Saving Agriculture

Goals of This Unit

1 To learn about smart agriculture.

2 To share opinions on some new developments in agriculture.

What do you think?

1 What do you usually eat for breakfast?

2 Do you know where the food you eat comes from?

🔊 Listen Up

Pre-listening **Where do vegetables you eat come from?　How are they grown?**
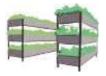
1 **Listen to the conversation between Ken and Beth and answer the questions.**

1 Gist What is the main topic of their conversation?
- ☐ how growing vegetables in a greenhouse can save the environment
- ☐ why protecting traditional ways of farming in the 21st century is important
- ☐ what the advantages and disadvantages to growing vegetables inside buildings are

2 Detail Choose the suitable words for the blanks in the table from the list below, and summarize the discussion.

	Traditional farming	Vertical farming
Where do you grow crops?	in (1)	inside (2) in cities
What is necessary?	a lot of water and (3)	water with nutrients and (4)
Advantages	(3) is free.	You don't have to care about the weather or (5). You can save water. You can save energy for (6).
Disadvantages	It uses more energy for (6).	It uses a lot of energy for light.

sunlight / artificial light / buildings / fields / transportation / natural disasters

3 Detail According to Beth, why might vertical farming not be so good for the environment?
- **a.** It reduces the damage caused by storms.
- **b.** It requires more energy to produce crops.
- **c.** It helps to keep water clean.

4 Detail According to Ken, if you start growing vegetables in cities, you can _____.
- **a.** avoid any transportation costs
- **b.** reduce the energy that you use for transportation
- **c.** increase the amount that you produce

2 **Listen to the conversation again and share your understanding and ideas with your partner.**

Post-listening **Which way of farming is more beneficial to your city?　Discuss.**

💡 Key Words

Here is some vocabulary that appears in the next passage.　Look at the vocabulary. What do you think the passage is about?

- technological innovations
- unpredictable weather
- food self-sufficiency
- a drone
- an environment-controlled greenhouse
- food supply
- smart agriculture
- Global Positioning System

Passage

Smart Agriculture

Overview

1» The term "smart agriculture" refers to any type of farming that uses technology such as sensors, location systems, and robots. These elements are connected and exchange data. Together, they collect and analyze data about crops or animals, make decisions, and even take action such as adding water or fertilizer. The advantages of smart agriculture are clear: quick response and high precision, and significant savings in water, energy, fertilizers, and labor time. According to one company involved in smart agriculture, farms have been able to save up to 85% in water, and 50% in energy costs while using less fertilizer. Crop yields of up to 40% higher are often achieved. The relatively low cost of digital technology provides an attractive opportunity for increasing food production in Japan in a way that is sustainable and does not damage the environment.

The Growing Agricultural Challenge

2» According to the United Nations, the world's population is expected to reach 9.7 billion by 2050. In order to meet the increased demand for food, global food production needs to increase 1.7 times from the 2010 level by 2050. At the same time, agriculture in Japan is facing several threats in the form of a decline in agricultural

World population prospects
(billion people)

出典：国際連合経済社会局「世界人口推計 2019 年版」をもとに作成

population and farmland area, and climate change.

• Agriculture in Japan has traditionally relied on skilled workers. Today, however, the average farmer is over 65 years of age. On top of this, the total number of farmers is decreasing. As a result, a large amount of farmland has become abandoned in recent years. With a declining population overall, securing human resources in Japan is seen as a major challenge.

• Unpredictable weather such as extreme heat or rainfall is a major risk to traditional agriculture. Such weather can lead to crop production becoming unstable. It is important to minimize the risk of crop failure and improve crop quality regardless of weather. This can help to increase self-sufficiency and provide more stable income for farmers.

Meeting the Challenge: The Young Generation and Technology

3» Three case studies summarized below show how high school students are working with smart agriculture technology to achieve higher quality production with minimal labor.

Study 1: Rice farming and greenhouse control using advanced technology

4» Students at Koyo High School in Okayama are working on a large-scale project in rice paddy cultivation. They're using tractors equipped with Global Positioning System (GPS), unmanned rice planters, and drones. They are also working on the development of an environment-controlled greenhouse that can be remotely managed and monitored for growing crops using sensors for temperature, moisture content, etc.

Study 2: Development of a low-cost agricultural assistance cart

5»   Students at Hokkaido Asahikawa Agricultural High School have invented a low-cost cart to help elderly farmers.   In the students' survey, about 80% of the mostly senior farmers indicated that hard physical work was a problem.   These farmers also found it difficult to introduce new machines due to costs.   The students developed a cheap, easy-to-use, automatic cart that can carry heavy loads.   Farmers can use it to transport tools or crops and reduce their burden.   The design enables it to carry about 100 kilograms of cargo.

Study 3: A willingness to learn smart agriculture

6»   Students at Hyogo Prefectural Agricultural High School are also learning to utilize advanced agricultural technology.   With a drone, a tractor using GPS, and the latest model rice planters, the students are analyzing the condition of fertilizer based on aerial images of paddy fields.   The images show fertilizer distribution.   This allows students to see if the fertilizer is sufficiently distributed to the rice, and to know when and how much fertilizer to add.

Saving Agriculture = Saving Our Lives

7»   Japan's domestic food self-sufficiency rate was 73% in 1965, but had declined to only 38% as of 2019.   Japan now depends on other countries for much of its food supply. Adapting new technological innovations for use in agriculture, and helping farmers put them to use, will be a big challenge for the next generation.   Meeting it will require the help of farmers, scientists, government, businesses, and investors.

5
10
15
20
25
30

💡 Comprehension

1 **If the statement is true, write T.   If it's false, write F.**

1   The UN expects the world population to be 9.7 billion by 2050.   (   )
2   The average farmer in Japan is 70 years of age.   (   )
3   Extreme heat and rain is a risk to traditional farming.   (   )
4   Smart agriculture often uses advanced technology for farming.   (   )
5   Some high school students in Japan are learning "smart agriculture."   (   )

2 **Choose the correct answer for each question.**

1   **Gist**   What is the passage about?
   a. using technology to improve agriculture
   b. teaching students how to grow strawberries
   c. using traditional farming methods in Japan

2   **Detail**   What are students in Okayama working on?
   a. building fast tