team writes that the approach could be "immediately and widely applied" to increase food production and curb agricultural pollution.

6 Ellard Hunting at the University of Bristol[3], UK, says what is really new here isn't *growing crops with an electric field* but using *rain and wind power* to provide the electricity to do it. "You could also achieve this with wind turbines and solar panels, but their approach is cheaper," he says.

7 Jean Yong at the Swedish University of Agricultural Sciences[4] says while the engineering is novel, the way the experiment was conducted limits the biological data available on the plants. "It cannot lead them towards providing an explanation for increasing yield or cutting pesticides," he says.

8 Luo suggests that the mechanism for how *electric fields* might increase yield could be photosynthesis, based on his analysis showing the peas *under the electric field* had more chlorophyll. But exactly how *electric fields affect crops* remains unclear. "That's the big question, and nobody really knows," says Hunting.

9 There may be other explanations for why the peas *exposed to an electric field* grew faster. The trial wasn't "double-blinded", so the technicians growing the plants knew which were in an electroculture.

10 Sarah Driessen at RWTH Aachen University[5] in Germany says one of her main concerns with the study is how overly confident it is that electroculture works. "The authors represent it as a fact that *static electric fields* promote *seed germination* and plant growth, although this is highly debatable," she says. "The authors do not elucidate the current state of knowledge on this topic properly and the basis for their hypothesis is rather poorly supported."

(Source: New Scientist | 22 January 2022)

NOTES

[1] **Beijing** [ʹbeiʹʤiŋ] – г. Пекин

[2] **triboelectric nanogenerator** [ˌtraɪbəʊiʹlɛktrɪk, -bəʊɪʹ-] – трибоэлектрический наногенератор. Трибоэлектрический наногенератор представляет собой устройство для преобразования механической энергии в электричество используя трибоэлектрический эффект (явление возникновения электрического заряда в результате трения) и электростатическую индукцию.

³ **University of Bristol** ['brɪstl] – Бристольский университет в городе Бристоль. Является правопреемником Университетского колледжа в Бристоле, существовавшего с 1876 года.

⁴ **Swedish University of Agricultural Sciences** – Шведский университет сельскохозяйственных наук. Хотя его центральный офис находится в Ултуна, Уппсала, университет имеет несколько кампусов в разных частях Швеции.

⁵ **RTWH Aachen** ['ɑːxən] **University** – РВТУ, Рейнско-Вестфальский технический университет г. Ахена, Германия.

READING AND VOCABULARY COMPREHENSION

Ex. 1.7. Answer the questions about the text.

1. What new technology is this article about?
2. Why is this technology promising?
3. In what country were the experiments conducted?
4. Where was electricity for the tests taken from?
5. What are the results of the tests?
6. Why do some researchers think that this approach should be immediately and widely applied?
7. What makes the Swedish scientist be skeptical about the novel engineering?
8. What explanation of electroculture effectiveness does the Chinese scientist give?

Ex. 1.8. Complete the sentences according to the text.

1. Some researchers think that a high-voltage electric field can _____ _____ _____.
2. Using electric fields to stimulate crop growth is known as _____.
3. This technology was tested in _____ , _____ , _____.
4. Scientists at the Chinese Academy of Sciences have grown two sets of peas in _____ _____.
5. One set of peas was exposed to _____ _____.
6. Scientists used a small device to generate electricity _____ _____ _____.
7. As a result, pea yields increased _____ _____ _____.
8. The plants germinated _____ _____ _____ _____ _____.
9. The generator system that the group used cost _____ _____ _____.
10. Exactly how electric fields affect crops _____ _____.

11. There is some evidence showing that the peas under the electric field have _____ _____.

12. German scientists doubt that _____ _____.

Ex. 1.9. Find in the article English equivalents of the following Russian words and word combinations.

1) Научно-исследовательская группа, 2) относиться с осторожностью, 3) наступает золотой век для…, 4) увеличиться почти на 20 % (на одну пятую), 5) основное достижение, 6) подход, 7) ветряной двигатель, 8) солнечная батарея, 9) в высшей степени спорно, 10) чрезмерно / слишком уверенный, 11) современный уровень знаний, 12) довольно слабо обоснована.

Ex. 1.10. Match the words in the two columns to get collocations from the article. Translate them.

1) to boost	a) an experiment
2) to treat	b) crop growth
3) to stimulate	c) crop yields
4) to be exposed	d) crops
5) to increase	e) food production
6) to curb	f) pesticides
7) to grow crops	g) pollution
8) to conduct	h) to an electric field
9) to cut	i) with an electric field
10) to affect	j) with caution

Ex. 1.11. Fill in the gaps with the words from the box.

How does electro culture farming work?

> research ⋅ fertility ⋅ benefits ⋅ plant growth ⋅
> efficiency ⋅ technology ⋅ plants
> growth hormones ⋅ water resources ⋅ reliance
> fertilizers ⋅ food production

Electroculture farming works by using electrical energy to stimulate 1) _____. This can be done in a number of ways, but the most common method is to apply a *current* (*ток*) to the roots of plants. The *current* causes the 2) _____ to produce more 3) _____ , which leads to increased growth rates. The electrical *current* can help to break down organic matter, making it more available for plants. This can help to improve the 4) _____ of the

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soil. Electroculture farming can also be used to improve the 5) _____ of photosynthesis, which can further increase crop yields.

There are many potential 6) _____ of electroculture farming. For one, it could help us increase 7) _____ without needing to use more land or water. Additionally, electro culture farming could reduce our 8) _____ on chemical 9) _____ and pesticides, as well as help us conserve soil and 10) _____. Furthermore, electro culture farming could also create new jobs in rural communities.

The potential benefits of electroculture farming are truly exciting, but we still need to do more 11) _____to fully understand how this 12) _____ works and whether or not it is viable on a large scale.

Ex. 1.12. Study the expressions in the box, then translate the sentences paying attention to the phrases in italics.

> **result** – (*n*) результат
> **as a result** – в результате
> **to result in smth** – (*v*) вести / приводить к (чему); иметь результатом / следствием (что)
> **to result from smth** – (*v*) происходить в результате (чего); быть / стать следствием (чего); вытекать из (чего)

1. Other scientists say the *results* should be treated with caution. 2. Hepatitis may *result from* excessive alcohol consumption or exposure to toxins. 3. The trials are complex and, *as a result*, are often lengthy. 4. The local vegetation is flourishing *as a result of* the recent rains. 5. The Black Sea is facing ecological catastrophe *as a result of* pollution. 6. Another crop failure could *result in* widespread famine. 7. Ill-considered actions often *result in* disaster. 8. We are still dealing with problems *resulting from* errors made in the past. 9. Nothing has *resulted from* my efforts.

Ex. 1.13. Complete the sentences with the correct form of the words.

to fertilise / fertiliser / fertility / fertile / fertilisation

1. The area is known for its soil _____. 2. Regulations on the use of _____ and pesticides have had a particularly heavy impact on farming methods. 3. Something rather similar happens when _____ occurs in flowering plants. 4. Desertification is the process by which _____ land becomes desert. 5. Trees, grasses, and weeds release these tiny grains into the air _____ other plants.

UNIT 2
REDHOUSES VS GREENHOUSES

ACTIVE VOCABULARY

Ex. 2.1. Read the words, expressions and sentences, translate them.

feed – корм, **to feed** (**fed, fed**) (on smth.) – кормить, питаться (чем), **to feed up** – откармливать

Feed the tomatoes once a week. The farmer *is feeding up* the chickens for Christmas. Wolves *feed on* sheep, not on northern moss.

wavelength ['weɪvlɛŋθ] – длина волны; *red wavelength* – длина волны красной области видимого спектра; *red light* – красная часть спектра, красный свет; *green wavelength* – длина волны зеленой области видимого спектра; *to re-emit green wavelengths as red ones*;

Light and sound have different *wavelengths*.

light [laɪt] – свет, *to distribute light evenly to plants*; *soft light* – мягкий, рассеянный свет; *to create soft pink light*; *to take green light from plants*; *to give plants some extra red light*; *to receive light*; *to manipulate the light*;

The red spectrum of light stimulates the leaves of plants to produce more chlorophyll.

LED light – светодиодная лампа, (**LED** = light-emitting diode ['daɪəʊd] – светоизлучающий диод); *red LED lights*;

sunlight ['sʌnlaɪt] – солнечный свет; *the altered sunlight*; *to absorb green wavelengths of sunlight*; *to convert green wavelengths in sunlight to red ones*;

to shine [ʃaɪn] (**shone**, **shone**) – светить, освещать, сиять; *to shine red LED lights on crops*;

to address issues – решать вопросы, коснуться проблем;

to boost [bu:st] – повышать, увеличивать; *to boost the yield of some crops*; *to boost crop yields*; *to boost crop productivity*;

transparent [træn'spærənt] – прозрачный; *transparent plastic*;

trial ['traɪəl] – опыт, испытание; **to trial smth** – исследовать, испытывать, опробовать; *crop trials*; *greenhouse trials*; *independent trials*; *to test smth in an independent trial*; *to run a trial*; *to complete a trial*;

to tailor ['teɪlə] – подбирать, приспосабливать, адаптировать; t*o tailor materials to different crops*.

Treatment is tailored to the needs of each patient. We prefer to tailor a program to the child's needs.

Ex. 2.2. Practise reading the following international words.

chlorophyll ['klɔrəfil]; te**ch**nology [tek'nɔlədʒɪ]
photosynthesis ['fəʊtəʊ'sɪnθɪsɪs];
fluorescent dye [flu(ə)'res(ə)nt 'daɪ] – флуоресцентный краситель;
carotenoid [kə'rɔtinɔid] – каротиноид (природный пигмент желтого или оранжевого цвета)

Ex. 2.3. Study the names of crops mentioned in the article.

lettuce ['letɪs] – салат латук; **butterhead lettuce** – салат «Бостон», или «баттерхед»; **cos lettuce** – кос-латук; **romaine** ['rəʊmeɪn] – салат ромен, салат римский;
pak coi – пекинская капуста;
cucumber ['kju:kʌmbə] – огурец;
blueberries – черника, голубика;
cereal ['sɪ(ə)rɪəl] – хлебный/зерновой злак, крупяное растение

Ex. 2.4. Fill in the table with the missing verb forms.

	V₁	V₂	V₃	Meaning
1		fed		
2			shone	
3		grew		выращивать
4	hang			
5		ran		
6			met	
7	rise			
8			taken	брать, взять
9		did		
10	see			

Ex. 2.5. Complete the sentences with the right form of the verb from the table in Ex. 2.4.

1. Tom _____ the neighbour's cat while they were away.
2. Clouds are _____ low overhead.
3. The sun was _____through the clouds.
4. If you plant an apple seed, it might _____ into a tree.
5. Without additional resources it will be very difficult to _____demand with existing resources.

6. It is my duty at the university to _____ research and publish the results.

7. And that was the last time I ever_____ her.

8. The number of children who died from infections in the unit has since _____ to seven.

9. I've been asked to help_____ a clinical trial.

10. The Government has also _____ steps to improve the quality of food in all the country's prisons.

Ex. 2.6. Translate the following expressions.

1) The amount of red light, an astonishing amount; 2) world's growing population; 3) flavor and nutrition of plants; 4) plant yields, plant growth; 5) 200-square-metre plot of lettuces; 6) to do further research; 7) a library of dyes, 8) different crops, 9) growing food demand; 10) temperature and humidity.

READING

Ex. 2.7. Look through the article to find answers to the questions below.

1. Why does covering plants with red plastic boost crop yields?

2. What are the advantages of the new material called LLEAF over red LED lights?

Covering Plants With Red Plastic Boosts Crop Yields

Alice Klein

1 The yields of some crops can be boosted by covering them in a material that increases the amount of *red light* they receive. This technology could help feed the world's growing population, although more research is needed to see if it affects the flavour and nutrition of plants.

2 *Red wavelengths of sunlight* are the biggest drivers of plant growth because they stimulate leaves to make the chlorophyll needed for photosynthesis. This is why some farms have started *shining red LED lights on crops to boost their yields*. But **these** are costly, energy-draining and don't *distribute light as evenly to plants as sunlight*.

3 *To address these issues*, Alexander Soeriyadi and Alexander Falber at the University of New South Wales[1] in Sydney[2], Australia, developed a material called LLEAF[3] that passively *converts some of the green wavelengths in sunlight* – which are less important for plant growth – to red **ones**.

4 It is a *transparent plastic* containing a fluorescent dye that *absorbs green wavelengths of sunlight* and *re-emits **them** as red ones*. LLEAF can be hung over existing greenhouses and *creates a soft pink light* inside. "It's quite pretty," says Soeriyadi.

5 In *greenhouse trials*, the researchers found that the material increased plant yields by an astonishing amount for various crops, including 37 per cent for pak choi. The material is now being tested in bigger, *independent trials* run by <u>Western Sydney University</u>[4] and the New South Wales government's <u>Department of Primary Industries</u>[5].

6 David Tissue at Western Sydney University and his colleagues recently *completed a trial* of the material. They installed **it** over a greenhouse to cover a 200-square-metre plot of lettuces next to an identical plot of lettuces that wasn't covered by LLEAF. The yield of cos lettuce, also known as romaine, rose by 14 per cent under the material, while **that of** butterhead lettuce increased by 27 per cent.

7 Tissue is now testing LLEAF on cucumbers, with plans for several other *crop trials* over the next five years. The Department of Primary Industries *is trialling* **it** with blueberries, but results aren't available yet.

8 One important consideration is whether *taking green light from plants* and *giving them* extra *red light* might harm them, says Tissue. He noticed that lettuces grown under the material had an orange tinge, probably because *the altered sunlight* changed their composition of carotenoids and other pigments. "But we need to do further research to see if this changes the flavour or nutrition," he says.

9 Robert Coe at <u>CSIRO</u>[6], Australia's national science institute, says it is also unclear how well the technology would work for other types of crop, like cereals. "But I think it's worth exploring," he says.

10 Soeriyadi and Falber are now developing a library of dyes *to tailor* their *material to different crops*. They hope that *boosting crop productivity* will help meet growing food demand, which is expected to increase by up to 56 per cent globally from 2010 to 2050.

11 By manipulating the light that plants receive, they believe it may even be possible to grow crops in parts of the world that don't normally suit **them**, if other variables like temperature and humidity are also controlled.

(Source: New Scientist | 26 February 2022)

NOTES

[1] **University of New South Wales** – Университет Нового Южного Уэльса, государственный университет Австралии, основан в 1949 г.;

² **Sydney** ['sɪdnɪ] – г. Сидней, административный центр штата Новый Южный Уэльс, Австралия.

³ **LLEAF** (Luminescent-Light Emitting Agriculture Films) – люминесцентно-светоизлучающие сельскохозяйственные пленки

⁴ **Western Sydney University** – Университет Западного Сиднея, государственный университет в Пентрите, Австралия, основан в 1989 г.

⁵ **Department of Primary Industries** – Департамент базовых отраслей промышленности

⁶ **CSIRO** (Commonwealth Scientific and Industrial Research Organization) – Организация стран Британского содружества по научным и промышленным исследованиям.

READING AND VOCABULARY COMPREHENSION

Ex. 2.8. Fill in the table with the missing information from the article.

Crop	Increase in plant yield, percentage
pak choi	
	14%
butterhead lettuce	
	are being tested, results are not available yet
blueberries	

Ex. 2.9. Read the article again and say what these words refer to.

these (paragraph 2): "But these are costly, energy-draining…";
ones (paragraph 3): "…– to red ones."
them (paragraph 4): "…and *re-emits them as red ones*."
it (paragraph 6): "They installed it over a greenhouse…"
that of (paragraph 6): " … while that of butterhead lettuce increased by 27 per cent."
it (paragraph 7): "The Department of Primary Industries *is trialling* it with blueberries,…"
them (paragraph 11): "…don't normally suit them,…"

Ex. 2.10. Find in the article English equivalents of the following Russian words and word combinations.

1) Движущая сила (стимуляторы) роста растений, 2) флуоресцентный краситель, 3) применяемые теплицы, 4) вегетационный опыт, 5) независимое повторение опыта, 6) одинаковый участок, 7) важный момент (важное соображение), 8) оранжевый оттенок, 9) провести

дальнейшее исследование, 10) стоит исследовать, 11) удовлетворить растущий спрос на продовольствие.

Ex. 2.11. Fill in the gaps with the words from the box.

stimulates	*tailored*	*existing*	*instead of*
greenhouses	*cover*	*biodegradable*	*cover*
chlorophyll	*redhouses*	*scientists*	*amount*

For centuries, humans have used [1]_____ to help plants grow outside of tolerable conditions. Now, as it turns out, it might be much better if [2]_____ greenhouses, we built [3]_____.

The red spectrum of light [4]_____ the leaves of plants to produce more [5]_____ , and an Australian ag-startup is wielding this basic science to create thick red films to [6]_____ existing greenhouses in order to boost plant production beyond what either the sun, or greenhouses are capable of.

Luminescent-Light Emitting Agriculture Films, or "LLEAF" was founded by [7]_____ from a partnership between the Universities of New South Wales and Western Sydney.

They produce, and are now testing, several different films to increase crop yields, with each one [8]_____ to a different kind of plant.

The [9]_____ are made from special dyes that absorb and diffuse photons from the green spectrum of light, and emit it again as red light to increase plant photosynthesis.

They reduce the [10]_____ of light which the plants can't use, and the diffusion of the light they can is done so more evenly, and in a way as to reduce shadows.

The plastics can be easily retrofitted to any [11]_____ greenhouse structure, and are very durable.

The dyes are 100% [12]_____ and carbon-based, containing no metals, while the plastic sheeting is 100% recyclable.

Ex. 2.12. Match the words in the two columns to get collocations from the article. Translate them.

1) to boost	a) a fluorescent dye
2) to feed	b) green wavelengths to red ones
3) to affect	c) growing food demand
4) to distribute	d) the flavor and nutrition of plants
5) to contain	e) the world's growing population
6) to run	f) the yields
7) to meet	g) trials

Ex. 2.13. Fill in the gaps with the words given below.

*tomato plant   yields   ripen   commercial farmers   light   purpose
black plastic mulch   conditions   plant growth   erosion*

Red Plastic Mulch for Tomatoes – Does It Make a Difference?

Red plastic mulch was actually not introduced as mulch. Rather, its developers (USDA's plant physiologist Michael J. Kasperbauer and Clemson University nematologist Bruce Fornum) found that it increased [1]_____ up to 20%. It was first recommended to [2]_____, rather than home gardeners, who could benefit from higher production on a larger scale.

Along the way, gardeners began referring to red plastic tomato mulch as a mulching option.

While the product is not technically mulch, it's increasingly used as one. Red plastic mulch (also known as Selective Reflecting Mulch, or SRM for short) is similar to [3]_____ in that it warms the soil, prevents [4]_____, and retains moisture. It's thinner than most garden plastic, allowing more light (and sometimes weeds) through.

But red plastic mulch's touted strength is in its ability to reflect certain red shades of light back into the plant, accelerating fruit production and increasing yield.

How red plastic mulch works

There are pigments in [5]_____ called phytochromes. They are color-sensitive proteins. Their job is to regulate [6]_____ and development.

Phytochromes react differently to different spectra of [7]_____. Specifically, when far-red light wavelengths from the plastic bounce back up to tomato plants, the phytochromes tell the tomato fruit to grow more and faster.

That's why gardeners say setting out red plastic mulch around their tomato plants makes their tomatoes [8]_____ faster and produce bigger fruit.

Naturally, the amount of light reflected depends on growing [9]_____. Also, the plastic color must be specific. In other words, just any color of red plastic may not give good results, but rather those which have been developed and tested for this [10]_____. Recent studies suggest that other colors of plastic may offer greater yields than black, too, particularly blue plastic.

UNIT 3
GENE TRANSFER

ACTIVE VOCABULARY

Ex. 3.1. Read the words, expressions and sentences, translate them.

to swap [swɔp] – обменивать, меняться

species ['spi:ʃi:z] – (*биол.*) вид, видовая принадлежность; *species of grass*, *plant species*, *closely related species*;

transfer ['trænsfɜ:] – перенос, передача; *gene transfer, lateral / horizontal gene transfer*;

The team found that *gene transfer* is widespread.

to transfer ['trænsfɜ:] – переносить, передавать, транспортировать, переходить; *syn.* **to pass, to cross into**; *laterally transferred genes*;

Some species of grass *pass* genes from one plant to another. DNA can *be transferred* from one complex organism to another. A plant gene *has crossed into* insects.

to inherit [ɪn'herɪt] – унаследовать; **inheritance** – наследование

cell – клетка организма, *single-celled organisms*;

to sequence ['si:kwəns] – (*мол.ген.*) секвенировать, секвенсировать;

sequenced – секвенированный, расшифрованный (участок генома);

shoot [ʃu:t] – побег, росток;

germline – генеративная (зародышевая) линия;

to hybridise ['haɪbrɪdaɪz] – скрещивать, создавать гибрид(ы);

to pollinate ['pɔlɪneɪt] – опылять, опыляться;

pollination ['pɔlɪ'neɪʃ(ə)n] – опыление, *pollination by wind*;

foxtail millet – просо итальянское

Ex. 3.2. Practise reading the following international words.

gene [dʒi:n] – ген, a plant gene
genome ['dʒi:nəʊm] – геном, совокупность генов
DNA = ДНК
eukaryotes [ju:'kærɪəʊt] – эукариоты (организмы, клетки которых имеют ядро, заключенное в ядерную оболочку)
eukaryotic [ju:'kæri'ɔtik] – эукариотический
bacteria [bæk'tɪ(ə)rɪə] – бактерии (*pl.* от bacterium)
fungi ['fʌŋgi:] – грибки, плесень (*pl.* от fungus)
protist ['prəʊtist] – протист, простейшее, одноклеточный организм
rhizome ['raɪzəʊm] – ризом, корневище, подземный побег

Ex. 3.3. Fill in the table with the missing verb forms.

	V1	V2	V3	Meaning
1		thought		
2	add			
3				изучать, учиться
4	find			
5		was /were		
6	can			
7			got	
8				значить
9	happen			
10		included		

Ex. 3.4. Complete the sentences with the right form of the verb from the table in Ex. 3.3.

1. "How did you_____ a job with the Carleton Blessing Agency?"
2. Be careful. I wouldn't want anything _____ to you.
3. Would you like to _____ me to your contact list?
4. I never spend a day without _____ of you.
5. This pizza recipe_____ hard-boiled eggs, tomatoes and oregano.
6. You may_____ your umbrella at the Lost and Found.
7. It won't _____ difficult.
8. I didn't know what it _____ at that time.
9. He _____ harder than any other student does in his class.
10. I have a friend who_____ fly a helicopter.

Ex. 3.5. Match the English and Russian expressions, and then translate the sentences.

1) rather than	a) внизу, ниже; под
2) in this way	b) все еще
3) as recently as	c) так как
4) such as	d) не далее как; совсем недавно; еще в…
5) still	e) а не; вместо того, чтобы…; вместо
6) beneath	f) так как
7) as	g) таким образом

1. She prefers to steam carrots *rather than* boil them. 2. Biologists have long known that single-celled organisms like bacteria pass genes *in this way*. 3. And yet, it has happened *as recently as* May. 4. The choice between

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these different approaches may involve balancing factors *such as* time, cost, efficiency, transparency and democracy. 5. I *still* think Tom doesn't understand what's going on. 6. Rhizomes can send out roots and shoots *beneath* the surface and allow plants to reproduce asexually. 7. The grasses aren't hybridising, *as* the DNA would look very different if they were.

READING

Ex. 3.6. Read the article and find the answers to the following question:

What assumption does the author of the article make in the end?

Plants Routinely Swap DNA

Genes can transfer between grasses without any need for inheritance

Michael Marshall

1 Some *species* of grass have been spotted doing what was once thought impossible: they routinely *pass genes from one plant to another*, even across different *species*. The finding adds to evidence that DNA can be *transferred* from one complex organism to another, rather than only *being inherited*.

2 Biologists have long known that *single-celled organisms* like bacteria *pass genes* in this way, a process called *lateral or horizontal gene transfer*. But as recently as 20 years ago, it was thought this didn't happen in more complex organisms called eukaryotes – the group that includes all animals, plants and fungi.

3 "People thought it was completely restricted to bacteria," says Luke Dunning at the University of Sheffield[1], UK. "It's probably only been 10 to 15 years that that's really shifted." Now, many eukaryotic examples are known, such as a plant gene that *has crossed into* insects.

4 To find out how widespread such *gene transfer* is, Dunning's team studied the genomes of 17 grass *species*, some of which have been evolving independently of one another for 50 million years. These included food crops like Asian rice, common wheat and *foxtail millet*. The team found that 13 of the 17 *species* had *laterally transferred genes*, indicating that *transfer* is widespread (New Phytologist[2], doi[3].org/f78n). In total, 170 genes *had been transferred*.

5 "As more and more genomes of eukaryotes are *sequenced*, we're seeing so many examples of *horizontal gene transfer*," says Julia Van Etten at Rutgers University[4] in New Jersey[5]. She co-authored a 2020 study estimat-

ing that *single-celled* eukaryotes called protists acquired about 1 per cent of their genes this way.

6 For every 10,000 genes in the grass genomes, Dunning's team estimates 3.72 are detectably *laterally transferred*. "But that is a massive underestimate," he says, because only some *transferred genes* will be favoured by natural selection and become common. The team found *lateral transfer* was more common among closely related species, but it still happened in the least related ones.

7 *Transfers* were also more common in grasses with rhizomes, which are underground stems that can send out roots and *shoots* beneath the surface and allow plants to reproduce asexually. "If you get any foreign DNA into that rhizome, when the plant regenerates, it's in every *cell* of that clone, including the flowers, and that's how it gets into the *germline*," says Dunning.

8 "The million-dollar question is to find out how it's happening," says Dunning. The grasses aren't *hybridising*, as the DNA would look very different if they were. He suggests that in many cases *pollination by wind* might be a factor. It may be that *lateral gene transfers* underpin some of the traits found in domestic strains of crop grasses like wheat, says Dunning. That is speculation, but if it is confirmed, it will mean *lateral gene transfer* has helped us create the crops that now feed us.

(Source: New Scientist | 1 May 2021)

NOTES

[1] **The University of Sheffield** – Шеффилдский университет, или Университет Шеффилда (Великобритания). Основан в 1905 году.

[2] **New Phytologist** – рецензируемый научный журнал, был основан в 1902 году ботаником Артуром Тэнсли.

[3] **doi** = Digital Object Identifier – идентификатор цифрового объекта, используется в ссылках на электронные книги.

[4] **Rutgers University** [ˈrʌtgərz] – Рутгерский университет, государственный исследовательский университет, крупнейшее высшее учебное заведение штата Нью-Джерси, США.

[5] **New Jersey** [ˈnjuːˈʤɜːzɪ] – Нью-Джерси, штат США.

READING AND VOCABULARY COMPREHENSION

Ex. 3.7. Find in the article English equivalents of the following Russian words and word combinations.

1) Виды травы, 2) перемещать гены от одного растения к другому, 3) различные виды, 4) открытие (находка), 5) от одного сложного организма к другому, 6) одноклеточные организмы, 7) более сложные организмы, 8) горизонтальный перенос генов, 9) относиться исключительно к… (ограничиваться чем), 10) развиваться независимо друг от друга, 11) продовольственные культуры, 12) горизонтально перенесенные гены, 13) горизонтальное перенесение генов, 14) быть соавтором исследования, 15) огромная (значительная) недооценка, 16) близкородственные виды, 17) размножаться бесполым путем, 18) чужеродная ДНК, 19) полностью обновляться, регенерировать, 20) главный (самый трудный) вопрос, 21) посевные (культурные) травы.

Ex. 3.8. Match the halves of the sentences.

1. Some species of grass	
2. Eukaryotes are	a) all animals, plants and fungi.
3. Eukaryotes include	b) are food crops.
4. Asian rice, common wheat and foxtail millet	c) complex organisms.
5. Scientists discovered that gene transfer	d) is a widespread phenomenon.
6. According to the article, lateral transfer was	e) may help gene transfer happen.
7. Rhizomes allow	f) more common among closely related species.
8. Rhizomes are	g) plants to reproduce asexually.
9. Researchers think that pollination by wind	h) routinely pass genes from one plant to another.
	i) underground stems.

Ex. 3.9. Read the article again and answer the questions.

1. What do some species of grass do?
2. What evidence does this phenomenon provide?
3. What is this process called?
4. What organisms have been known to pass genes in this way?
5. What didn't scientists know about this process as recently as 20 years ago?
6. Is gene transfer possible between plants and animals / insects?
7. Why did biologists study the genome of 17 grass species?
8. Among what species was lateral transfer found to be more common?
9. What important question haven't scientists answered yet?
10. What do they suggest?

UNIT 4
NEW METHOD FOR GRAFTING PLANTS

ACTIVE VOCABULARY

Ex. 4.1. Read the words, expressions and sentences, translate them.

to graft [grɑːft] – прививать (растение), **graft** – прививка, привой; *graft site* – место прививки; **grafting** ['grɑːftɪŋ] – прививка, привой.

A new method for *grafting plants* could increase production. He propagated the apple tree by *grafting*. So in order to have these types of apple, you have *to graft* from the same tree. Researchers *grafted* a wheat shoot to disease-resistant oat roots.

to imperil [ɪm'perɪl] – подвергать опасности, **imperiled** – подверженный угрозе вымирания; *imperiled crops*, *a list of imperiled species*;

disease [dɪ'ziːz] – болезнь, *to eliminate diseases*, *to eradicate diseases, to combat disease*, *disease-resistant roots*, *disease-resistant stems*, *soilborne disease* – болезнь, передаваемая через почву; *Panama disease of banana* – "панамская" болезнь банана, фузариозное увядание банана.

palm [pɑːm] – пальма, *date palm* – финиковая пальма, *oil palms*.

species ['spiːʃiːz] – (*биол.*) вид, представитель какого-либо биологического вида, *to belong to the same species*, *vulnerable species*

Grafting can work between *species*.

tissue ['tɪʃuː] – ткань (организма), *embryonic tissue* – эмбриональная (зародышевая) ткань

fuse [fjuːz] – соединиться, срастаться

to proliferate sexually [prə'lɪfəreɪt 'seksjʊəlɪ] – размножаться половым путем, to proliferate asexually

science breakthrough ['breɪkθruː] – научный прорыв, переворот в науке

monocotyledons [ˌmɒnəʊˌkɒtɪˈliːdənz] – однодольные / односемядольные растения, (*сокр.*) **monocots**; *monocot specimens* ['spesɪmən], *a monocot plant seed, a wide range of monocot plant families*

feasible ['fiːzəb(ə)l] – выполнимый, приемлемый, вероятный

rootstock ['ruːtstɔk] – корневище, подвой, корневой побег; привитое растение

Ex. 4.2. Practise reading the following international words.

citrus ['sɪtrəs] – цитрусовое (растение), *citrus trees*
te**ch**nique [tek'niːk] – метод, способ, технический прием

vascular cambium [´væskjulə ˈkæmbiəm] – васкулярный (сосудистый) камбий (внутренний слой коры)

fluorescent dye [flu(ə)ˈres(ə)nt ´daɪ] – флуоресцентный краситель

tequila agave [tɪˈki:lə əˈɡeɪvɪ] – агава

Ex. 4.3. Fill in the table with the missing verb forms.

	V1	**V2**	**V3**	**Meaning**
1		increased		
2	heal			заживлять
3			improved	
4	eradicate			искоренить
5			allowed	
6		applied		
7	verify			
8			written	
9		lacked		не иметь, недоставать
10	say			

Ex. 4.4. Complete the sentences with the right form of the verb from the table in Ex. 4.3.

1. Violence must be _____.
2. There is no smoking _____ on our campus.
3. New technology is being _____ to almost every industrial process.
4. 1.3 billion people around the world_____ access to electricity.
5. It is time to _____ the wounds**.**
6. The article is very well _____.
7. The label says to take one tablet before meals.
8. They were unable to produce any statistics to _____ their claims.
9. We read to _____ our vocabularies.
10. The boss finally _____ her salary.

READING

Ex. 4.5. Read the article and find the answer to the following questions:

What is meant by 'near impossible' plant-growing technique?
What category of plants can it be used to?
What discovery made it possible to use new plant-growing technique?

'Near Impossible' Plant-growing Technique Could Revolutionise Farming

Alex Wilkins

1 A new method for *grafting* plants could increase production and *eliminate diseases* for some of the world's most *imperiled* crops, such as bananas and *date palms*.

2 *Grafting*, where the root of one plant is attached to the shoot of another, has been used in agriculture for thousands of years to improve the growth of plants such as apples and citrus trees and *to eradicate diseases*. But this technique wasn't thought to work for a major group of plants: the *monocotyledons* (or *monocots*). This category includes all grasses like wheat and oats, as well as other high-value crops like bananas and *date palms*. These *species* lack a *tissue* called vascular cambium, which helps *grafts* heal and *fuse* in many other plants.

3 Now, Julian Hibberd at the University of Cambridge[1] and his colleagues have found an approach that allows *monocots to be grafted*. They extracted a form of *embryonic tissue* from inside a *monocot plant seed* and applied it to the potential *graft site* between two *monocot specimens* belonging to *the same species* – for instance, wheat.

4 The *tissue* stimulated growth and *fused* the two plant halves together. The researchers used fluorescent dyes to verify that the root and shoots had joined and could transport liquids and nutrients up and down the stem (Nature[2], doi[3].org/g94p).

5 "I have written on the record that I thought it was near impossible. So, as a *science breakthrough*, it's pretty amazing," says Colin Turnbull at Imperial College London[4].

6 The method appeared to work on a wide range of *monocot plant families*, including important crops such as pineapple, banana, onion, tequila agave, oil palm and date palm. The researchers' preliminary studies in the lab also suggest that the *grafting* can *work between species* – they *grafted* a wheat shoot to *disease-resistant oat roots*. This may protect the wheat from *soil-borne disease*, although it is unclear whether this protection would be *feasible* in the real world.

7 Hibberd, who worked on the research after a proposal from his colleague Greg Reeves, was initially hesitant. "Everyone said you can't do it, so I didn't want [Reeves] to dedicate a PhD[5] to trying something that everyone says you can't do," says Hibberd. "It's a beautiful thing. It's science at

its best, where you find something out even though everyone says it's not possible, and he proved me wrong."

8 The technique could be especially useful for *combating disease* in *vulnerable species* like the Cavendish banana, which forms the vast majority of the world's supply of the fruit. Unable *to proliferate sexually*, the Cavendish banana is only reproducible by cloning, meaning the crop is highly genetically uniform and so vulnerable to threats like *Panama disease*, which is caused by a *soil-borne fungus*.

9 By *grafting* more *disease-resistant stems* (or *rootstocks*) with the banana plant, the Cavendish banana could avoid *Panama disease*.

(Source: New Scientist | 8 January 2022)

NOTES

[1] **University of Cambridge** – Кембриджский университет (Великобритания).

[2] **Nature** – британский журнал, в котором публикуются исследования в основном естественно-научной тематики. Один из самых старых и авторитетных общенаучных журналов мира.

[3] **doi** = Digital Object Identifier – идентификатор цифрового объекта, используется в ссылках на электронные книги.

[4] **Imperial College London** – Имперский колледж Лондона, один из лучших университетов Великобритании.

[5] **PhD** = Philosophy Doctor / Doctor of Philosophy – ученая степень доктора философии является т.н. "исследовательским докторатом" (doctorate of research), т.е. эквивалентом нашей аспирантуры (кандидата наук), и НЕ эквивалентна степени доктора в нашем понимании (т.н. "хабилитации", или "высшего" доктората (habilitation or higher doctorate).

READING AND VOCABULARY COMPREHENSION

Ex. 4.6. Find in the article English equivalents of the following Russian words and word combinations.

1) Высокотоварная (интенсивная) культура, 2) потенциальное место прививки, 3) две половинки растений, 4) корни и ростки, 5) жидкости и питательные вещества, 6) записать в отчете (протоколе), 7) предварительные исследования, 8) устойчивые к болезням корни овса, 9) работать над исследованием, 10) проявлять нерешительность, 11) посвятить докторскую диссертацию (чему), 12) наука в ее лучшем проявле-

нии, 13) уязвимые виды, 14) размножаться половым путем, 15) размножаться клонированием.

Ex. 4.7. Answer the questions about the text.

1. Production of what crops could be increased by a new method of grafting plants?
2. What were the reasons for using grafting in agriculture? What plants has grafting been used in agriculture for?
3. Was grafting used for monocots?
4. What species do monocots include?
5. Why wasn't grafting applied to monocots?
6. What have researchers from the University of Cambridge found?
7. What is special about their grafting technique?
8. What is the role of embryonic tissue?
9. How did the researchers verify that the root and shoots had joined?
10. What species did the method appear to work on?
11. Can this grafting work between species?
12. Where can this technique be especially useful?
13. Why is the Cavendish banana so vulnerable to threats?
14. How can the Cavendish banana avoid Panama disease?

Ex. 4.8. Complete the sentences with the words from the article.

1. A new method of grafting could increase _____ and eliminate _____ for some of the mist imperiled crops.
2. Grafting has been used in agriculture to improve _____ _____ _____ and to eradicate _____ .
3. The monocotyledons lack a tissue called _____ _____ .
4. This tissue helps grafts _____ and _____ in many plants.
5. A new approach allows _____ to be grafted.
6. Embryonic tissue is extracted from inside a _____ _____ _____ .
7. This tissue stimulated _____ and _____ the two plant halves together.
8. The method appeared to work on a wide range of _____ _____ _____ and between _____ .
9. The technique could be especially useful for _____ _____ in vulnerable species.
10. The Cavendish banana is only reproducible ___ _____ .

Ex. 4.9. Fill in the gaps with the words given below.

*contemporary artist   branches   technique   apricot   heritage varieties
art project   different kinds   stone fruit   locations   changes*

Tree of 40 Fruit

A **Tree of 40 Fruit** is one of a series of fruit trees created by the Syracuse University[1] Professor Sam Van Aken using the **1**_____ of grafting. Each tree produces forty types of **2**_____, of the genus *Prunus*, ripening sequentially from July to October in the United States.

Sam Van Aken is an associate professor of sculpture at Syracuse University[1]. He is a **3**_____ who works beyond traditional art making and develops new perspective art projects in communication, botany, and agriculture.

His family is Pennsylvania Dutch[2], and he grew up on the family farm.

In 2008, while looking for specimens to create a multicolored blossom tree as an **4**_____, Van Aken acquired the 3-acre (1.2 ha) orchard of the New York State Agricultural Experiment Station, which was closing due to funding cuts. He began to graft buds from some of the over 250 **5**_____ grown there, some unique, onto a stock tree. Over the course of about five years the tree accumulated **6**_____ from forty different "donor" trees, each with a different fruit, including almond, **7**_____ , cherry, nectarine, peach and plum varieties. Each spring the tree's blossom is a mix of different shades of red, pink and white.

The tree of 40 fruits was originally conceived as an art project, and Sam Van Aken hoped that people would notice that the tree has **8**_____of flower in spring and has different types of fruit in summer. However, the project also introduces the **9**_____ in agricultural practices over the centuries.

As of 2014, Van Aken had produced 16 Trees of 40 Fruit, installed in a variety of private and public **10**_____, including community gardens, museums, and private collections.

_____

[1] **Syracuse** [ˈs(a)ɪ(ə)rəkjuːs] **University** – Сиракузский университет – частный исследовательский университет США, расположенный в городе Сиракьюс, штат Нью-Йорк.

[2] **Pennsylvania Dutch** – пенсильванские немцы (так называют немецких поселенцев в Южной Пенсильвании)

UNIT 5
GENE EDITED FOOD

ACTIVE VOCABULARY

Ex. 5.1. Read the words, expressions and sentences, translate them.

to edit DNA – редактировать ДНК, **gene-edited** – генетически отредактированный, **gene-editing** – редактирование гена (генома), *gene-edited crops*, *to allow gene-edited crops*, *gene-edited plants*, *gene-edited food*, *gene-edited tomato*,

to trial ['traɪəl] – испытывать, исследовать, опробовать; **trial** – испытание, исследование, *to aid trials* – содействовать испытаниям

The UK parliament passed legislation designed to aid trials of *gene-edited crops* in England. Wheat edited to be less likely to cause cancer is one example *being trialled*.

to approve [ə'pru:v] – ободрять, санкционировать, **approval** [ə'pru:v(ə)l] – одобрение, утверждение, санкция, *approval time* – время утверждения, *trial approval time*, *approval for* – согласование, разрешение, *to speed up approval for existing products*

to insert [ɪn's3:t] – (*биол.*) встраивать

drive – (*зд.*) оперативность, энергичные усилия, напористость, стремление; *the UK government's gene-editing drive*

to allay [ə'leɪ] **risks** – снизить риски

The slow approach the UK government is taking may partly also be *to allay risks* of a *backlash* (недовольство) like the UK's "Frankenfoods" protests against GMOs in the late 1990s and early 2000s.

Ex. 5.2. Match the English and Russian expressions, and then translate the sentences.

1) according to	a) за счет кого / чего
2) at least	b) как
3) akin to	c) однако
4) at the expense of	d) по крайней мере
5) like	e) пока что
6) so far	f) совсем не, вообще
7) at all	g) согласно (чему/ кому)
8) however	h) похож на, сродни

1. It does not matter *at all*. 2. She's not *at all like* her sister. 3. Something *akin to* panic overwhelmed him. 4. *So far*, I've saved about £500.

5. They tried to enrich themselves *at the expense of* the poor. 6. The first part was easy; the second, *however,* took hours. 7. You are taxed *according to* your income.

Ex. 5.3. Fill in the table with the missing verb forms.

	V1	**V2**	**V3**	**Meaning**
1		sold		
2	involve			
3			caused	быть причиной, вызывать
4	require			
5			made	
6		cut		
7		broke		ломать
8			taken	
9		sped up		ускорить
10	change			

Ex. 5.4. Complete the sentences with the right form of the verb from the table in Ex. 5.3.

1. Someone's _____ the TV.
2. It _____ the development of agriculture by making women more efficient than before.
3. The project will _____ a great amount of time and money.
4. He was _____ into custody.
5. Don't _____ me in your family affairs!
6. Jane _____ the cord with a knife.
7. Paper is _____ from wood.
8. Toni's _____ her car for £700.
9. The flood _____ great hardship.
10. He _____ his name.

READING

Ex. 5.5. Look through the article and say whether the statements below are TRUE or FALSE.

1. Gene-edited crops are already on sale in England.
2. In the UK gene-edited food is treated differently to GMOs.
3. CRISPR technology is used to insert genes from one species into another.

4. The UK government plans to allow gene-edited food to be commercially grown and sold.

5. Gene-edited livestock will be blocked from sale.

6. According to the UK government there is public support for gene-edited food.

Gene-edited Food May Be Five Years Away From Sale In England

Adam Vaughan

1 Crops that have been *gene-edited* to be more nutritious and less environmentally harmful are at least five years away from being sold in England, according to one of the UK government's leading scientists.

2 Gideon Henderson, the chief scientific officer of the UK's Department for Environment, Food and Rural Affairs[1], says there is no scientific basis for such food being blocked for sale. The UK parliament passed legislation on 20 January designed to aid *trials of gene-edited crops* in England.

3 The UK government plans to change current laws so that *gene-edited plants* are treated differently to genetically modified organisms (GMOs). GMOs can involve genes from one species *inserted* into another, while *gene-editing* usually involves using CRISPR technology[2] to edit the DNA of one organism in an accelerated version of natural breeding techniques. Wheat *edited* to be less likely to cause cancer is one example *being trialled*. Crops resistant to pests so that they require less pesticide is another.

4 "One of the really big wins are the environmental benefits, things that use less pesticides, are more tolerant of climate change," says Henderson. Now, researchers *trialling gene-edited crops* in England should save around £10,000 per *trial* and cut two months off *trial approval time*. A future law change would allow *gene-edited food* to be commercially grown and sold. Crops will be first, with livestock later, according to Henderson.

5 For animals, the main issue is whether gene editing could be used to make them more productive at the expense of their welfare, akin to breeding chickens so heavy their legs break. Ethicists have warned that *the UK government's gene-editing drive* should guard against such risks.

6 The slow approach the UK government is taking may partly also be to *allay risks* of a backlash like the UK's "Frankenfoods[3]" protests against GMOs in the late 1990s and early 2000s. "I think we have to be mindful there might be something like that, but so far in the last year we've not seen anything like that at all," says Henderson. He says government surveys suggest there is public support for *gene-edited food*, and notes the roughly 6000

submissions to a government consultation was relatively low. <mark>However</mark>, most of those were opposed to the idea.

7 Asked whether there is any good reason the law won't change to allow *gene-edited crops*, he says: "There are political reasons why it might not happen, it might not be popular as it passes through parliament. But scientifically don't think there are reasons why it shouldn't happen." Argentina[4] and Japan[5] are good case studies of *gene-edited food* being done safely and beneficially, he adds.

8 Henderson says moves in other countries might speed up *approval for existing products*, such as *a gene-edited tomato* sold in Japan[5] since last September, which could take years to go on sale in the UK under current legislation.

(Source: New Scientist | 29 January 2022)

NOTES

[1] **Department for Environment, Food and Rural Affairs** – Министерство окружающей среды, продовольствия и сельского хозяйства (Великобритания)

[2] **CRISPR technology** (= **c**lustered **r**egulatory **i**nterspaced **s**hort **p**alindromic **r**epeats – кластерные короткие палиндромные повторы, разделенные регулярными промежутками) – инструмент генного программирования

[3] **Frankenfood** ['fræŋkənfuːd] (= **Franken**stein **food**) – франкенфуд; еда, приготовленная из генетически модифицированных продуктов

[4] **Argentina** [ˈɑːʤənˈtiːnə] – Аргентина

[5] **Japan** [ʤəˈpæn] – Япония

READING AND VOCABULARY COMPREHENSION

Ex. 5.6. Find in the article English equivalents of the following Russian words and word combinations.

1) Более питательные, 2) менее вредные для окружающей среды, 3) ведущие ученые, 4) научная основа, 5) быть в продаже / поступить в продажу, 6) быть запрещенным для продажи,7) изменить действующее законодательство, 8) экологические выгоды / преимущества использования для окружающей природной среды, 9) более устойчивый к изменению климата, 10) будущее изменение закона, 11) благосостояние / качество жизни, 12) специалисты по этике, 13) не забывать / иметь в виду, 14) общественная поддержка, 15) политические причины, 16) существующие продукты, 17) по действующему законодательству.

Ex. 5.7. Answer the questions about the text.

1. Why are some crops gene-edited?
2. What is the difference between GMOs and gene-edited crops?
3. What technology does gene-editing involve?
4. What legislation did the UK parliament pass in January 2022?
5. What is gene-editing compared to in the article?
6. What examples of gene-editing trials are given in the article?
7. What is the problem with animals being gene-edited? What do ethicists worry about?
8. What risks does the UK government try to allay?
9. Why should current legislation be changed in the UK? What could speed up approval for gene-edited products?

Ex. 5.8. Fill in the gaps with the words from the box.

| supplements | tomatoes | gene-edited | organisms | law |
| source | supermarkets | government | edited fruit | vitamin |

Tomatoes gene-edited to produce vitamin D

Adam Vaughan

Biologists have created 1) _____ tomatoes that offer a new plant-based 2) _____ of vitamin D, as the UK government prepares to change the 3) _____ to allow such "precision-bred" food to be sold in 4) _____.

Eating two of the 5) _____ a day would address typical deficiencies in vitamin D, which about a billion people globally don't get enough of, particularly in sun-starved northern latitudes. The 6) _____ also offers a new vegan alternative to standard vitamin D 7) _____. Most of those containing 8) _____ D3, one of two main types of the vitamin, are sourced from lanolin in sheep wool.

However, despite the UK 9) _____ introducing a bill on 25 May to treat gene-edited food differently to genetically modified 10) _____, the tomatoes face a series of technical and economic hurdles (препятствие / барьер) before they can become widely available.

(Abridged from: **New Scientist |** 28 May 2022)

UNIT 6
GROWING UPGRADED CROPS

ACTIVE VOCABULARY

Ex. 6.1. Read the words, expressions and sentences, translate them.

genetic tinkering – генетические манипуляции / изменения
field trials – опытные полевые работы
to upgrade ['ʌp'greɪd] – улучшать, обогащать, повышать качество, совершенствовать; *upgraded crops, to upgrade photosynthesis*
Growing upgraded crops could help reduce deforestation, greenhouse gas emissions and the loss of biodiversity.
to boost – повышать, активно поддерживать, способствовать росту, ускорять, усиливать; *to boost growth*, *to boost yields;* **boost**(*n*) – бурный подъем, рост; *to get a boost* – получить импульс / расти
Scientists have managed to boost growth in plants such as tobacco by upgrading photosynthesis. Researchers think they could get a boost as big as 50 per cent.
to improve – улучшать, *to improve photosynthesis, improved crop varieties*; **improvement** – улучшение, *yield improvements, to achieve improvements*
to increase [ɪŋk'riːs] – увеличить, усилить; *to increase the incomes*; **increase** (*n*) ['ɪŋkriːs] – увеличение, возрастание, прирост; *to produce big yield increases.*
Several approaches are being explored and combining them should produce even bigger yield increases.
energy ['enədʒɪ] – энергия, *light energy*, *excess energy, to lose energy*
to absorb [əb'zɔːb] **–** поглощать, улавливать (энергию)
When a leaf is in full sunshine, it absorbs more light energy than its photosynthetic machinery can handle.
to dissipate ['dɪsɪpeɪt] – рассеивать (энергию), *to dissipate the excess energy*, *to avoid dissipating energy*
to quench [kwentʃ] – (*зд.*) охлаждать, **quenching** – охлаждение, *genes involved in the quenching process, to turn quenching on and off*
protein ['prəutiːn] – белок, **encoded protein** ['prəutiːn] – (*ген.*) кодируемый белок, *protein content*
Soya is the main plant source of protein globally.
to result in – привести к, иметь результатом

Adding extra copies of genes involved in the quenching process to the soybeans *results in* higher levels of the encoded proteins.

Ex. 6.2. Fill in the table with the missing verb forms.

	V₁	V₂	V₃	Meaning
1		modified		
2	reduce			
3			achieved	достигать
4	adapt			
5		damaged		
6		set		
7	dissipate			
8			preserved	
9		lost		
10	fertilise			удобрять

Ex. 6.3. Complete the sentences with the right form of the verb from the table in Ex. 6.2.

1. The morning sun _____the fog.
2. Did you _____the alarm?
3. The scandal significantly _____ her career.
4. The design was _____ to add another window.
5. She was unable to _____ her aims.
6. She says that the pandas _____ the tea plants.
7. The medicine _____ the risk of infection.
8. The camera has been _____ for underwater use.
9. Salt can be used to _____ meat.
10. Can eating just vegetables help you _____ weight?

Ex. 6.4. Match the English and Russian expressions, and then translate the sentences.

1) as well as   a) учитывая, что
2) such as   b) главным образом
3) mainly   c) в результате
4) vice versa [ˌvaɪ.sə ˈvɜː.sə] d) если не, пока не
5) unless   e) и наоборот
6) although [ɔːl'ðəu]   f) а также
7) as a result   g) хотя
8) given   h) такие как

1. He won't go to sleep *unless* you tell him a story. 2. Nobody can change history, *although* many have tried. 3. The workforce is *mainly* made up of women. 4. The local vegetation is flourishing *as a result* of the recent rains. 5. One possibility occurred to him: a wife could not give evidence against her husband and *vice versa.*6. Moderate exercise, *such as* walking, is recommended. 7. A museum should aim to entertain *as well as* educate. 8. *Given* the engine's condition, it is a wonder that it started.

READING

Ex. 6.5. Look through the article and find paragraphs containing the following information:

- benefits of growing genetically modified soybeans
- aims of researchers
- comparison of modern approaches to those of the green revolution
- explanation of a mechanism known as quenching

Genetic Tinkering Increases Soy Yield by Upgrading Photosynthesis

Michael Le Page

1 Soybeans that have been genetically modified to make them more efficient at photosynthesis have produced yields more than 20 per cent larger than those of unmodified crops in *field trials* – and with no added fertiliser.

2 Growing these *upgraded crops* could help reduce deforestation, greenhouse gas emissions and the loss of biodiversity, as well as *increasing the incomes* of farmers in low-income countries for whom the crops are being created.

3 "We think it will work in most crops," says Stephen Long at the University of Illinois Urbana-Champaign[1]. "We are working on cowpea and we are working on rice."

4 Several teams have managed *to boost growth* in plants such as tobacco by *upgrading photosynthesis*, but this is the first time it has been achieved in a food plant in *field trials*, says Long.

5 The work is the result of a global collaboration set up 10 years ago, mainly funded by the Bill & Melinda Gates Foundation[2], that aims *to boost yields* by *improving photosynthesis* and to make these *upgraded crops* available to small farmers in sub-Saharan Africa[3]. Several approaches are being explored and combining them should produce even bigger *yield increases*.

6 "We think we could *get a boost* as big as 50 per cent," says Long. "If that could be achieved, it would be green revolution level." The green revolution refers to the major *yield improvements* achieved in the 1950s and 1960s thanks to *improved crop varieties* and other technologies.

7 The genetically modified soybeans have higher yields because they adapt better to changes from sun to shade, and vice versa. When a leaf is in full sunshine, it *absorbs* more light energy than its photosynthetic machinery can handle. This damages cells unless they turn on a mechanism known as *quenching to dissipate the excess energy*. When a leaf is shaded, however, *quenching* has to be turned off to avoid dissipating energy that could be used. Most crop plants turn *quenching* on and off rather slowly, and lose a lot of energy as a result.

8 Some wild plants, such as ferns, turn *quenching* on or off much more rapidly, says Long. His team has added extra copies of three *genes involved in the quenching process* to the soybeans, which *results in* higher levels of the *encoded proteins* and speeds up the transitions, making photosynthesis more efficient (Science[4], doi[5].org/h8ns).

9 "Although we don't fertilise our soybean crops, the *protein content* was unchanged," says Long. That is important, given soya is the main plant source of protein globally. "This study is very exciting," says Emma Kovak at the Breakthrough Institute[6], a global research centre. "Not only do *yield increases* help reduce greenhouse gas emissions, but by reducing deforestation, they also help preserve plant biodiversity and wildlife habitat."

<div align="right">(Source: New Scientist | 27 August 2022)</div>

NOTES

[1] **University of Illinois Urbana-Champaign** – Иллинойский университет в Урбане-Шампейне, самый большой из кампусов Иллинойского университета, США. (**Urbana-Champaign** – сдвоенный город в штате Иллинойс)

[2] **Bill & Melinda Gates Foundation** – Фонд Билла и Мелинды Гейтс, считается крупнейшим частным фондом в Соединенных Штатах, поддерживает широкий спектр социальных, медицинских и образовательных разработок.

[3] **sub-Saharan Africa** – страны Африки, расположенные к югу от Сахары

[4] **Science** – журнал Американской ассоциации содействия развитию науки. Считается одним из самых авторитетных научных журналов.

READING AND VOCABULARY COMPREHENSION

Ex. 6.6. Find in the article English equivalents of the following Russian words and word combinations.

1) Генетические манипуляции, 2) сократить вырубку лесов, 3) выбросы парниковых газов, 4) утрата биоразнообразия, 5) доходы фермеров, 6) малообеспеченные страны, 7) вигна китайская (китайский горох), 8) ускорить рост растений, 9) глобальное сотрудничество, 10) продовольственное растение, 11) улучшенные культуры, 12) увеличение урожайности (прибавки урожая), 13) дикие растения, 14) папоротники, 15) кодируемый белок, 16) основной растительный источник белка во всем мире, 17) исследовательский центр.

Ex. 6.7. Answer the questions about the text.

1. Why were soybeans genetically modified? Has it helped to boost yields?

2. What is the benefit of growing these upgraded crops?

3. What other crops are being worked on to upgrade photosynthesis? When was the global collaboration in this field set up?

4. What is the aim of researchers funded by the Bill & Melinda Gates Foundation?

5. What results do the scientists hope to get?

6. How were major yield improvements achieved during the green revolution in the 1950s and 1960s?

7. How does upgraded photosynthesis work?

8. What is quenching? How does it help genetically modified soybeans cope with excess energy?

9. What did researchers do to make photosynthesis in soybeans more efficient?

10. What are the main advantages of upgrading photosynthesis?

UNIT 7
SUSTAINABLE FUELS

ACTIVE VOCABULARY

Ex. 7.1. Read the words, expressions and sentences, translate them.

fuel [fjuəl] – топливо, **sustainable biofuel** – экологически безопасное биотопливо, *alcohol-based biofuel*, *to create biofuel*

ethanol [ˈeθənɒl]– этанол, **ethanol yield** – выработка этанола
Bioethanol [ˌbaɪəʊˈeθənɒl] is a well-known alcohol-based biofuel.

waste – отходы, *agricultural waste*, *waste products, to make use of waste products, to cause the waste to breakdown into compounds*

wastage [ˈweɪstɪdʒ] – потери (от утечки, усушки и т.д.), непроизводительный расход кормов, отходы производства; *crop wastage*

by-products – побочная продукция, отходы производства, *agricultural by-products, to generate bioethanol from straw and other by-products*
Straw, sawdust and corncobs are agricultural by-products.

yeast [jiːst] – дрожжи, *compounds which are toxic to yeast,* **naturally occurring yeasts** – дрожжи природного происхождения (встречающиеся в природе дрожжи)
Five strains of naturally occurring yeasts could be used successfully in the fermentation process.

strain of yeast – штамм / раса дрожжей, *genetically modified yeasts, strains of naturally occurring yeasts*
Some strains of yeast are capable of turning agricultural by-products into bioethanol – a well-known alcohol-based biofuel.

glucose-release process – процесс высвобождения глюкозы
treatment process – технология переработки, процесс обработки
furfural [ˈfɜːf(ə)rəl] – (*хим.*) фурфурол, *toxic compound furfural, furfural tolerant strains, furfural resistance, furfural resistant strains,* **hydroxymethylfurfural** [ˌhaidrɔksiˌmeθilˈfəːfjurəl] – (*хим.*) гидроксиметилфурфурал
Furfural and hydroxymethylfurfural are compunds toxic to yeast. Furfural and hydroxymethylfurfural make fermentation difficult.

carbon footprint – углеродный след (количество углерода / углекислого газа, выбрасываемого в атмосферу при производстве какой-либо продукции)

to inhibit [ɪnˈhɪbɪt] – тормозить, замедлять, препятствовать

Many strains of yeast necessary for fermentation are inhibited by compounds in the straw.

Ex. 7.2. Fill in the table with the missing verb forms.

	V1	V2	V3	Meaning
1		estimated		оценить
2	create			
3			generated	
4	avoid			
5			found	
6		developed		
7	inhibit			тормозить, замедлять
8	turn			
9		pinpointed		определить, указать
10	produce			

Ex. 7.3. Complete the sentences with the right form of the verb from the table in Ex. 7.2.

1. I can't _____ my keys anywhere.
2. They were finally able _____ the cause of the fire.
3. The hydroelectric plant needs to _____ more electricity.
4. The government is trying to _____ new industries.
5. People who are lying tend to _____ eye contact.
6. The President has announced a plan to_____ new jobs.
7. Some antibiotics may_____ certain reactions.
8. Honey is _____ by bees.
9. Water _____into steam when it is boiled.
10. The builders _____ the cost of repairing the roof at $600.

Ex. 7.4. Translate the following expressions.

1) Straw-powered cars, 2) agricultural by-products, 3) alcohol-based biofuel, 4) automotive industry, 5) ethanol production, 6) fermentation process, 7) ethanol yield, 8) compounds toxic to yeast, 9) to display resistance, 10) yeast necessary for fermentation.

READING

Ex. 7.5. Look through the article and find what these numbers refer to:

400; 5; 70; 1979

Agricultural waste could be used as biofuel

1 Straw-powered cars could be a thing of the future thanks to new research from the University of East Anglia (UEA)[1].

2 A new study pinpoints five *strains of yeast* capable of turning *agricultural by-products*, such as straw, sawdust and corncobs, into bioethanol – a well-known alcohol-based biofuel.

3 It is estimated that more than 400 billion litres of bioethanol could be produced each year from *crop wastage*.

4 The research team say that their findings could help *to create biofuel* which is more environmentally friendly and ethically sound than other sources because it would *make use of waste products*.

5 Processes *to generate bioethanol from straw and other by-products* are currently complex and inefficient.

6 This is because high temperatures and acid conditions are necessary in *the glucose-release process*. But this *treatment process* causes the *waste* to breakdown into compounds which are toxic to yeast (*furfural* and *hydroxymethylfurfural*) – making fermentation difficult.

7 One way to avoid these problems is to use *genetically modified yeasts*, but this new research has found five strains of *naturally occurring yeasts* which could be used successfully in the fermentation process.

8 Lead researcher Dr Tom Clarke, from UEA's School of Biological Sciences, said: "Dwindling oil reserves and the need to develop *motor fuels* with a smaller *carbon footprint* has led to the explosion of research into sustainable fuels.

9 "*Bioethanol* is a very attractive *biofuel* to the automotive industry as it mixes well with petrol and can be used in lower concentration blends in vehicles with no modifications. In Brazil[2], vehicles which run purely on *bioethanol* have been on the roads since 1979.

10 "Breaking down *agricultural waste* has previously been difficult because many *strains of yeast* necessary for fermentation *are inhibited* by compounds in the straw. Their toxic effects lead to reduced ethanol production."

11 The research team investigated more than 70 strains of yeast to find the most tolerant. They found five strains which were resistant to the *toxic compound furfural*, and which produced the highest *ethanol yield*.

12 Of the five *furfural tolerant strains* S. cerevisiae NCYC 3451 displayed the greatest *furfural resistance*. The genomic lineage of this strain links it to yeast used in the production of the Japanese rice wine Sake[3].

13 "These strains represent good candidates for further research, development and use in bioethanol production," added Dr Clarke.

(Source: University of East Anglia. "Agricultural waste could be used as biofuel.". www.sciencedaily.com/releases/2015/03/150326083304.htm)

NOTES

[1] **University of East Anglia** ['æŋglɪə] – Университет Восточной Англии, общественный исследовательский университет в г. Норидже графства Норфолк Восточной Англии Великобритании.

[2] **Brazil** [bræ'zɪl] – Бразилия

[3] **Sake** [seɪk] – саке, японская водка из риса

READING AND VOCABULARY COMPREHENSION

Ex. 7.6. Find in the article English equivalents of the following Russian words and word combinations.

1) Древесные опилки, 2) кукурузные кочерыжки, 3) по имеющимся оценкам, 4) отходы сбора сельскохозяйственных культур, 5) научная группа (научный коллектив), 6) результаты, 7) этически безупречны, 8) использовать отходы производства, 9) сельскохозяйственные побочные продукты, 10) кислотная среда (кислотность), 11) технология переработки, 12) разлагаться на сложные химические соединения, 13) генетически модифицированные дрожжи, 14) ведущий научный сотрудник, 15) убывающие нефтяные ресурсы, 16) горючее для двигателей, 17) углеродный след (выбросы парниковых газов в атмосферу), 18) стремительный рост научных исследований, 19) смеси с более низкой концентрацией, 20) разложение сельскохозяйственных отходов.

Ex. 7.7. Answer the questions about the text.

1. What kind of cars could come into use in the future? Why?
2. What strains of yeast did the research team find?
3. What agricultural by-products can be turned into bioethanol?
4. How is bioethanol used?
5. How much bioethanol could be produced from waste products each year?
6. What are the benefits of biofuel?
7. What factors are important in the glucose-release process?
8. Why does the glucose-release process make fermentation difficult?
9. What findings of researchers could help to avoid problems in the fermentation process?

10. What caused the explosion of research into sustainable fuel?

11. What makes bioethanol a very attractive fuel?

12. How long has bioethanol been used as biofuel in Brasil?

13. Why was production of biofuel reduced?

14. How did researchers contribute to the increase in the production of ethanol?

15. What strain of yeast displayed the greatest resistance of the toxic compound furfural?

Ex. 7.8. Fill in the gaps with the words from the box.

fertilizer	*substitute*	*petroleum-based*	*crude oil*	*leaves*
plant byproducts	*containers*	*biodiesel*	*plastics*	*recyclable*

Uses for Agricultural Waste

1. Biofuels

Plant waste can produce biofuels such as 1) _____ or ethanol. If crops are rich in cellulose (as corn stalks are) they can be used to make ethanol, a 2) _____for gasoline. If crops are rich in lipids (such as unproductive oil seeds) they can be used to make biodiesel, a substitute for diesel.

2. Plastic Substitutes

After the juice has been extracted from sugarcane, the stalk that is left is known as *bagasse* ([bə'gæs] – *жмых, жом*). Bagasse can be used to create plastics such as bowls, plates and other plastic 3) _____. Unlike plastic made from 4) _____, plastics made from bagasse are natural fiber products that are compostable and degrade in 30-60 days after use. This makes them a great alternative to *Styrofoam* (*пенопласт*) and other plastic products.

3. Bioplastics

Bioplastics are getting both stronger and greener. These 5) _____, not designed to break down, are developed from corn and sugarcane. They reduce the company's overall footprint because they are more sustainably produced than conventional 6) _____ plastics, and are also 7) _____. Look for these materials in things like Legos, refrigerators and some packaging.

4. Compost

Animal waste has long been used as a field 8) _____to add nutrients to existing topsoil. However, many people are using manure to mix with other 9) _____ such as straw, corn stover, wood residue or 10) _____ to create a richer compost to be used in gardens and fields. The compost cycle takes around 4-8 months and reduces the volume of the waste by around 30%.

UNIT 8
VULNERABILITIES OF DIGITAL AGRICULTURE

ACTIVE VOCABULARY

Ex. 8.1. Read the words, expressions and sentences, translate them.

security – безопасность, *security threats*;

cybersecurity [ˌsaɪbəsɪˈkjʊərɪtɪ] – компьютерная безопасность, кибербезопасность, *cybersecurity attacks, cyber-security community*

smart [smɑːt] – (*зд.*) интеллектуальный, высокотехнологичный, с микропроцессорным управлением; *smart technologies*, *smart sensors and systems*, *smart low-power devices*

Wide-ranging use of smart technologies is raising global agricultural production. Smart sensors and systems are used to monitor crops, plants, the environment, water, soil moisture, and diseases.

digital [ˈdɪʤɪt(ə)l] – цифровой, *digital agriculture, digital havoc* – цифровой хаос*, digital domain*– цифровое пространство, цифровая сфера, цифровой формат

The transformation to digital agriculture would improve the quality and quantity of food for the ever-increasing human population. Digital agriculture is not immune to cyber-attack. Many labour-intensive food production jobs moved into the digital domain.

to facilitate [fəˈsɪlɪteɪt] – способствовать, содействовать, продвигать,

Smart low-power devices has facilitated the shift of many labour-intensive food production jobs into the digital domain.

vulnerability [ˈvʌln(ə)rəˈbɪlɪtɪ] – уязвимость, слабое место, *vulnerabilities to digital agriculture to cyber-attack*

sensitive information – важная / конфиденциальная информация, информация для служебного пользования

Those files contain sensitive information. When someone's asking for sensitive information, it's basic security to make sure that the person you're dealing with is who he says he is.

side-channel attack – атака по сторонним каналам

Extraction of cryptographic or sensitive information from the operation of physical hardware is termed side-channel attack.

food supply – снабжение продовольствием, запасы продовольствия

Food supplies are at a critically low level. Many countries have a big deficit in food supply.

flow-on costs – текущие затраты

Ex. 8.2. Fill in the table with the missing verb forms.

	V1	V2	V3	Meaning
1		raised		
2	warn			
3	reap			жать, пожинать плоды
4		included		
5			highlighted	привлечь внимание
6		improved		
7	reach			достигать
8			forecast	
9		took		
10	facilitate			

Ex. 8.3. Complete the sentences with the right form of the verb from the table in Ex. 8.2.

1. Thundershowers are _____for tomorrow.
2. She is now _____ the benefits of her hard work.
3. Reading helps to_____ your vocabulary.
4. Cutting taxes may _____ economic recovery.
5. Your resume should _____ your skills and achievements.
6. The climbers failed to _____the summit.
7. Bob missed the last train and had to _____ a taxi.
8. Service is _____ in the bill.
9. He _____ his head and looked around.
10. The police _____ us of the pickpockets.

Ex. 8.4. Learn the following expressions, and then translate the sentences paying attention to the words in italics.

to be prone to – иметь свойство, быть предрасположенным к (чему-либо), иметь склонность к (чему-либо)

as seen by – как видно из/по…, как…. видят, глазами…

term – (*n*) срок, определенный период; термин; (*v*) называть, именовать; **be termed** – именоваться, называться

in terms of – в терминах, с точки зрения; в том, что касается;

with an eye on – для того, чтобы; с намерением; в связи с; принимая во внимание; с прицелом; с оглядкой на

1. He thinks of everything *in terms of* money. 2. His grave is visited by admirers of his life's work and achievements *as seen by* fresh flowers placed

there regularly. 3. And this is very important *in terms of* future work. 4. The project *was termed* a success. 5. She *was prone to* generalization. And *is prone to* exaggeration. 6. DNA synthesis is currently expensive, slow and *prone to* errors. 7. This software is created *with an eye on* artificial intelligence, neural networks and voice control. 8. Of course, most purchases are planned by the individual *with an eye on* their own financial capabilities.

READING

Ex. 8.5. Look through the article to find answers to the questions below.

1. What businesses have already suffered from cyber-attack?
2. What is a side-channel attack?

Agriculture Tech Use Opens Possibility of Digital Havoc

1 Wide-ranging use of *smart technologies* is raising global agricultural production but international researchers warn this digital-age phenomenon could reap a crop of another kind – *cybersecurity attacks*.

2 Complex IT and math modelling at <u>King Abdulaziz University</u>[1] in <u>Saudi Arabia</u>[2], <u>Aix-Marseille University</u>[3], <u>France and Flinders University</u>[4] in South Australia, has highlighted the risks in a new article in the open access journal <u>Sensors</u>[5].

3 "*Smart sensors and systems* are used to monitor crops, plants, the environment, water, soil moisture, and diseases," says lead author Professor Abel Alahmadi from King Abdulaziz University.

4 "The transformation to *digital agriculture* would improve the quality and quantity of food for the ever-increasing human population, which is forecast to reach 10.9 billion by 2100."

5 This progress in production, genetic modification for drought-resistant crops, and other technologies is prone to cyber-attack – particularly if the ag-tech sector doesn't take adequate precautions like other corporate or defence sectors, researchers warn.

6 Flinders University researcher Dr Saeed Rehman says the rise of internet connectivity and *smart low-power devices has facilitated* the shift of many labour-intensive food production jobs into the *digital domain* – including modern techniques for accurate irrigation, soil and crop monitoring using drone surveillance.

7 "However, we should not overlook *security threats* and *vulnerabilities* to *digital agriculture*, in particular possible side-channel attacks specific to

ag-tech applications," says Dr Rehman, an expert in *cybersecurity* and networking.

8 "*Digital agriculture* is not immune to cyber-attack, as seen by interference to a US watering system, a meatpacking firm, wool broker software and an Australian beverage company."

9 "Extraction of cryptographic or *sensitive information* from the operation of physical hardware is termed *side-channel attack*," adds Flinders co-author Professor David Glynn.

10 "These attacks could be easily carried out with physical access to devices, which the *cyber-security community* has not explicitly investigated."

11 The researchers recommend investment into precautions and awareness about the *vulnerabilities of digital agriculture to cyber-attack*, with an eye on the potential serious effects on the general population in terms of *food supply*, labour and *flow-on costs*.

(Source: Flinders University.
"Agriculture tech use opens possibility of digital havoc."
<www.sciencedaily.com/releases/2022/05/220526095551.htm>.)

NOTES

[1] **King Abdulaziz University** – Университет (имени) короля Абдул-Азиза (государственное высшее учебное заведение в г. Джидде, Саудовская Аравия, основан в 1967 г.)

[2] **Saudi Arabia** ['saudɪə'reɪbɪə] – Саудовская Аравия

[3] **Aix-Marseille University** – Университет Экс-Марсель, французский государственный университет, основан в 2012 г.

[4] **Flinders University in South Australia** – Университет Флиндерса, государственный университет, расположен в г. Аделаида, на южном побережье Австралии.

[5] **Sensors** – швейцарский ежемесячный научный журнал с открытым доступом, основан в 2001 г.

READING AND VOCABULARY COMPREHENSION

Ex. 8.6. Find in the article English equivalents of the following Russian words and word combinations.

1) Умные технологии, 2) феномен цифровой эпохи, 3) атаки в области кибербезопасности, 4) цифровое сельское хозяйство, 5) постоянно растущее население, 6) засухоустойчивые культуры, 7) агротехнологический сектор, 8) рост числа подключений к интернету, 9) устройства

(приборы) с низким энергопотреблением, 10) трудоемкие рабочие места на производстве продовольственных продуктов, 11) агротехнические приложения, 12) специалист в области кибербезопасности и сетевых технологий, 13) оросительная система, 14) мясоперерабатывающая фирма, 15) меры предосторожности и осведомленность.

Ex. 8.7. Match the verbs with the nouns to get collocations from the article. Translate them into Russian.

1)	to raise	a)	a crop
2)	to reap	b)	attacks
3)	to highlight	c)	precautions
4)	to take	d)	production
5)	to facilitate	e)	risks
6)	to overlook	f)	threats
7)	to carry out	g)	soil moisture
8)	to monitor	h)	the shift

Ex. 8.8. Translate the Russian expressions into English, make use of phrases from Ex. 8.7.

1. Gambling business legalization (*будет способствовать переходу*) to the whole-year functioning of our hotels and the construction of new hotels. 2. The militants also (*совершают нападения*) in the capital. 3. I would also like (*подчеркнуть риски*) of stifling innovation – the last thing you want. 4. Police and law enforcement officers must not (*игнорировать угрозы*) against journalists nor neglect requests for protection. 5. Every home owner should (*предпринять меры предосторожности*) against fire. 6. As a result, it will improve the quality of life of their citizens and (*поднимет производство*). 7. (*Контроль влажности почвы*) allows farmers to make effective irrigation decisions. 8. The farmers (*убирают 2-3 урожая*) annually.

Ex. 8.9. Answer the questions about the text.

1. What is the benefit of wide-ranging use of smart technologies?
2. What do international researchers warn about?
3. Researchers from what countries spoke up about the possibility of digital havoc in modern agriculture?
4. Where was their article published?
5. How are smart sensors and systems used in agriculture?
6. What could be the result of the transformation to digital agriculture?
7. Why should the ag-tech sector take adequate precausions?

8. What is the role of rising internet connectivity and smart low-power devices in global agricultural production?

9. What do experts in cybersecurity and networking think of security threats and vulnerabilities of digital agriculture?

10. What do the researchers recommend?

Ex. 8.10. Fill in the gaps with the words from the box.

threaten   asparagus-harvesting   prevention   ransom   prime target asparagus   prevent   malicious attacks   agricultural robots   ditch

Smart technology is increasingly being used to make farms more efficient and productive – for example, until now the labour-intensive harvesting of delicate food crops such as **1**_____ has been beyond the reach of machines.

The latest generation of **2**_____ use artificial intelligence, minimising human involvement. They may help to plug a labour shortage or increase yield, but fear of the inherent security risk is growing.

Chris Chavasse, the co-founder of Muddy Machines, which is trialling an autonomous **3**_____ robot called Sprout, said: "There is a real risk that people anywhere in the world could try and take control of these machines," he said, "to get them to do whatever those people want, or just **4**_____ them from operating."

He said potentially someone could drive Sprout into a hedge or a **5**_____, or prevent it from working at all, so they are working with security researchers to address any vulnerabilities.

Asparagus farming is unlikely to be a **6**_____, but Mr Chavasse believes malicious hackers could **7**_____ "mission critical" agricultural infrastructure.

Even the largest companies aren't safe from cyber gangs. Some use ransomware: malicious code that can encrypt data and lock systems.

Last year, one of the world's biggest meat processing companies, JBS, paid $11m in **8**_____ to resolve a cyber attack. This month, top US agriculture firm, AGCO, was hit by a ransomware attack that affected production.

Organizations in 2021 and 2022 heavily invested in **9**_____, detection, and backup technology to combat these attacks, however, in 2023 that may not be enough – as threat actors get more creative and innovative with their **10**_____, data security professionals must embrace newer, more innovative, and effective technologies to defend their systems.

UNIT 9
LABOUR-TIME USE ON DAIRY FARMS

ACTIVE VOCABULARY

Ex. 9.1. Read the words, expressions and sentences, translate them.

to decline [dɪ'klaɪn] – уменьшаться, убывать, приходить в упадок; *declining numbers of workers in the agricultural sector*

to face challenges – столкнуться с трудностями, перед…стоят трудности; *face increasing challenge*

However, it is also true that we face increasing challenges. Globally, dairy producers face increasing challenges.

to meet demand – удовлетворять потребности / спрос; *to meet increasing demand for nutritious and affordable food.*

The company increased production to meet demand.

to employ – нанимать, предоставлять работу;

employment – занятость

Employment in agriculture, as a share of total worldwide employment, has declined by 29.8% since the year 2000.

availability [ə'veɪlə'bɪlɪtɪ] – доступность, наличие; *reduced availability of workers*

labor input – затраты труда, трудозатраты, *management of labor input, to record labor input, farm labor input*

workload – загруженность работой, затраты труда, *seasonal workload*, *work hours*

labor time-use – использование рабочего времени, *to track labor time-use, improved time-use*

time-consuming task – трудоемкая задача

labor-demanding time – трудоемкое время

fatigue [fə'ti:g] – чрезмерная усталость, упадок сил

pasture-based dairy farms – молочные фермы на пастбищах

spring-calving dairy farms – молочные фермы с весенним отелом

grassland management – организация пастбищного хозяйства, содержание пастбища, уход за пастбищем

enhanced health and safety – обеспечение безопасности жизнедеятельности, охрана здоровья и безопасности

social dimension – социальный аспект (параметр)

Ex. 9.2. Match the English phrases with their Russian equivalents.

1) to improve profitability	a) изучить рабочее время
2) to make improvements	b) опубликовать отчет
3) to emphasize importance	c) отслеживать время
4) to face challenges	d) повысить прибыльность
5) to meet demand (for)	e) подчеркивать важность
6) to publish a report (on)	f) производить улучшения
7) to record labour input	g) создавать рабочие места
8) to track time	h) сталкиваться с трудностями
9) to examine working hours	i) удовлетворить спрос
10) to create workplaces	j) учитывать затраты труда

Ex. 9.3. Complete the sentences with the phrases from Ex. 9.2.

1. All countries *f___ c_____* in meeting these standards. 2. This helps us to understand how people use the site and *to m____ i_____ to* our site. 3. Farmers continued to increase both the quantity and variety of local products to *m____ d_____*. 4. Programme graduates will also be able *to c____ w_____* for themselves as freelance employees or promoters of their own companies. 5. Managers constantly look for ways to change the business to *i____ p_____*. 6. Each farmer *r___ their l____ _____* on one alternating day each week. 7. The Minister of Health *p_____ __ _____* on women's health in 2000. 8. Doctors *e____ i_____* of regular mammograms. 9. Long before clocks, humans found creative ways to *t____ t____*. 10. The article *e____* the legislation on *w____ ____* in the European Union.

Ex. 9.4. Translate the following expressions.

1) Work hours, 2) farm labour, labour time-use, labour use, labour input, labour efficiency improvements, 3) farm workers, 4) online survey, 5) calf care, cow care, 6) phone app, smartphone app, 7) research team, 8) farm operator, 9) farm profitability, 10) herd size.

READING

Ex. 9.5. Look through the article and find answers to the questions about the study of labour time-use.

1. Where was the study made? 2. When was it conducted?
3. How many farms were involved?
4. Where was a report on the study published?
5. What did the researchers emphasize? Why?

For Dairy Farmers, Where Does the Time Go?

1 Globally, dairy producers *face increasing challenges* regarding sustainability, including *declining* numbers of workers in the agricultural sector, while continuing to *meet increasing demand for nutritious and affordable food*. Dairy systems must now focus on more sustainable production that reflects economic, environmental, and social goals. A new report in the *Journal of Dairy Science®*, published by Elsevier[1], explores labor time-use on Irish pasture-based dairy farms in the busy spring and summer seasons.

2 *Employment* in agriculture, as a share of total worldwide *employment*, has declined by 29.8% since the year 2000. Due to this reduced *availability* of workers, *management of labor input* is becoming a *crucial challenge* for dairy farms internationally, especially in expanding dairy markets. The seasonal *workload* associated with pasture-based dairy farming – a system that promotes farm profitability along with favorable environmental impacts – combined with increasing herd sizes, has led to a renewed focus on *labor time-use* and efficiency on these farms.

3 The study used up-to-date technology, including a mobile phone app, *to track labor time-use* across 82 spring-calving pasture-based Irish dairy farms from February 1 to June 30, 2019. This allowed the research team to begin examining the often-overlooked social dimension of sustainable farming, including working hours and quality of life.

4 First author Conor Hogan, of Teagasc Animal & Grassland Research & Innovation Centre[2] (Moorepark, Fermoy, County Cork, Ireland) and the School of Agriculture and Food Science, University College Dublin[3] (Dublin, Ireland), explains, "Each farmer *recorded their labor input* on one alternating day each week, using a smartphone app. Any *labor input* by farm workers not using the app was recorded through a weekly online survey."

5 The team found that milking was the most *time-consuming task*, representing 31% of farm *labor input*, making it an important focus for potential improvements in efficiency. The next most *time-consuming tasks* were calf care (14%), grassland management (13%), cow care (10%), repairs and maintenance (10%), and administration/business (8%). The researchers further report that participating farmers worked, on average, 60 hours a week across the study period, and that the busiest months on most of the farms were February and March.

6 The team emphasizes the importance of understanding *labor use* during the most *labor-demanding time* of year on pasture-based dairy farms, as this points to areas where labor efficiency improvements can be made. As

Hogan points out, "*Improved time-use* in spring and summer, resulting in reduced *work hours*, can have associated positive effects on many aspects of dairy farming, including enhanced health and safety of farm operators and reduced stress and *fatigue* among farmers, creating more attractive workplaces and improving farm profitability."

NOTES

[1] **Elsevier** [ˌelsə´viə] – издательство Эльзевир, нидерландская компания. «Эльзевир», многонациональный академический научный издатель, основан в 1880 г. и является одним из четырех крупнейших издательских домов мира.

[2] **Teagasc Animal & Grassland Research & Innovation Centre** – государственное агентство, предоставляющее исследования, консультации и образование в области сельского хозяйства, садоводства, продовольствия и развития сельских районов в Ирландии.

[3] **School of Agriculture and Food Science, University College Dublin** – Школа сельского хозяйства и продовольственных наук, находится в Университетском колледже в Дублине.

READING AND VOCABULARY COMPREHENSION

Ex. 9.6. Find in the article English equivalents of the following Russian words and word combinations.

1) уменьшение числа рабочих в сельскохозяйственном секторе, 2) питательная и доступная еда, 3) устойчивое (не наносящее ущерба окружающей среде) производство, 4) экономические, экологические и социальные цели, 5) общая занятость по всему миру, 6) молочные фермы на пастбищах, 7) горячая пора (сезон наибольшей нагрузки) / самые загруженные месяцы, 8) уменьшающееся количество рабочих, 9) важнейшая задача, 10) расширяющиеся рынки сбыта молочной продукции, 11) сезонная рабочая нагрузка, 12) молочные фермы с весенним отелом, 13) часто упускаемый из виду, 14) уровень (качество) жизни, 15) доение, 16) еженедельный интернет-опрос, 17) ремонт и техническое обслуживание, 18) обеспечение безопасности жизнедеятельности (охрана здоровья и безопасность).

Ex. 9.7. Complete the sentences with the correct form of the words.

1. to improve / improvement / improved / improver

a) Doctors were amazed by the sudden _____ in her medical condition. b) The weather _____ toward evening. c) Our washing powder now has a new _____ formula. d) Peat makes a good ground cover and soil _____. e) The advertising campaign has _____ sales.

2. to profit / profit (*n*) / profitable /profitability / profitably

a) The _____of sugar beet agriculture and processing was roughly 25% last year. b) They're looking to the new manager to make the company _____ . c) The company made a _____ this year. d) Factories have to produce goods that are _____ sold. e) The company has not _____ from the merger.

3. to employ / employment / employer / employee / unemployment

a) _____ is a serious social evil. b) That new _____ is really a hard worker. c) She got her first job through an _____ agency. d) The shoe factory is the largest _____ in this area. e) The factory_____ over 2000 people.

Ex. 9.8. Answer the questions about the text.

1. What challenges do dairy producers face?
2. What demand do they have to meet?
3. What does a report published in the Journal of Dairy Science explore?
4. How has employment in agriculture changed since the year 2000?
5. What does reduced availability of workers mean for dairy farmers?
6. Why did researchers focus on labour time-use and efficiency on dairy farms?
7. What is pasture-based dairy farming?
8. How was the study conducted?
9. On what farms was labour time-use examined?
10. How was the information about labour input by farm workers collected?
11. What tasks turned out to be the most time-consuming ones?
12. How many hours a week did participating farmers work on average?
13. What were the busiest months on pasture-based dairy farms?
14. Why is understanding labour use on pasture-based farms of great importance?
15. On what aspects of dairy farming can reduced work hours have positive effect?

UNIT 10
INCREASING MILK PRODUCTION

ACTIVE VOCABULARY

Ex. 10.1. Read the words, expressions and sentences, translate them.

to produce –производить, *to produce milk*; **production** – производство, *milk production*, *to increase milk production*, *to influence milk production*; **productivity** – производительность, продуктивность, *milk productivity*, *to affect milk productivity*

Farmers' attitudes to their cows influence milk production. Calling cows by name can significantly increase milk production.

to treat [tri:t] – обращаться с, относиться, обходиться с; *treat a cow as an individual*

Dairy farmers believe treating every cow as an individual is "vitally important".

importance [ɪm'pɔ:t(ə)ns] – значение, важность, *place importance on* – придавать значение (чему); **important** –важный

Placing more importance on knowing the individual animals can significantly increase milk production. Treating every cow as an individual is "vitally important".

to herd [hɜ:d] – собирать / сгонять в стадо, пасти, **herd** (*n*) – стадо

On farms the cattle were herded as a group. Many farmers said they "knew all the cows in the herd".

yield [ji:ld] – (*зд.*) надой (молока); *annual milk yield*, *overall milk yield*

personal touch – личный контакт, душевная теплота

respond [rɪ'spɔnd] – ответить, откликаться; *respond better to the personal touch*

attention [ə'tenʃ(ə)n] – внимательность, ухаживание, забота; *one-to-one attention* – индивидуальное внимание

Cows also feel happier if they are given more *one-to-one attention*."

interact ['ɪntə'rækt] – взаимодействовать; *interacting with the animal*

welfare ['welfeə] – благополучие, качество жизни; *animal's welfare; welfare of dairy cattle*

Farmers can not only improve the animal's welfare and her perception of humans, but also increase milk production.

at no extra cost – без дополнительных затрат;

Calling cows by name can – at no extra cost to the farmer – increase their annual milk yield.

Ex. 10.2. Fill in the table with the missing verb forms.

	V1	V2	V3	Meaning
1		found		
2	show			
3			given	
4	believe			полагать
5			grown up	вырасти
6		owned		
7	know			
8			influenced	
9		agreed		
10	explain			

Ex. 10.3. Complete the sentences with the right form of the verb from the table in Ex. 10.2.

1. Thus, the study _____ general change of attitude to education.
2. Some scientists _____ acid rain may even enhance some yields.
3. As every farmer _____ , trouble can come at any point before the harvest is complete.
4. She _____ a horse farm that makes dog food.
5. Let us _____ a name to the picture which he is trying to paint.
6. Did you _____ how to behave at the zoo to the children?
7. By signing a contract, you _____ to certain terms and conditions.
8. We are _____ both by environment and by heredity.
9. Researchers have _____ that the month you were born in could affect your health.
10. We had no electricity when I was _____ .

READING

Ex. 10.4. Look through the article and match the numbers with the corresponding information.

1) 500	a) percentage of farmers who call their cows by name
2) 516	b) pints, increase in milk yield
3) 46	c) farmers who knew all the cows in the herd
4) 258	d) percentage of farmers who believe that positive human contact affects productivity of cows
5) 66	e) the number of farmers questioned by researchers
6) 48	f) percentage of farmers saying that a fear of humans results in a poor milking temperament
7) 10	g) litres, gain in milk yield

Personal Touch In Farming:
Giving A Cow A Name Boosts Her Milk Production

1 A cow with a name produces more milk than one without, scientists at Newcastle University[1] have found. Drs[2] Catherine Douglas and Peter Rowlinson have shown that by giving a cow a name and *treating* her as an individual, farmers can increase their *annual milk yield* by almost 500 pints[3].

2 The study, published online in the academic journal Anthrozoos[4], found that on farms where each cow was called by her name the *overall milk yield* was higher than on farms where the cattle *were herded* as a group.

3 "Just as people *respond better to the personal touch*, cows also feel happier and more relaxed if they are given a bit more *one-to-one attention*," explains Dr Douglas, who works in the School of Agriculture, Food and Rural Development[5] at Newcastle University[1].

4 "What our study shows is what many good, *caring farmers* have long since believed.

5 "By *placing more importance on* the individual, such as calling a cow by her name or *interacting with the animal* more as it grows up, we can not only improve the *animal's welfare* and her perception of humans, but also increase milk production."

6 Dairy farmer Dennis Gibb, who co-owns Eachwick Red House Farm outside Newcastle, Northern England, with his brother Richard, says he believes *treating every cow as an individual* is "vitally important".

7 "They aren't just our livelihood – they're part of the family," says Dennis. "We love our cows here at Eachwick and every one of them has a name. Collectively we refer to them as 'our ladies' but we know every one of them and each one has her own personality."

What the study found

8 The Newcastle University study looked at how farmers' attitudes to their cows influences milk production.

9 Dr Douglas and Dr Rowlinson questioned 516 UK dairy farmers about how they believed humans could affect the productivity, behaviour and welfare of dairy cattle.

10 Almost half – 46 per cent – said the cows on their farm were called by name. Those that called their cows by name had a 258 litre higher milk yield than those who did not.

11 Sixty six per cent of farmers said they "knew all the cows in the *herd*" and 48 per cent agreed that positive human contact was more likely to produce cows with a good milking temperament. Almost 10 per cent said that a fear of humans resulted in a poor milking temperament.

12 Dr Douglas added: "Our data suggests that on the whole UK dairy farmers regard their cows as intelligent beings capable of experiencing a range of emotions.

13 "*Placing more importance on* knowing the individual animals and calling them by name can – *at no extra cost* to the farmer – also significantly increase milk production."

(Source: Newcastle University. "Personal Touch In Farming: Giving A Cow A Name Boosts Her Milk Production." ScienceDaily. www.sciencedaily.com/releases/2009/01/090128074933.htm)

NOTES

[1] **Newcastle University** – Университет Ньюкасла / Ньюкасльский университет, Великобритания (один из двух университетов в городе Ньюкасл-апон-Тайн)

[2] **Drs** = Doctors

[3] **pint** [paɪnt] – пинта (мера емкости, в Англии = 0,57 л)

[4] **Anthrozoos** – междисциплинарный журнал о взаимодействии людей и животных. Публикуется издательством Bloomsbury Publishing.

[5] **School of Agriculture, Food and Rural Development** – Школа сельского хозяйства, продовольствия и развития сельских районов (в Университете Ньюкасла).

READING AND VOCABULARY COMPREHENSION

Ex. 10.5. Find in the article English equivalents of the following Russian words and word combinations.

1) Относиться к корове как к личности, 2) научный журнал, 3) общий надой молока, 4) индивидуальный подход (личный контакт), 5) заботливые фермеры, 6) придавать значение, 7) звать корову по имени, 8) взаимодействовать с животным, 9) улучшать благосостояние животных, 10) совместно с братом владеть фирмой, 11) источник существования, 12) отношение фермеров к своим коровам, 13) сказаться на производительности, 14) в среднем (в общем и целом), 15) умное существо, 16) испытывать множество разнообразных эмоций, 17) без дополнительных затрат для фермера.

Ex. 10.6. Match the words from the two columns to get collocations from the article.

1) interact	a) an individual
2) treat a cow as	b) importance on smb /smth
3) improve animal	c) more attention
4) place more	d) of emotions
5) respond better	e) productivity
6) affect	f) to the personal touch
7) experience a range	g) welfare
8) give	h) with animals / people

Ex. 10.7. Translate the Russian expressions into English, make use of the phrases from Ex.10.6 in the right form.

1. Parents should (*уделять больше внимания*) to their children. 2. Every child should be (*обращаться как с личностью*) with his or her personal needs, wishes and feelings. 3. Agency employees admire his unassuming manner, and they (*реагируют на его индивидуальный подход*), including a droll sense of humor. 4. That's why we (*придаем такое большое значение*) on access to data. 5. He could no longer (*взаимодействовать с*) people. 6. How big does a project need to be before team size begins to (*влиять на производительность*)? 7. Any creature with a nervous system (*испытывает разнообразные эмоции*). 8. Europe has also already moved decisively to (*по улучшению благосостояния животных*).

Ex. 10.8. Answer the questions about the text.

1. What have scientists at Newcastle University found?
2. Where was the study published?
3. What does the study show?
4. How do cows respond to personal touch?
5. Why is treating a cow as an individual vitally important?
6. What results from a fear of humans?
7. What conclusions do scientists come to in the end?

UNIT 11
EMOTIONAL STATES IN CATTLE AND PIGS

ACTIVE VOCABULARY

Ex. 11.1. Read the words, expressions and sentences, translate them.

welfare ['welfeə] – благополучие, качество жизни; *improving animal welfare on farms*, *welfare auditors*

Better welfare should improve health and yields.

cue [kju:] – знак, сигнал, намек

deep learning – глубокое обучение, разновидность машинного обучения на основе искусственных нейронных сетей; используется в компьютерном зрении (для извлечения информации из изображений), машинном переводе и распознавании человеческой речи.

frustration [frʌ'streɪʃ(ə)n] – разочарование, отчаяние, удрученность

neutrality [nju:'trælɪtɪ] – безучастность, безразличие

Ex. 11.2. Fill in the table with the missing verb forms.

	V1	V2	V3	Meaning
1		detected		
2	analyse			
3			boosted	повышать
4	predict			
5		eliminated		устранить, удалить
6	reveal			
7			identified	
8		prevented		
9			thought	
10	bite			кусать, грызть

Ex. 11.3. Complete the sentences with the right form of the verb from the table in Ex. 11.2.

1. Various crimes were_____ in connection with other forms of child exploitation.
2. He took out a cigarette, but his uncle _____ him from lighting it.
3. What do you _____ of your new school?
4. The tax cut will _____ the economy.
5. She still needs to _____ the data.
6. Eating the right food helps to_____ waste matter from the body.

7. In the cemetery, there is a statue of a snake _____ its own tail.
8. The police took fingerprints and _____ the body.
9. She claims that she can _____future events.
10. The reporter has refused to _____ his sources.

Ex. 11.4. Translate the following word combinations from the article.

1) Emotional states, 2) positive states, 3) negative emotional states, 4) automated system, 5) previous research, 6) particular emotions, 7) forward-facing ears, 8) facial actions, 9) continuous monitoring, 10) cheap cameras, 11) cloud-based systems, 12) occasional visits, 13) ultimate aim, 14) serious infections, 15) artificial intelligence.

READING

Ex. 11.5. Look through the article and find all the words denoting different emotional states in cattle and pigs.

AI[1] Can Read a Cow's Face to Tell if It Is Stressed or Excited

Michael Le Page

1 An *artificial intelligence* can detect nine emotional states in cattle and pigs by analysing their faces, and could lead to systems for improving animal *welfare* on farms.

2 At present, well-being efforts focus on reducing animals' pain and distress, but automated systems could help boost positive states as well, says Suresh Neethirajan at Wageningen University & Research[2] in the Netherlands. "There is a need to move away from just eliminating negative emotional states to providing positive states, such as playful behaviour."

3 He collected thousands of images and videos of cattle and pigs from farms in Canada, the US and India and classified them based on *cues* known from previous research to reveal particular emotions. For instance, when the white of a cow's eye is visible, it is usually a sign of excitement or stress. A pig's forward-facing ears are a sign of alertness or sometimes aggression.

4 *Deep learning* was used to detect the faces of animals in these images. The system was then trained to identify 13 facial actions associated with emotional states like stress, aggression, *frustration*, *neutrality*, relaxation and excitement. When tested on another set of images, the system matched the human classification around 86 per cent of the time (bioRxiv[3], doi[4].org/f78m).

5 Neethirajan says it will take a couple of years to develop the system to a point where it could start to be used on farms. But he thinks continuous monitoring by cheap cameras hooked up to a cloud-based system could be far better than the occasional visits by *welfare auditors* that are required in some countries.

6 According to Neethirajan, the ultimate aim is to be able to predict and prevent problem behaviours, such as tail biting in pigs, which can lead to serious infections. Better welfare should improve health and yields, so Neethirajan thinks many farmers will embrace such systems.

<div align="right">(Source: New Scientist | 1 May 2021)</div>

NOTES

[1] **AI = artificial intelligence** [ˈɑːtɪˈfɪʃ(ə)lɪnˈtelɪʤ(ə)ns] – искусственный разум / интеллект

[2] **Wageningen University & Research** – Вагенингенский университет и научно-исследовательский центр (Нидерланды)

[3] **bioRxiv** – бесплатный онлайн-архив и сервис распространения неопубликованных препринтов в области наук о живой природе. Он управляется лабораторией Колд-Спринг-Харбор, некоммерческим исследовательским и образовательным учреждением.

[4] **doi** = Digital Object Identifier – идентификатор цифрового объекта, используется в ссылках на электронные книги.

READING AND VOCABULARY COMPREHENSION

Ex. 11.6. Find in the article English equivalents of the following Russian words and word combinations.

1) Усилия по обеспечению благополучия животных, 2) игривое поведение, 3) белок глаза коровы, 4) признак волнения или стресса, 5) обращенные вперед уши свиньи, 6) признак настороженности или агрессии, 7) мимические движения, 8) облачная система, 9) ревизоры, проверяющие соблюдение стандартов содержания животных, 10) проблемное поведение, 11) кусание хвостов, 12) внедрить / использовать систему.

Ex. 11.7. Answer the questions about the article.

1. How many emotional states in cattle and pigs can an artificial intelligence detect?
2. How can an AI detect emotional states in animals?

3. Why is it important to understand animals' emotions on farm?

4. What kind of research did the scientist from the Netherlands do?

5. What signs reveal negative emotional states in cow and pigs?

6. What method was used to detect facial actions in animals?

7. How many facial actions associated with different emotional states can the method identify?

8. What emotional states in animals can be identified with the help of deep learning?

9. How long can it take to introduce the system on farms?

10. How is animal welfare on farms monitored in some countries?

11. What is the ultimate aim of scientists?

12. Why does Suresh Neethirajan think many farmers will embrace the system using deep learning?

Ex. 11.8. Read the summary of an article. Choose the appropriate word in italics.

It is globally recognized that [1]*stresses / emotions* are important elements of farm animals' life. However, scientific understanding regarding how to measure and interpret positive emotional [2]*states / signs* is currently lacking. This study [3]*eliminated / investigated* whether eye white and ear posture (*положение ушей*) can reliably help in the interpretation of [4]*mood / food* and level of excitement in dairy cows. We found that eye white and ear posture are strongly correlated, and that can be used as [5]*complementary / elementary* measures to interpret emotions. Daily access to pasture has [6]*negative / beneficial* effects on cows' emotions. Animals are more relaxed than in any other context, with most of the animals exhibiting half-closed eyes and ears hung down or backwards. The cows were [7]*found / founded* to be particularly excited during the execution of a human-animal relationship test, showing [8]*ear posture / eye white* clearly visible and ears directed forwards, towards the assessor. Housing has an important effect on cows' emotions: the lower the competition for resources (i.e., in case of more feeding places or cubicles than the number of animals), the lower the level of excitement. This [9]*research / resource* is a further step towards the use of indicators able to measure emotions in dairy cows and can contribute to [10]*reduce / enhance* animals' quality of life on farm.

UNIT 12
SERENDIPITOUS DISCOVERY

ACTIVE VOCABULARY

Ex. 12.1. Read the words, expressions and sentences, translate them.

to swell [swel] – распухать

to cough [kɔf] – кашлять

to be rampant ['ræmpənt] – свирепствовать, буйствовать

East Coast Fever[2] (береговая лихорадка) is rampant in African countries.

tick – (зоол.) иксодовый клещ

The ticks can be attacked with sprayed pesticides.

kin – родня, родственники

to breed – заниматься селекцией, выводить (животных), *to breed cattle that can beat the disease*, **breeding**, *conventional breeding* – традиционная селекция / разведение; **breed** – порода (скота, птицы); *higher yielding European breeds*; **breeder**

This discovery could soon lead to better selective breeding. African cattle breeders can test their animals' DNA for this gene variant and breed from those carrying it, thus producing ECF[2] resistant offspring.

susceptible [sə'septəb(ə)l] – подверженный, склонный

Higher yielding European breeds are much more susceptible to the illness than their African kin.

to curtail [kɜ:'teɪl] – сокращать, укорачивать

serendipity ['serən'dɪpɪtɪ] – интуитивная прозорливость, проницательность, счастливая способность к открытиям;

serendipitous ['serən'dɪpɪtəs] – непрогнозируемый, случайный; *serendipitous discovery* – случайно сделанное открытие; **serendipitously** – по счастливой случайности

to sire ['saɪə] – осеменять, быть производителем (о жеребце и т. д.)

Researchers noticed that of the 12 unvaccinated animals involved, all three survivors had been sired by the same bull.

cell [sel] – клетка (организма), **cellular** ['seljulə] – клеточный

A process of programmed cellular suicide called apoptosis helps regulate cell numbers.

to succumb (to) [sə'kʌm] – умереть (от чего-л.), стать жертвой

44 of 97 cows without a version of a gene called *FAF1* succumbed to East Coast Fever.[2]

tolerance ['tɔl(ə)rəns] – иммунность, резистентность

gene editing – редактирование гена, **gene editing technique** – метод генной инженерии; *gene-edited cattle*

Such gene-editing programmes are increasingly common, and are achieving official acceptance.

to splice [splaɪs] – склеивать, соединять; **splice** (*n*) – сплайсинг

Ex. 12.2. Practise reading the following international words.

lymphocytes ['limfəsait] – лимфоцит, лимфоцитная клетка
lymph [lɪmf] – лимфа, lymph nodes – лимфоузлы
protozoan parasites ['prəutə'zəuən 'pærəsaits] – простейшие паразиты
protozoan illness;
apoptosis [æpə'təusis] – апоптоз, запрограммированная смерть клеток
trypanosomiasis [ˌtripənəsəu'maiəsis] – трипаносомоз

Ex. 12.3. Fill in the table with the missing verb forms.

	V1	V2	V3	Meaning
1		began		
2	swell			опухать, разбухать
3			fed	
4	breed			
5		spread		
6	curtail			сокращать, урезать
7	offer			
8		beat		бить, победить
9			observed	
10		brought about		

Ex. 12.4. Complete the sentences with the right form of the verb from the table in Ex. 12.3.

1. The fire _____ quickly through the building.
2. Few cases of the disease have been _____ in humans.
3. This disease of childhood makes the cheeks _____out.
4. Budget cuts have drastically_____ training programs.
5. We have been successful because we are _____ a quality service.
6. He learned he had stomach cancer at age 10, and he did not _____ the disease until age 13.
7. What are the chances that a new disease could _____ _____ the extinction of humanity?

8. The sooner we _____, the sooner we will be through.

9. Kids gather eggs and _____ chickens, don't use much machinery.

10. These dogs were originally _____ in Scotland to round up sheep.

Ex. 12.5. Read and translate the following expressions.

A 1) African countries, 2) African kin, 3) productive European breeds (of cattle), 4) less productive local varieties, 5) agricultural output, 6) a Kenyan cow, 7) new research, 8) veterinary scientists, 9) sprayed pesticides, 10) the same bull, 11) the current study, 12) further investigation, 13) adverse side effects, 14) the protective version, 15) official acceptance, 16) short slick hair, 17) useful effect, 18) healthy cattle, 19) unvaccinated animals, 20) specific genetic element, 21) cellular suicide;

B 1) story is common, 2) fever is rampant, 3) a vaccine is available, 4) approaches are costly, 5) the difference is stark;

C 1) cattle farmer, cattle breeder, 2) a bite near the cow's ear, 3) animal's lymphocytes, cattle lymphocytes, 4) lymph nodes, 5) gene variant, 6) the variant's discovery, 7) vaccination trial, 8) cell numbers, 9) variant version, 10) gene-editing technique, gene-editing programme, 11) tsetse flies, 12) animal disease, 13) disease resistance.

Ex. 12.6. First match the adverbs with their Russian equivalents, and then translate the sentences paying attention to the words in italics.

1) serendipitously	a) быстро
2) disproportionately	b) все больше и больше
3) exactly	c) несоразмерно
4) quickly	d) по счастливой случайности
5) successfully	e) точно
6) increasingly	f) успешно

1. The variant's discovery came about *serendipitously*. 2. It has a *disproportionately* large effect on cattle's ECF tolerance. 3. They were not sure *exactly*. 4. That variant may stop cattle lymphocytes from multiplying as *quickly*. 5. Such gene-editing programmes are i*ncreasingly* common. 6. Productive European breeds can be raised far more *successfully* in Africa.

READING

Ex. 12.7. Look through the article and say whether the statements below are TRUE or FALSE.

1. East Coast Fever is widespread in African countries.

2. The disease is caused by protozoan parasites.

3. Protozoan parasites are spread by tsetse flies.

4. East Coast Fever kills 1m cattle a year.

5. There is no vaccine against the disease.

6. European breeds of cattle are not susceptible to the disease.

7. Local breeds of cows in African countries are less productive than high yielding European breeds.

8. There is a possibility of breeding cattle that can beat the disease.

9. Veterinary scientists have found a gene variant associated with resistance to ECF.

10. The variant's discovery was made by chance.

East Coast Fever
Cowabunga![1]

A genetic discovery could help Africa's cattle farmers

1 It begins with a bite near the cow's ear. In the next few days, the animal's lymphocytes multiply. Its lymph nodes *swell*. It stops feeding and starts coughing as fluid fills its lungs. It develops a fever as high as 41°C. A few weeks after the bite, it dies.

2 Such a story is common in African countries where East Coast Fever (ECF)[2] *is rampant*. ECF, which is caused by protozoan parasites spread by ticks, kills around 1m cattle a year. It also prevents the introduction of faster growing, *higher yielding European breeds*, which *are much more susceptible* to the illness than their African *kin*. Though a vaccine is available, and the *ticks* can be attacked with sprayed pesticides, both of these approaches are costly. Most farmers thus continue to use less productive local varieties – *curtailing* their incomes and reducing agricultural output. The difference is stark: a Kenyan cow produces around a tenth as much milk as one in Britain.

3 New research may offer a solution. Veterinary scientists led by Phil Toye of the International Livestock Research Institute[3]'s campus in Nairobi[4] and James Prendergast of the Roslin Institute[5], in Edinburgh[6], have found a gene variant associated with resistance to ECF. This result, published in *PLOS* Genetics[7], opens up the possibility of *breeding* – or even gene-editing into existence – cattle that can beat it.

4 The variant's discovery came about *serendipitously*. While observing a small ECF vaccination trial in 2013, researchers at the International Livestock Research Institute[3] noticed that of the 12 unvaccinated animals in-

volved, all three survivors had been *sired* by the same bull. Further investigation suggested the specific genetic element responsible was a version of a gene called *FAF1*, which they dubbed *FAF1B*. *FAF1* is part of a process of programmed *cellular* suicide called *apoptosis*, which helps regulate *cell* numbers.

5 The current study examined 20 animals carrying two copies of the variant version. Just one of these *succumbed to* ECF. In contrast, 44 of 97 cows without the variant *succumbed*. The results, says Dr Prendergast, suggest that *FAF1B* has a "disproportionately large effect" on cattle's *ECF tolerance*. He and his colleagues, though not sure exactly why that might be, think this variant may stop cattle *lymphocytes* from multiplying as quickly.

6 Their discovery could soon lead to better selective *breeding*. Once researchers are sure the variant does not have adverse side effects, African cattle *breeders* can test their animals' DNA for it and *breed* from those carrying it, thus producing ECF resistant offspring. In the longer term, *gene editing techniques* such as CRISPR[8]-Cas9 may permit the protective version to be *spliced* into productive *European breeds*, which can then be raised far more successfully in Africa.

7 Such *gene-editing programmes* are increasingly common, and are achieving official acceptance. In March, regulators in America approved the first sales to consumers of meat from *gene-edited cattle*. (The modification in question gives the animals short, slick hair, to help them cope with a warming climate.) The International Livestock Research Institute and Roslin, meanwhile, are designing livestock resistant to other diseases, including trypanosomiasis, a protozoan illness spread by tsetse flies.

8 By reducing mortality and increasing productivity, *gene-edited European livestock* could have a useful effect in Africa – though some worry the benefits are overstated. Dr Prendergast points to the many other animal diseases prevalent on the continent, to which such cattle would still be susceptible. He suggests farmers might be better off *breeding* local varieties for resistance (and also higher productivity). But no matter whether disease resistance is brought about by *conventional breeding* or *gene editing*, it should lead to healthier cattle – and happier farmers.

(Source: The Economist April 30th 2022)

NOTES

[1] **Cowabunga!** [ˌkaʊəˈbʌŋgə] – Прикинь! Представь! (*австр.* восклицание, выражающее возбуждение, радостное настроение, удовольствие и т.д.)

² **East Coast Fever** (**ECF**) – (*с/х*) береговая лихорадка, восточно-береговая лихорадка, тейлериоз крупного рогатого скота (тейлериозы – инвазионные трансмиссивные болезни крупного рогатого скота, овец, коз, вызываемые простейшими – тейлериями, паразитирующими в крови. Симптомы: лихорадка, анемия; животные часто гибнут)

³ **International Livestock Research Institute** (**ILRI**) – Международный научно-исследовательский институт животноводства

⁴ **Nairobi** [naɪˈrəʊbɪ] – г. Найроби (столица Кении, страны на восточном побережье Африки)

⁵ **Roslin Institute** – Рослинский институт (государственный научно-исследовательский институт в Рослине вблизи Эдинбурга, Шотландия, Великобритания). Он финансируется исследовательским советом биотехнологии и биологических наук Соединенного Королевства.

⁶ **Edinburgh** [ˈedɪnbərə] – г. Эдинбург (столица Шотландии, Великобритания)

⁷ *PLOS* **Genetics** – рецензируемый научный журнал с открытым доступом, созданный в 2005 году и издаваемый Публичной научной библиотекой.

⁸ **CRISPR** (*сокр.* clustered regularly interspaced short palindromic repeats) – инструмент генного перепрограммирования

READING AND VOCABULARY COMPREHENSION

Ex. 12.8. Find in the article English equivalents of the following Russian words and word combinations.

1) Укус возле уха коровы, 2) через несколько недель после укуса, 3) это обычная история, 4) лихорадка свирепствует, 5) более высокопродуктивные породы, 6) распыленные / распыляемые пестициды, 7) менее продуктивные местные породы, 8) объем сельскохозяйственного производства, 9) в десять раз меньше, чем…, 10) новое исследование, 11) предложить решение, 12) ученые-ветеринары, 13) вариант гена, 14) устойчивость к береговой лихорадке, 15) уцелевшие / оставшиеся в живых животные, 16) непривитые животные, 17) дальнейшее расследование, 18) регулировать количество клеток, 19) нынешнее исследование, 20) умереть от лихорадки, 21) в долгосрочной перспективе, 22) модификация, о которой идет речь (рассматриваемая / обсуждаемая модификация), 23) преувеличивать (выгоды преувеличены / завышены), 24) традиционная селекция (традиционное разведение), 25) селекционное разведение / генетический отбор.

Ex. 12.9. Answer the questions about the text.

1. How does the East Coast Fever begin and advance?
2. What causes the disease?
3. What damage does the disease do?
4. Why aren't high yielding European cows bred in Africa?
5. What is the difference between European breeds of cows and their African kin?
6. What measures are there to prevent the disease? Why aren't they taken?
7. What do African farmers do as a result?
8. What discovery was made by veterinary scientists?
9. What solution may this finding offer?
10. How did the discovery come about? When?
11. How many animals under the trial were not vaccinated? How many of them survived? Why?
12. What is apoptosis? What role does it play?
13. What animals were examined in the current study? How many of them died?
14. How many cows of those without the specific genetic element died?
15. What effect might the specific genetic element have on the cows' tolerance to the East Coast Fever?
16. What can the discovery lead to?
17. Are gene-editing techniques used in agriculture?
18. What do American gene-edited cattle look like? Why?
19. What livestock is being designed by the International Livestock Research Institute and Roslin Institute?
20. What effect can gene-edited European livestock have in Africa?
21. Why do some researchers think the benefits of introducing gene-edited European livestock in Africa are overstated?
22. What might African farmers do to be better off?

Ex. 12.10. Match the halves of the sentences.

1. In African countries ECF	a) apoptosis.
2. Protozoan parasites are	b) is rampant.
3. Ticks can be attacked	c) offer a solution.
4. New research may	d) regulate cell numbers.
5. There is gene variant associated with	e) resistance to ECF.
6. The variant's discovery came about	f) serendipitously.
7. Programmed cellular suicide is called	g) spread by ticks.
8. Apoptosis helps	h) with sprayed pesticides.

ACTIVE VOCABULARY

Ex. 13.1. Read the words, expressions and sentences, translate them.

to swap (to / for) [swɔp] – обменивать, поменять; сменить (что на что), переключиться на; *swapping the meat and dairy products for insect meal and laboratory-grown produce*; *swapping to a vegan diet*

The team found that swapping to a vegan diet would cut greenhouse emissions by 83 per cent.

to switch to – переходить на, переключиться на

Researchers have studied the potential effects of switching to "novel and future foods".

cultured [ˈkʌltʃəd] – культивированный, искусственный; *cultured meat*, *cultured milk*; *cf.* **lab-grown meat** – мясо, выращенное в лаборатории

impact [ˈɪmpækt] – влияние, воздействие, *huge environmental impact,* **to have an impact** – оказывать воздействие; **to lessen an impact** – уменьшить воздействие

Food production has huge environmental impacts. We're doing everything we can to lessen the impact on the environment

land clearance – операции по расчистке земель

life-cycle assessment – оценка жизненного цикла, анализ воздействия в течение всего жизненного цикла

cell – клетка (организма); **fungal cell** – клетка гриба, *meat grown from fungal cells*

assumption [əˈsʌmpʃ(ə)n] – предположение, **to make an assumption** – высказать / выдвинуть предположение

The study makes a huge number of very optimistic assumptions.

to apply to – распространяться на, относиться к

Even if the analyses of the "future foods" currently produced in small quantities are correct, the analyses might not *apply to* mass-produced versions.

kelp [kelp] – бурая водоросль, ламинария

alga spirulina [ˈælgə spairəˈlinə] – водоросль спирулина

policy implications – практические выводы, выводы для экономической политики; **to have policy implications** – иметь (политические) последствия (для политики)

Science Plan will have policy implications. These decisions have far-reaching policy implications.

Ex. 13.2. Fill in the table with the missing verb forms.

	V1	**V2**	**V3**	**Meaning**
1		consumed		
2	suggest			
3			driven	
4	assess			
5		convinced		
6	assume			предполагать
7		ate		есть
8			resembled	
9		reduced		
10	calculate			

Ex. 13.3. Complete the sentences with the right form of the verb from the table in Ex. 13.2.

1. Research s_____ they should not be so confident.
2. We need to rethink the way we c_____ energy.
3. There's quite a lot of people that are e_____ insects.
4. She forced herself to hold on and a_____ the situation logically.
5. The wind is d_____ the clouds.
6. I can only a_____ that it was a mistake.
7. He had finally c_____ several customers of the advantages of his product.
8. He programmed the computer to c_____ his monthly expenses and earnings.
9. The police took steps to r_____ crime.
10. He strongly r_____ his father in appearance and in temperament.

Ex. 13.4. Memorise the following phrasal verbs, and then translate the sentences below.

to opt for – делать выбор в пользу, остановить свой выбор на, выбирать, отдать предпочтение, склониться к
to save on – экономить на чем
to come about – состояться, случиться, произойти
to play out – получаться, срабатывать
to force smth on smb – навязывать (что кому), принуждать
to make up – составлять
to carry out – производить, осуществлять, приводить в исполнение

1. Meat and dairy products *make up* a typical European diet. 2. Research *was carried out* into how environmental principles can be integrated into

agricultural research. 3. I *opted for* a nutritious snack and bought an apple instead of a candy bar. 4. Can't wait to see how it all *plays out*. 5. During the late winter, she and her children went to bed before 7 p.m. *to save on* heat. 6. I understand exactly how it *has* all *come about*. 7. *Don't force* ads *on* end users.

Ex. 13.5. Translate the following word combinations.

A 1) Insect meal, 2) greenhouse gases, greenhouse gas emissions, 3) water use, land use, 4) land clearance (for farms), 5) a key cause, 6) biodiversity loss, 7) production technology, 8) global warming potential, 9) policy implications, 10) food production;

B 1) laboratory-grown pr**o**duce, lab-grown meat, 2) food-related greenhouse gases, 3) cultured meat, cultured milk, 4) huge environmental impacts, 5) pretty significant reductions, 6) a typical European diet, optimised diet, a vegan diet, current diet, 7) immense policy implications, 8) voluntary changes, 9) optimistic assumptions, 10) potential effects / benefits; 11) widely available products;

C 1) as well as, 2) compared with, 3) rather than, 4) produce on a small scale, 5) produce in small quantities, 6) such as.

READING

Ex. 13.6. Look through the article and say what British academics think about the study conducted by researchers from Finland.

Insects and Lab-grown Meat
Could Reduce Food Emissions by 80 Per cent

Michael Le Page

1 *Swapping* the meat and dairy products that make up a typical European diet for insect meal and laboratory-grown produce could cut food-related greenhouse gases, as well as water and land use, by over 80 per cent, a study suggests. Food production has *huge environmental impacts*, driving more than a third of all greenhouse gas emissions. *Land clearance* for farms is also a key cause of biodiversity loss.

2 To assess ways *to lessen this impact*, Rachel Mazac at the University of Helsinki[1] in Finland and her colleagues have studied the potential effects of switching to "novel and future foods".

3 "What we are looking at are foods that are novel in their production technology, like *cultured meat* or *cultured milk*," says Mazac. She is part of a group at the University of Helsinki that has been doing *life-cycle assessments* of the *environmental impacts* of such foods.

4 Her team used the analyses to calculate the potential benefits of *switching to* these foods, assuming people are willing to do so, compared with foods that are typically consumed in Europe.

5 The results suggest that an "optimised diet" of novel foods could cut greenhouse emissions by 83 per cent, water use by 84 per cent and land use by 87 per cent (Nature Food[2], doi[3].org/hrh8).

6 "We are seeing some pretty significant *reductions in impacts*," says Mazac.

7 The team also found that *swapping to* a vegan diet would cut greenhouse emissions by 84 per cent, water use by 82 per cent and land use by 80 per cent.

8 *Opting for* lab-grown meat, rather than a vegan diet, could allow many people to eat foods that more closely resemble their current diet. "It would be a way for someone to consume their fast-food burger, but *save on* land use and water use and global warming potential," says Mazac.

9 Some of these products are already widely available, such as Quorn[4], *grown from fungal cells*. Others, such as *lab-grown meat*, are only produced on a small scale. The team's analysis also included some foods not widely eaten in Europe, such as insects, kelp and the alga spirulina.

10 Speaking of the results, Tim Lang at City, University of London[5], says: "It's almost too good to be true." If the findings are correct, the research has immense policy implications, he says. But Lang thinks the environmental benefits won't *come about* through consumers making voluntary changes to their diet. They will only *play out* if governments and companies essentially *force* these foods *on* people, he says.

11 Not everyone is convinced by how the research was *carried out*. "[The study] makes a huge number of very optimistic *assumptions*," says Erik Millstone at the University of Sussex[6], UK. Even if the analyses of the "future foods" currently produced in small quantities are correct, the analyses might not *apply to* mass-produced versions, he says.

(Source: New Scientist | 30 April 2022)

NOTES

[1] **University of Helsinki** – Хельсинкский университет, старейший и крупнейший университет в Финляндии

³ **doi** = Digital Object Identifier – идентификатор цифрового объекта, используется в ссылках на электронные книги.

⁴ **Quorn** [kwɔːn] – Кворн, заменитель мяса

⁵ **City, University of London** – Лондонский университет

⁶ **University of Sussex** – Суссекский университет, Великобритания

READING AND VOCABULARY COMPREHENSION

Ex. 13.7. Say whether the statements below are TRUE or FALSE.

1. A typical European diet is made up of insect meal and algae.
2. Food production has a great effect on the environment.
3. Finnish scientists have studied the ways to lessen the environmental impacts of food production.
4. Novel foods include insect meal, cultured milk and lab-grown meat.
5. The team of researchers from Finland analysed the potential benefits of foods that are typically consumed in Europe.
6. According to the research done, new food production technology could cut greenhouse emissions as well as water and land use.
7. Swapping to a vegan diet would also contribute to cutting greenhouse emissions.
8. Quorn is a novel laboratory-grown food product which is already widely available.
9. A British scientist from London thinks that many people will be willing to switch to the novel foods.
10. A researcher from the University of Sussex doubts the optimistic assumptions of his colleagues from Finland.

Ex. 13.8. Answer the questions about the text.

1. According to the article, what should a typical European diet be swapped for?
2. Why is switching to an "optimized diet" necessary?
3. What did Finnish researchers study?
4. What did they calculate?
5. What do their results suggest?
6. What else did the team find?
7. Why is opting for lab-grown meat, in their opinion, better than choosing a vegan diet?

8. What novel foods were included into the analysis?

9. What does Tim Lang think of the results?

10. Why is he dubious about the environmental benefits of switching to novel foods?

11. What are the weak points of the analysis in question, in Erik Millstone's opinion?

Ex. 13.9. Complete the sentences with the correct form of the words.

1. to consume / consumer / consumption / consumable

a) China is now the world's second-biggest oil _____, taking more barrels per day than India and Japan combined. b) Human and financial resources were often far removed from those who _____ and produced them. c) _____ materials, such as paper and erasers, are not included in the repossession order. d) Tourism is often associated with high energy _____ . e) The meat was declared unfit for human _____.

2. to assume / assumption

a) It is wrong _____ that technological advance brings a higher quality of life. b) Many astronomers _____ that the universe expands infinitely. c) Many scientific _____ about Mars were wrong. d) It is always better to ask questions than to make an _____ .

3. to imply / implication

a) War _____ fighting and death. b) The _____ for industry are obvious. c) High profits do not necessarily _____ efficiency. d) Think very carefully of all the _____ , before you make your decision.

4. to assess / assessment

a) She made a careful _____ of the situation. b) The facts are still emerging here, so we'll continue to monitor and _____ them. c) We need _____ whether or not the system is working.

5. to reduce / reduction / reduced

a) The workforce has been _____ by half. b) _____ spending is our best weapon against inflation. c) Urban poultry farming is a great way _____ our carbon footprint. d) The most immediate effect of retirement is a dramatic _____ in living standards.

UNIT 14
PROBIOTIC BERRIES

ACTIVE VOCABULARY

Ex. 14.1. Read the words, expressions and sentences, translate them.

blackcurrant ['blæk'kʌrənt] – черная смородина, *black currant bushes*, *blackcurrant fields*, *black currant farmers*

judicious [dʒu:'dɪʃəs] – разумный, целесообразный; *judicious use of probiotics*

Judicious use of natural resources was needed for the long-term stability of the agricultural sector.

gut flora – кишечная флора, микрофлора кишечника; *to restore the gut flora*, *to improve gut flora in people*

to dissolve [dɪ'zɒlv] – растворять

Bacteria help plants dissolve minerals found in the soil.

shoots – побеги

bud [bʌd] – бутон, почка

to flower – цвести (о бутоне)

to enhance – повышать, усиливать, увеличивать; *to enhance production of certain antioxidants*, *to enhance the chemical composition of the berries*, *the yield-enhancing bacteria*, *enhanced berry growth*; *syn.* **to boost** – повышать, *to boost yields, to boost the yield of black currant bushes*

to expose (**to**) [ɪk'spəʊz] – подвергать воздействию (чего-л.); **exposure** [ɪk'spəʊʒə] – подвергание (внешнему) воздействию, воздействие; *to increase production of strawberries and raspberries by exposing plants to a carefully selected mix of bacteria*, *exposure to a probiotic mixture*

Exposure to probiotic mixtures allowed blackcurrant growth to be enhanced.

to treat – обрабатывать (чем-либо), **treatment** ['tri:tmənt] – обработка (чем-либо); *different probiotic treatments*

Four blackcurrant fields were exposed to different probiotic treatments.

to spray – опрыскивать; *to spray a field with a mix of bacteria / with a mix of organic fertilisers and bacteria / with water*

demand [dɪ'mɑ:nd] – требование, спрос на (что), **to be in high demand from** (smb) – пользоваться большим спросом (у кого), **to meet demand** – удовлетворить спрос

The right mix of bacteria can help black currant farmers meet demand without using chemicals.

to keep off – отгонять, держать(ся) в отдалении, не подпускать; *antibiotics keep disease-causing microbes off the leaves*

All day he walked, keeping off the road where that was possible.

Ex. 14.2. Practise reading the following international words.

probiotics [ˌprəʊbaɪ'ɒtɪks] – пробиотик

bacteria [bæk'tɪ(ə)rɪə] – бактерии (*pl* от 'bacterium'); *a carefully selected mix of bacteria*, *yield-enhancing bacteria*

antibiotic ['æntɪbaɪ'ɒtɪk] – антибиотик

microbe ['maɪkrəʊb, 'maɪkroʊb] – микроб, бактерия, микроорганизм; *disease-causing microbes*

nitrogen ['naɪtrədʒən] – азот

antioxidant ['æntɪ'ɔksɪd(ə)nt] – антиоксидант

anthocyanin [ænθə'saɪənin] – антоциан

flavonoid [ˈfleɪvənɔɪd, ˈflæv.ə.nɔɪd] – флавоноид / флавонид

chemical ['kemɪk(ə)l] – химикат, химический препарат

Ex. 14.3. Fill in the table with the missing verb forms.

	V1	**V2**	**V3**	**Meaning**
1		sought		искать, стремиться
2	boost			
3			changed	
4		kept		
5	set up			поставить (опыт)
6		measure		
7			struggled	
8	weigh			весить; взвешивать
9	improve			
10		produced		

Ex. 14.4. Complete the sentences with the right form of the verb from the table in Ex. 14.3.

1. The researcher _____ experiments to test the hypothesis.
2. The tax cut will _____ the economy.
3. We read to _____ our vocabularies.
4. For over 100 years, men have _____ for gold in these hills.
5. 'I'm _____ off the main roads – they're too dangerous.
6. We can _____ the energy that food provides in calories.
7. We _____ more cars than we can sell.

8. Whether he agrees or not, we won't _____ our plans.

9. He _____ some potatoes on the scales.

10. Millions of people are _____ for survival.

Ex. 14.5. Translate the following expressions.

1) Berries, freshly picked berries, strawberries, raspberries, enhanced berry-growth, 2) pesticide-free juices, 3) gut flora, 4) disease-causing microbes, 5) minerals found in the soil, 6) antioxidant activity, 7) probiotic mixture, 8) the control level, the control plot, 9) the right mix of bacteria, 10) probiotic treatment, 11) nutrient content, 12) the same number.

Ex. 14.6. Match the English phrases with their Russian equivalents, then translate the sentences below.

1) among other things	a) в общей сложности, с учетом всего
2) as they report in…	b) за счет (чего)
3) at a cost of	c) зная все это
4) to this end	d) как сообщают в…
5) all told	e) произвольно
6) on one's own	f) с этой целью, для достижения этого
7) at random	g) самостоятельно, само по себе
8) knowing all this	h) среди прочего

1. *Among other things*, bacteria help plants produce antibiotics that keep disease-causing microbes off their leaves. 2. *Knowing all this*, they decided to use probiotics to boost the yield of black currant bushes. 3. *As they report in* the journal, the results were impressive. 4. A thousand black currants were collected *at random* from the control plot and weighed. 5. The researchers thought that enhanced berry growth might be coming *at a cost of* less antioxidant. 6. *To this end*, they decided to set up an experiment. 7. *All told*, the researchers are convinced that the right mix of bacteria can help black currant farmers meet demand without using chemicals. 8. They conducted the research *on their own*. Exposure to either of the probiotic mixtures *on their own* did significantly lower black currant antioxidant activity from the control level.

READING

Ex. 14.7. Read the article and find the information about the experiment carried out by the Lithuanian researchers to fill in the table.

Fields	Size	Sprayed with	Purpose
1st field			to improve growth and yield
2nd field		a mix of organic fertilisers and bacteria	
3rd field	1 hectar		
4th field			

Probiotic Berries

Growing better blackcurrants with the help of bacteria

1 Few fruits carry more health-promoting antioxidants than *blackcurrants*. Widely grown in cooler parts of Europe, they *are in high demand from consumers* seeking pesticide-free juices made from the berries. Farmers, though, can struggle *to boost yields* without relying on chemicals. That could change, not just for *blackcurrants* but other fruit too, with the *judicious use of probiotics.*

2 Probiotics is mostly known for its use of microorganisms, including certain bacteria, *to restore* or *improve the gut flora in people* and animals. But plants can benefit from a collaborative arrangement with bacteria too. Among other things, bacteria help plants produce antibiotics that keep disease-causing microbes off their leaves, support them in collecting nitrogen from the environment and help them *dissolve* minerals found in the soil.

3 Knowing all this , Virgilija Gaveliene and Sigita Jurkoniene, of the Institute of Botany Nature Research Centre[1] in Lithuania[2], set out to find a way to use probiotics *to boost the yield of black currant bushes*, which are grown in that country . The researchers also knew from other work that the production of strawberries and raspberries could be increased by *exposing* plants to a carefully selected mix of bacteria from families like *Bacillus*, *Acinetobacter* and *Pseduomona*. And they were aware of preliminary evidence that probiotics had the potential *to enhance production of certain antioxidants*, like anthocyanins and flavonoids.

4 Working with colleagues, they set up an experiment. Four *blackcurrant fields*, each one hectare in size, were exposed to *different probiotic treatments*. These were applied first when *shoots* were just starting to grow and then again as *buds* were beginning to flower. One field *was sprayed*

with a mix of bacteria that the team suspected would improve growth and yield. Another field *was sprayed with a mix of organic fertilisers and bacteria* that the researchers expected would *enhance* the chemical composition of the berries and improve their nutrient content. The third field was sprayed with both mixtures while the fourth was left as a control and *sprayed* only *with water*. After the harvest, the team measured the biomass of the freshly picked berries and studied their chemistry.

5 As they report in *Agricultural Science and Technology*[3], the results were impressive. While a thousand *black currants* collected at random from the control plot weighed just over 538 grams, the same number from the field *exposed* to both *treatments* weighed nearly 783 grams. A similar increase was also true for the field *sprayed with the yield-enhancing bacteria*.

6 The team were, however, concerned that *enhanced berry growth* might be coming at a cost of less antioxidant. To this end, their analysis showed that *exposure to* either of the probiotic mixtures on their own did significantly lower black currant antioxidant activity from the control level of 73% to 65% and 60%. Only *exposure to* both probiotic mixtures allowed black-currant growth *to be enhanced* while maintaining a statistically identical level of antioxidant activity of 72.7%

7 All told, Drs Jurkoniene and Gaveliene are convinced that the right mix of bacteria can help black currant farmers *meet demand* without using chemicals. And it could help other growers. What works for berries should, in theory, work for other fruit, like apples, pears and oranges. More experiments are needed to be sure.

(Source: The Economist | November 13th 2021)

NOTES

[1] **Institute of Botany Nature Research Centre** – Научно-исследовательский центр природы Института ботаники (в Литве)

[2] **Lithuania** [ˌlɪθjʊˈeɪnɪə] – Литва

[3] *Agricultural Science and Technology* – международный научный журнал по сельскохозяйственным и технологическим наукам, издается на английском языке

READING AND VOCABULARY COMPREHENSION

Ex. 14.8. Find in the article English equivalents of the following Russian words and word combinations.

1) Полезные для здоровья антиоксиданты, 2) пользуются большим спросом со стороны потребителей, 3) прикладывают большие усилия для того, чтобы повысить урожаи, 4) рациональное использование пробиотиков, 5) кишечная флора у людей и животных, 6) извлечь пользу из, 7) совместная деятельность, 8) болезнетворные микробы, 9) растворять минералы, 10) решили найти способ, 11) тщательно подобранная смесь бактерий, 12) предварительные данные / результаты, 13) увеличить производство, 14) провести эксперимент, 15) различные обработки пробиотиком, 16) улучшить химический состав ягод, 17) такое же количество (ягод), 18) бактерии, повышающие урожайность, 19) обработка.

Ex. 14.9. Answer the questions about the text.

1. Where are black currants grown?
2. Why are these berries in high demand from consumers?
3. What problem can farmers face while growing black currants?
4. How can farmers grow pesticide-free berries?
5. What are probiotics usually used for?
6. How can plants benefit from the use of probiotics?
7. What idea did the researchers from Lithuania come up with? Why?
8. What experiment did they set up?
9. How many times were black currants treated with probiotics?
10. When was probiotic treatment applied?
11. Were the fields exposed to one and the same probiotic treatment?
12. What were the blackcurrant fields sprayed with? Why?
13. What did the researchers do after the harvest?
14. What results did the scientists obtain?
15. Did exposure to the probiotic mixtures lower black currant antioxidant activity?
16. What conclusion have the researchers made?

Ex. 14.10. Insert the right preposition. Consult the text if necessary.

1. Do not *rely* _____ past experience – processes change. 2. The newspaper was *known* _____ its investigative reports on crime and government corruption. 3. Companies should always *be aware* _____ changes to labour legislation. 4. African countries *will benefit* _____ those initiatives. 5. Were the plants *sprayed* _____ any chemicals prior to harvesting or processing? 6. Large numbers of people are *exposed* _____ toxic chemicals and hazardous wastes.

UNIT 15
COW TOILET TRAINING

ACTIVE VOCABULARY

Ex. 15.1. Read the words, expressions and sentences, translate them.

calf [kɑːf] – теленок (*pl* calves)

to master [ˈmɑːstə] – научиться, освоить, овладеть,

to train [treɪn] – приучать, тренировать; *to train cows to use the toilet*, *to help cows master toilet training*, *training process, toilet trained cows*

Building toilets and training animals costs time and money. Of the 16 calves enrolled in the training process, 11 were considered successfully toilet trained by the end of it.

to account for – составлять, на…приходится

In the European Union, livestock farming accounts for around 70% of ammonia emissions.

bladder [ˈblædə] – мочевой пузырь

urea [ˈju(ə)riə] – мочевина

urine [ju(ə)rin] – моча, **urination** [ju(ə)riˈneɪʃ(ə)n] – мочеиспускание

to convert [kɔnˈvɜːt] – превратить; *urea is converted into ammonia*, Bacteria in the soil convert that ammonia into nitrous oxide.

to treat [triːt] – обрабатывать

conundrum [kəˈnʌndrəm] – трудный вопрос, загадка; *to solve the conundrum*

to override reflexes – подавить рефлексы

to persuade [pəˈsweɪd] – убеждать, убедить

to relieve [rɪˈliːv] – облегчать, **to relieve oneself** – справлять естественные надобности, помочиться, справить малую нужду, облегчить мочевой пузырь

latrine [ləˈtriːn] – уборная, отхожее место, сортир, нужник; *to establish the latrine*, *selection of a latrine, an alley outside the latrine*

Free roaming cows were persuaded to voluntarily relieve themselves in a latrine. Urinations in the latrine were rewarded.

loo [luː] – сортир, туалет

pee [piː] – (*разг.*) моча; **to pee** – испускать мочу, мочиться

molasses [məˈlæsɪz] – меласса, свекловичная (кормовая) патока

Calves were confined to a latrine and rewarded with molasses or crushed barley after peeing in it.

Ex. 15.2. Practise reading the following international words.

climate ['klaɪmɪt] – климат, *climate change*
nitrogen ['naɪtrədʒən] – азот
nitrous oxide ['naitrəs 'ɔksaɪd] – оксид азота
enzyme ['enzaɪm] – энзим, фермент
faeces ['fi:si:z] – экскременты, фекалии, кал
ammonia [ə'məʊnɪə] – аммоний, аммиак
bacteria [bæk'tɪ(ə)rɪə] – бактерии (*pl* от *bacterium*)
anaesthetic ['ænɪs'θetɪk] – анестетик, обезболивающее средство

Ex. 15.3. Fill in the table with the missing verb forms.

	V1	V2	V3	Meaning
1		fought		
2	contain			
3			broken	
4	confine			ограничивать
5	override			подавлять (рефлексы)
6		rewarded		
7	punish			
8			allowed	
9		relieved		
10	enroll			записать (ся), отбирать

Ex. 15.4. Complete the sentences with the right form of the verb from the table in Ex. 15.3.

1. We _____ him for finding our lost dog.
2. Bacteria are added to help _____ down the sewage.
3. The British troops _____ bravely, but were unable to stop the Germans.
4. The brain may _____ the reflex to move your hand from a hot plate if there is food on the plate that you don't want to drop.
5. The article _____ information on how to plan your experiment.
6. Doctors are trying to _____ the disease within the city.
7. In some societies, theft is _____ by death.
8. A foreign language is a great option for developing and gaining new skills, so you can _____ in courses.
9. You drag me out of prison with a full bladder, and now I have to _____ myself downwind of cattle – nice.
10. They don't _____ people to smoke in this hotel.

Ex. 15.5. Translate the following expressions.

A 1) Human children, 2) potent greenhouse gas, 3) free roaming cows, 4) tricky business, 5) excretory reflexes, 6) intentional relaxation, 7) crushed barley, 8) fairly intelligent animals, 9) longer lasting lessons, 10) errant animals, 11) the next step, 12) working farm.

B 1) Cow urine, 2) cow faeces, 3) cow pee, 4) ammonia emissions, 5) bladder fullness, 6) nitrogen rich compound, 7) three stage process, 8) success rate, 9) water sprayer, 10) sample size, 11) livestock farming.

Ex. 15.6. Match the English words with their Russian equivalents, and then complete the sentences with the right word.

1) in turn	a) в конце концов, наконец
2) therefore	b) в свою очередь
3) nevertheless	c) ведь, после всего, в конце концов
4) finally	d) затем, далее
5) after all	e) поэтому, следовательно
6) next	f) тем не менее, все-таки

1. Such marriages _____ occurred quite frequently.
2. Different diseases can cause shrivelling of tubers which _____ leads to a loss of seed vigour.
3. _____ , skepticism is a healthy element of science.
4. What comes _____?
5. After a few seconds, she _____ responded.
6. Their car was bigger and _____ more comfortable.

READING

Ex. 15.7. Look through the article and answer the questions below.

What experiments did German researchers carry out? Why?
Do you think such experiments are worth spending money on?

How to Toilet Train Your Cow

Another way to fight climate change

1 Puppies can be taught. So can human children, though not for the first couple of years. Now, in the hope of fighting climate change, Dr Jan Lang-

bein, of <u>the Fredrich-Loweffler-Institut</u>[1] in Germany, and his colleagues hope they can *train cows to use the toilet*, too.

2 Cow urine contains *urea*, a nitrogen rich compound that, when broken down by enzymes in cow faeces, *is converted into ammonia*. Bacteria in the soil, in turn, *convert* that ammonia into nitrous oxide. Best known as a dental anaesthetic, the **stuff** is also a potent greenhouse gas. And agriculture is a big source of **it**. In the European Union, livestock farming accounts for around 70% of ammonia emissions.

3 Collecting and *treating* cow pee before the ammonia can be produced might, therefore, seem like a good idea. But it has proved difficult in the past without confining the cows to small areas, which is bad for their welfare. As Dr Langbein describes in <u>Current Biology</u>[2], this *conundrum* could be solved if free roaming cows could be persuaded to voluntarily relieve themselves in a *latrine*.

4 But going to the *loo* is a tricky business, says Dr Langbein. It requires awareness of bladder fullness, self-control to override excretory reflexes, selection of *a latrine* , and intentional relaxation of the muscles which control the flow of urine. Nevertheless, he has developed a three stage process to help cows master *toilet training*.

5 The first job was to establish the *latrine* as the correct place to conduct business . Calves were confined to a *latrine* and rewarded with *molasses* or crushed barley after *peeing* in **it**. Next, they were given the freedom to roam around an alley outside *the latrine*. Urinations in *the latrine* were rewarded; **those** in the alley were gently punished with a spray of water. Finally, the alley that led to *the latrine* was extended, to allow the animals to practise self-control for longer, and over a greater distance.

6 Cows are fairly intelligent animals, and the lessons proved quite effective. Of the 16 calves enrolled in the *training process*, 11 were considered successfully *toilet trained* by the end of **it**. Their overall performance, say the researchers, was roughly comparable to **that** of human children. The animals managed *to pee* in *the latrine* around 77% of the time.

7 Dr Langbein is optimistic that his methods can be improved further. One step would be to extend the principle to faeces, which also contains nitrogen, and is another source of nitrous oxide. The effectiveness of the *training* could be boosted too, perhaps with longer lasting lessons, or by making adjustments to rewards and punishments. He notes that the success rate increased after repositioning the water sprayer used to punish errant animals. Four out of eight calves were successfully trained before it was moved, compared with seven out of eight afterwards – though the small

sample size means this difference is not statistically significant. More research, as always, is required.

8 The next step, says Dr Langbein, is to see if cattle on a working farm can be similarly *trained*. Whether farmers will be keen is another question. Building toilets and *training* animals costs time and money, after all. But when it comes to climate change, every little helps.

(Source: The Economist | September 18th 2021)

NOTES

[1] **Fredrich-Loweffler-Institut** – Федеральный институт охраны здоровья животных Германии. Институт был основан в 1910 г. и назван в честь своего основателя Фридриха Леффлера в 1952 г.

[2] **Current Biology** – британский научный журнал, посвященный проблемам различных областей биологии

READING AND VOCABULARY COMPREHENSION

Ex. 15.8. Find in the article English equivalents of the following Russian words and word combinations.

1) Изменение климата, 2) соединение, богатое азотом, 3) стоматологическое обезболивающее средство, 4) оказалось сложным, 5) непростое дело, 6) наполненность мочевого пузыря, 7) выделительные рефлексы, 8) намеренное расслабление мускулов, 9) подходящее место, 10) уроки оказались весьма эффективными, 11) общий результат деятельности, 12) источник оксида азота, 13) доля успешных попыток / показатель эффективности, 14) разбрызгиватель воды / поливочная машина, 15) животные, отбившиеся от стада, 16) статистически значимый / достоверный, 17) другой вопрос, 18) любая малость пригодится.

Ex. 15.9. What do these words in the article refer to?

Paragraph 2:	the stuff	'…the stuff is also…'
	it	'…a big source of it.'
Paragraph 5:	it	'…after peeing in it…'
	those	'…those in the alley were punished'
Paragraph 6:	it	'…by the end of it'
	that	'comparable to that of human children'

15.10. Answer the questions about the text.

1. What did researchers from Germany decide to teach cows? Why?

2. What makes cow urine so 'dangerous' for the environment?

3. What is livestock farming in the European Union blamed for?

4. What brilliant idea did German academics come up with?

5. Why has it proved difficult to collect and treat cow pee in the past?

6. How could this conundrum be solved with free roaming cows?

7. Why is going to the loo a tricky business for cows?

8. What should cows be aware of in order to go to the loo? What skills does going to the loo require?

9. How were cows mastering toilet training? How many stages did the teaching process consist of?

10. What was done in the first stage?

11. How were cows accustomed to the latrine in the second stage?

12. What changes in the teaching process were made in the 3rd stage?

13. Did the researchers succeed in their experiment? What results did they obtain in the end?

14. What are Dr Langbein's plans for the future?

15. Why is more research required?

16. Are the researchers going to build latrines for cows on working farms?

17. What do you think of this project? Should it be given **the Nobel** or **the Ig Nobel Prize**? To find out what **the Ig Nobel Prize** is do the following exercise.

Ex. 15.11. Read the article. Then, answer the questions.

1. What animals did Mr Shafik use for his research?

2. Who did the winners of the psychology [saɪˈkɔlədʒɪ] prize talk to as part of their research?

3. What common object did the winners of the medicine prize use for their research?

4. Which company won the chemistry prize?

5. What animals has Charles Foster lived as in the wild?

6. Why did Thomas Thwaites appear to get worried once during his time as a goat?

UNUSUAL SCIENCE PRIZES: THE IG NOBELS!

What's it like to live like a goat? Do cotton trousers affect the sex lives of rats? Can rocks have personalities? The scientists who did research into all these questions were awarded <u>Ig Nobel prizes</u>[1].

Ig Nobels are awards for unusual scientific research – the kind of research that makes you laugh, then makes you think. The ceremony for the prizes is organised by science magazine <u>The Annals of Improbable Research</u>[2], and takes place every year at <u>Harvard University</u>[3]. Here are some of this year's winners.

The Reproduction Prize went to the late Ahmed Shafik for testing the effects of polyester, cotton or wool trousers on the sex life of rats.

Mark Avis and colleagues were awarded the Economics Prize for assessing the personalities of rocks, from a sales and marketing perspective.

The Psychology Prize went to Evelyne Debey and colleagues for asking a thousand liars how often they lie, and then deciding whether to believe those answers or not.

This year's Perception Prize was awarded to Atsuki Higashiyama and Kohei Adachi for investigating whether things look different when you bend over and view them between your legs.

Christoph Helmchen and colleagues were given the Medicine Prize for discovering that if you have an itch on the left side of your body, you can relieve it by looking into a mirror and scratchin**g** the right side of your body (and vice versa).

This year's Chemistry Prize was given to Volkswagen. They solved the problem of excessive automobile pollution emissions. They did this by electromechanically producing fewer emissions whenever the cars were being tested.

And finally, the Biology Prize was awarded jointly to Charles Foster and Thomas Thwaites for trying to experience life from an animal's perspective. Charles has lived in the wild as a variety of animals including a deer, a fox and a bird; Thomas spent three days in the Alps as a mountain goat, complete with a special set of goat legs. In an interview with the BBC, he said that he'd developed a strong bond with one animal in particular – a "goat buddy", but also very nearly got into a fight. "I was just sort of walking around, you know chewing grass, and just looked up and then suddenly realized that everyone else had stopped chewing and there was this tension which I hadn't kind of noticed before, and then one or two of the goats started tossing their horns around and I think I was about to get in a fight."

How unusual!

NOTES

[1] **IgNobel Prize** – Шнобелевская премия. The name of the competition (The Ig Nobels) forms an expression that sounds like the English word "**ig-**

noble" /низкий, постыдный, простонародный/, which is basically the opposite of "**noble** " /благородный, великий, славный, доблестный/.

[2] **The Annals of Improbable Research** – "Анналы невероятных исследований", выходящий раз в два месяца журнал, посвященный научному юмору, в форме сатирического взгляда на стандартный академический журнал.

[3] **Harvard University** – Гарвардский университет (Кембридж, штат Массачусетс, США)

Ex. 15.12. Read the texts and for each task 1–7 choose the correct answer 1, 2, 3 or 4.

The Ig Nobel Prize

Most Nobel Prize winners are scientists who have answered important questions about existence or 1) _____ discoveries that have helped 2) _____ the human race. But not all scientists work on curing diseases or discovering life on other planets. There are also those who investigate 3) _____ questions. For instance, a group of UK scientists worked 4) _____ the fact that cows with pet names produce more milk than cows without pet names; and there was a team of Australian mathematicians who studied how many times you have to take a group photograph to make sure 5) _____ has their eyes open. Both of these research projects were awarded not Nobel Prizes, but Ig Nobel Prizes. The Ig Noble Prizes began in 1991 to 6) _____ scientists who first make people laugh and then make them think. Since 1995, they have been presented at a ceremony in Harvard University, USA. 7) _____ the fact that the event is extremely light-hearted, the organisers emphasise that the prizes are intended as genuine acknowledgements of scientific research.

1	1 done	2	found	3 learnt	4	made
2	1 progress	2	proceed	3 improve	4	advance |
3	1 thicker	2	simpler	3 older	4	purer
4	1 out	2	off	3 around	4	towards ;
5	1 someone	2	no one	3 everyone	4	anyone
6	1 praise	2	respect	3 honour	4	credit
7	1 Although	2	Even	3 Despite	4	Though

UNIT 16
SEAWEED-FED LIVESTOCK

ACTIVE VOCABULARY

Ex. 16.1. Read the words, expressions and sentences, translate them.

to burp [bɜːp] – отрыгнуть
to belch [belʧ] – отрыгивать
methane ['miːθeɪn] – метан, *methane belched by cows*, *methane-diminishing effect of seaweeds*; **methanogen** ['meθənəʤen] – метанопродуцирующая бактерия; **methanogenic** [miːˌθænəʊ'dʒɛnɪk] – метаногенный, метанообразующий; *methanogenic bacterial activity*; *antimethanogenic powers of seaweeds*

Methane is a greenhouse gas that has a warming effect 28 times as powerful as carbon dioxide's. Dairy cows belch methane.

alga ['ælgə] (*pl.* **algae** ['ælʤiː]) – водоросль, водоросли

The algae are rich in bromoform ['brəʊməˌfɔːm], a compound which blocks one of the enzymes that methanogens use to create the gas. The essential oil of the Hawaiian alga *Asparagopsis taxiformis* consists of 80% bromoform.

seaweed – морская водоросль, *seaweed-fed beef cattle, seaweedless diets, to cultivate seaweed, to gather seaweed from the wild*

Dairy cows eating a diet containing 1% *Asparagopsis* produce only a third of the methane belched by cows on seaweedless diets. Soon-to-be-published work shows that seaweed-fed beef cattle grew faster than their seaweedless confrères (собратья).

in question – о котором идет речь, рассматриваемый, о котором говорится; *research in question, seaweed in question*

The antimethanogenic powers of *Asparagopsis*, the seaweed in question, were discovered in 2016.

stomach ['stʌmək] – желудок
ruminant ['ruːmɪnənt] – жвачное животное; *methanogenic bacterial activity in ruminants*

Cattle and sheep are ruminants. Stomachs of ruminants are inhabited by microbes.

fare [feə] – пища, *fibrous* ['faɪbrəs] *fare* – волокнистая пища,
host animal – животное-хозяин (паразитирующего организма)
twofer ['tuːfə] – два по цене одного, двойная выгода
safety trials – испытания на безопасность

Ex. 16.2. Practise reading the following international words.

microbe ['maɪkrəʊb] – микроб
molecule ['mɒlɪkjuːl, 'mɑːl-] – молекула, energy-rich molecules
carbon dioxide ['kɑːbəndaɪˈɒksaɪd] – углекислый газ
enzyme ['enzaɪm] – энзим, фермент

Ex. 16.3. Fill in the table with the missing verb forms.

	V1	**V2**	**V3**	**Meaning**
1	graze on			
2		reduced		
3	inhabit			населять
4			transformed	
5		absorbed		
6		tried		
7	require			
8			predicted	
9	add			добавить
10			discovered	

Ex. 16.4. Complete the sentences with the right form of the verb from the table in Ex. 16.3.

1. Tom _____ to forget his love sorrow by playing the piano.
2. The woods are _____ by many wild animals.
3. Syria alleges that sheep mortality increased as a result of _____on contaminated grassland and drinking contaminated water.
4. Tom believed he could actually _____ the future.
5. Many jobs today _____ computer skills.
6. The island was _____ by Captain Cook in I775.
7. The medicine _____ the risk of infection.
8. Plants use their roots _____ moisture from the soil.
9. The prince was _____ into an ugly animal.
10. If the mixture seems dry, _____ water.

Ex. 16.5. Translate the following expressions.

1) Greenhouse gas, greenhouse-gas emissions, greenhouse effect, 2) science agency, 3) growth rate, 4) animal feed, 5) host animal, stock animals, 6) livestock eating seaweed, 7) energy-rich molecules, 8) soon-to-be-

published work, 9) seaweed-fed beef cattle, 10) compound called bromoform, 11) the obvious solution to the problem.

Ex. 16.6. Match the English words with their Russian equivalents, and then complete the sentences with the right word.

1) however	a) а не
2) though	b) более того, кроме того
3) instead	c) в придачу, вдобавок, к тому же
4) since	d) вместо этого
5) furthermore	e) однако
6) according to	f) поскольку
7) rather than	g) согласно (чему), в соответствии с
8) in order to	h) таким образом
9) to boot	i) хотя
10) thus	j) для того, чтобы

1. Plants need light _____ survive. 2. Geoff didn't study law. _____, he decided to become an actor. 3. Computer chess games are getting cheaper all the time; _____, their quality is improving. 4. _____ he is still absent, we should call the police. 5. I chose to learn German _____ French. 6. Prices change _____ demand and supply. 7. _____ it was raining, we went hiking. 8. This is a cheap and simple process. _____, there are dangers. 9. Most of the evidence was destroyed in the fire. _____ it would be almost impossible to prove him guilty. 10. He was now publicly accused of being a Communist, a madman, an egomaniac, and a murderer _____.

READING

Ex. 16.7. Look through the article to find answers to the questions below.

1 What does the word '*do*' (paragraph 1) mean?
2. What does the word '*stuff*' (paragraph 1) mean?
3. What does the word '*one*' (paragraph 6) mean?

Pardon!

HAMILTON[1], NEW ZEALAND
The answer to livestock that burp methane may be seaweed

1 Ancient Greek writings describe livestock eating seaweed, as **do** Icelandic sagas. And sheep on North Ronaldsay[2], in the Orkney Islands of

Scotland, still graze on the **stuff**. But that is now seen as unusual. It may not be in the future, however, as *research conducted in Australia and New Zealand* suggests <u>algavory</u>[3] of this sort may reduce greenhouse-gas emissions from stock animals.

2 The *research in question* is being co-ordinated by <u>CSIRO</u>[4], Australia's main science agency. The project is looking into microbes that inhabit the *stomachs of ruminants* such as cattle and sheep. These bugs transform those animals' *fibrous fare* into energy-rich molecules, some of which the *host animal* is able to absorb and utilise.

3 One energy-rich molecule that is not absorbed, though, is *methane*. Instead, the animals *belch* it into the atmosphere. Which is a problem, because *methane* is a greenhouse gas that has a warming effect 28 times as powerful as carbon dioxide's. Since this loss of *methane* also deprives the host of the energy therein, thus probably reducing its growth rate, controlling *methanogenic bacterial activity* in *ruminants l*ooks like a beneficial *twofer*.

4 The *antimethanogenic powers* of *Asparagopsis*, the *seaweed in question*, were discovered in 2016 and experiments involving it have been going on since then. One of the latest, published in October in the *Journal of Cleaner Production*[5], showed that dairy cows eating a diet containing 1% *Asparagopsis* produce only a third of the *methane belched* by cows on *seaweedless diets*. Since a cow has about the same greenhouse effect as a car, cutting the emissions of even a portion of the world's 1.5bn cattle would bring great benefit. Furthermore, according to Michael Battaglia, who directs CSIRO's agriculture and global change programme, soon-to-be-published work shows that *seaweed-fed beef cattle* grew, as predicted, faster than their *seaweedless confrères*.

5 The *methane-diminishing effect* of *Asparagopsis* is caused by a compound called bromoform, in which the *algae* are rich. Bromoform blocks one of the enzymes that *methanogens* use to create the gas. The obvious solution to the problem might therefore seem to be to add this chemical directly to animal feed. That might work in principle (no one has yet tried), but in practice would require a lot of *safety trials* and, if those came back positive, a change in the regulations. It would also risk a backlash by consumers, who might perceive adding bromoform as adulteration of some sort.

6 The alternative is *to cultivate seaweed*, rather than gathering it from the wild, in order to provide the quantities that will be needed if the idea of adding *Asparagopsis* to feed becomes popular. And New Zealand's government is proposing to do precisely that. It has just made money available for people who hope to develop ways to farm *Asparagopsis*. Exactly how

this will work remains to be seen. But the idea of adding a new crop to the world's agriculture, and a marine **one** to boot, is intriguing.

(Source: The Economist | November 2nd 2019)

NOTES

[1] **Hamilton** [ˈhæmɪlt(ə)n] – г. Гамильтон

[2] **North Ronaldsay** – Норт-Роналдсей, самый северный из Оркнейских островов у северной оконечности Шотландии

[3] **algavory** (the consumption of seaweed) – употребление водорослей в пищу. Слово **algavory** образовано по аналогии со словами **herbivory** (привычка поедать растения), **carnivory** (плотоядность), **omnivory** [ɔmˈnivəri] (всеядность).

[4] **CSIRO** (Commonwealth Scientific and Research Organization) – Государственное объединение научных и прикладных исследований (самая крупная научно-исследовательская организация Австралии, создана в 1949 г.)

[5] **Journal of Cleaner Production** – Британский научный журнал, освещающий междисциплинарные исследования в области более чистого производства; публикуется издательством Elsevier

READING AND VOCABULARY COMPREHENSION

Ex. 16.8. Find in the article English equivalents of the following Russian words and word combinations.

1) Исследования, о которых идет речь, 2) желудки жвачных животных, 3) богатые энергией вещества, 4) лишать (кого) энергии, 5) показатель прироста, 6) приносить большую пользу, 7) очевидное решение проблемы, 8) добавить химическое вещество прямо в корм для животных, 9) в общем и целом / по сути, 10) на практике / на самом деле, 11) исследования по безопасности, 12) если они окажутся положительными, 13) отрицательная реакция со стороны потребителей, 14) подмешивание / фальсификация (продукта), 15) выделить деньги, 16) пока еще неясно / предстоит увидеть.

Ex. 16.9. Answer the questions about the text.

1. What unusual feed for sheep is discussed in paragraph 1?
2. What is the benefit of sheep eating that stuff for modern agriculture?
3. Where is research on this subject conducted?
4. What problem in particular is the research project looking into? Why?

5. What do cows belch into the atmosphere? Why is it bad both for cows and for the environment?

6. Why do scientists got interested in the seaweed *Asparagopsis*? What useful properties does the seaweed have?

8. How long have the experiments with the seaweed in question been going on?

9. What findings were published in the *Journal of Cleaner Production*?

10. What benefits would feeding cows on seaweed bring?

11. What causes the methane-diminishing effect of *Asparagopsis*?

12. Why hasn't bromoform been added yet directly to the animal feed?

13. What is the alternative to adding bromoform to the animal feed?

14. How is the idea of adding a new crop to the world's agriculture supported in New Zealand?

Ex. 16.10. Match the halves of the sentences.

1. Sheep on the Orkney Islands	a) grow faster.
2. Algavory may reduce	b) fibrous fare into energy-rich molecules.
3. Microbes in the stomach of ruminants transform	c) gathering it from the wild.
4. Cattle belch	d) greenhouse-gas emissions from stock animals.
5. Seaweed-fed beef cattle	e) in bromoform.
6. The algae are rich	f) methane into the atmosphere.
7. The idea of adding *Asparagopsis* to feed	g) still graze on seaweed.
8. Cultivating seaweed is better than	h) may become popular.

Ex. 16.11. Find synonyms in these groups of words.

A 1) to belch, 2) seaweed, 3) to cultivate, 4) to reduce, 5) microbes, 6) feed, 7) cattle, 8) compound

B a) cows, b) to burp, c) to farm, d) to diminish, e) algae, f) fare, g) chemical, h) bugs.

Ex. 16.12. Form sentences from the words.

1. global warming / New Zealand's contribution / Third of / to / ruminant-belched methane/ is.

2. the amount of / Scientists / looking / to reduce / the country's animals / methane / burp up /are /ways / for.

3. reduce / Algavory / greenhouse-gas / may / emissions / stock animals/ from.

UNIT 17
THE FUTURE OF FARMING

ACTIVE VOCABULARY

Ex. 17.1. Read the words, expressions and sentences, translate them.

to catch on – стать популярным, сделаться модным, привиться
The idea of eating insects will never catch on.
to endorse [ɪn'dɔːs] **the idea** – поддержать идею
The United Nations endorsed the idea a decade ago.
waste, waste products – отходы (производства), *waste products of the beer industry, brewery* ['bruː(ə)rɪ] *waste, beer waste* – отходы пивоваренных заводов, *waste from fermentation* ['fɜːmen'teɪʃ(ə)n] *industry* – отходы бродильного производства, *wastewater* – отработанная вода, сточные воды, жидкие отходы, *sugar beet waste*
yeast [jiːst] – дрожжи
to discard ['dɪskɑːd] – выбрасывать, *discarded barley and yeast*
insect – насекомое, *syn* **bug**, *to eat insects, juvenile* ['ʤuːvənaɪl] *insects, insects grown for feed, insects' metabolic performance, to feed the insects to livestock, bug-fed steak*
leftover chicken feed – остатки куриного корма
to rear [rɪə] – разводить, выращивать (животных), *to rear insects on leftover chicken feed, insect-reared meat, insect-reared beef*
to supply [sə'plaɪ] – снабжать, доставлять, **supply** (*n*) – запасы
meal – еда, мука крупного помола; *square meal* – обильная еда, сытный прием пищи, *bone meal* – костная кормовая мука
black soldier fly – черная львинка (кормовая муха *Hermetia illucens*)
weight gain – привес, прирост / увеличение массы (тела)
to exhale [eks'heɪl] – выдыхать
carrion ['kærɪən] – падаль, мертвечина
slaughterhouse ['slɔːtəhaus] – скотобойня
nutrient ['njuːtrɪənt] – питательное вещество, *nutrient recycling by insects*, **nutritious** [njuˈtrɪʃəs, nuˈ-] – питательный

Ex. 17.2. Practise reading the following international words.

carbohydrates [kɔːbə(u)'haidr(e)its] – углеводы
larva ['lɑːvə] – личинка, *pl*. larvae ['lɑːvi] – личинки
carbon dioxide ['kɑːbəndaɪ'ɔksaɪd] – углекислый газ
protein ['prəutiːn] –белок, протеин

Ex. 17.3. Fill in the table with the missing verb forms.

	V1	V2	V3	Meaning
1		caught		
2	remain			
3			fed	кормить
4	eat			
5	grind			молоть
6		divided		
7	assess			
8			confirmed	
9		offered		
10	depend			

Ex. 17.4. Complete the sentences with the right form of the verb from the table in Ex. 17.3.

1. The farmer is _____ up the chickens for Christmas.
2. We need to _____whether or not the system is working.
3. The corn is _____ into meal.
4. Many other questions _____ unanswered.
5. Animals _____ on plant material for food.
6. She ran like mad _____ the bus.
7. A small girl was _____ an ice cream.
8. The book is _____ into 12 lessons.
9. Research has _____ that the risk is higher for women.
10. She _____ us all a cold drink.

Ex. 17.5. Translate the following expressions.

A 1) supermarket shelves, 2) food source, 3) black soldier fly larvae;

B 1) indifferent public, 2) disgusted public, 3) insect-reared meat, 4) bug-fed steak, 5) new sources, 6) rotting fruit, 7) reasonable targets;

C 1) to explore other options, 2) to feed the insects to livestock, 3) to feed insects on waste products of the beer industry, 4) to consume both brewery and chicken feed, 5) to favour rotting fruit, 6) to be rich in protein, to be protein-rich, 7) to be low in carbohydrates, 8) to be deficient in carbohydrates, 9) to be plentiful.

Ex. 17.6. Match the English words with their Russian equivalents, and then complete the sentences with the right word.

1) at least	a) вместо этого
2) instead	b) до сих пор, на текущий момент
3) to date	c) еще предстоит выяснить
4) compared with	d) по крайней мере
5) remains to be seen	e) по сравнению с
6) therefore	f) также
7) likewise	g) хотя
8) though/although	h) поэтому, следовательно

1) I was offered a ride, but I chose to walk _____. 2) The owner of the restaurant is _____ the owner of the deli next door. 3) _____ 30 schools entered the competition. 4) _____ she's almost 40, she still plans to compete. 5) The smartphone is thin and light and _____ very convenient to carry around. 6) _____ , only a small section of the population has access to proper medical care. 7) The long-term effect on the ecology of the planet _____ . 8) _____ other children of the same age, Robert is very tall.

READING

Ex. 17.7. Look through the article and say what it is mainly about:

  a) why there is no demand for insect food
  b) what insects feed on in the wild
  c) how insects influence beer industry
  d) why feeding insects to animals is worth considering

BUG-FED STEAK

Insects could help turn beer waste into beef

1 Eating insects is one of those ideas that never quite seems *to catch on*. The United Nations[1] *endorsed the idea* a decade ago, but, in the West at least, *bugs* remain mostly absent from supermarket shelves. Faced with an indifferent – or disgusted – public, scientists have been exploring other options. **One** is to feed the *insects* instead to livestock, which are not so picky.

2 Of course, the insects need to eat, too. To date, they have mostly been *reared* on *leftover chicken feed*. But the *supply* of **that** is limited, and if *insect-reared meat* is to take off, new sources will be needed. In a paper in

Applied Entomology[2], Niels Eriksen, a biochemist at <u>Aalborg University</u>[3], suggests feeding them on the *waste products of the beer industry*.

3 The world knocks back around 185bn litres of *beer* every year. Each litre produces between three and ten litres of *wastewater* full of *discarded barley and yeast*. The mix is rich in protein but deficient in carbohydrates, especially compared with *chicken feed*. Most *insects grown for feed* depend, in the wild, on the carbohydrates found in rotting fruit. Whether *insects* would actually consider *brewery waste* a *square meal* was, therefore, unclear.

4 The researchers used the larvae of the *black soldier fly*, a workhorse of the "<u>entomoremediation</u>"[4] world. The *juvenile insects* were divided into three groups, which were offered *beer waste*, *chicken feed* or a mixture of both. The researchers monitored both their *weight gain* and the amount of carbon dioxide they *exhaled*, which helped assess the *insects' metabolic performance*.

5 The larvae happily consumed both *brewery waste* and *chicken feed*, and grew equally well on either food source. When Dr Eriksen ground some up and chemically analysed the resulting paste, he found few differences in how *nutritious* the *insects* would be to farm animals. The results confirmed one of Dr Eriksen's hunches. Although *black soldier fly larvae* favour rotting fruit in the wild, they are capable of eating *carrion* too. Like *beer waste*, **it** too is rich in protein and low in carbohydrates.

6 The experiment may have implications beyond the *brewing business*, too. *Bone meal* from *slaughterhouses*, *sugar beet waste* and *waste from other fermentation industries* (such as **those** that produce bioethanol) are all likewise plentiful and protein-rich. All now look to be reasonable targets for *nutrient recycling by insects*. Whether consumers will be willing to eat *insect-reared beef,* though, remains to be seen.

(Source: The Economist |May 20th 2023)

NOTES

[1] **United Nations** – Организация Объединенных наций

[2] **Applied Entomology** – Прикладная энтомология (журнал)

[3] **Aalborg University** – Ольборгский Университет, датский государственный университет с кампусами в Ольборге, Эсбьерге и Копенгагене, основан в 1974 году.

[4] "**entomoremediation**" – combination of two words: **entomo**logy /энтомология/ + **remediation** /ремедиация, восстановление/

READING AND VOCABULARY COMPREHENSION

Ex. 17.8. Find in the article English equivalents of the following Russian words and word combinations.

1) Равнодушная общественность, 2) возмущенная общественность, 3) изучать другие варианты, 4) скармливать насекомых домашнему скоту, 5) если мясо, выращенное на корме из насекомых, будет востребовано, 6) разборчивый / привередливый, 7) заливать в себя/хлестать (алкоголь), 8) смесь, богатая белком, но испытывающая недостаток углеводов, 9) корм для цыплят, 10) гниющие фрукты, 11) метаболические характеристики, 12) источник питания, 13) «рабочая лошадка» (*зд.* наиболее интенсивно используемое для опытов насекомое), 14) полученная паста, 15) догадка / предположение, 16) пивоваренный бизнес, 17) имеются в изобилии, 18) обоснованные цели, 19) иметь последствия не только для пивоваренного бизнеса.

Ex. 17.9. Answer the questions about the text.

1. What idea did the UNO endorse a decade ago?
2. Why are insects absent from supermarket shelves?
3. What have scientists suggested exploring?
4. What problem with feeding insects is there?
5. What idea did a Danish biochemist come up with?
6. Why can waste products of the beer industry become a good food source for insects grown for feed?
7. What made scientists study whether insects grown for feed would like brewery waste?
8. How was the experiment carried out?
9. What parameters did the researchers monitor? Why?
10. What did the academics find out?
11. What did Dr Eriksen chemically analyse? Why?
12. What did the findings confirm?
13. What other food sources for insects grown for feed can be used? What makes them a good alternative for rotting fruit?
14. Will consumers eat insect-reared beef? What conclusion does the author come to?

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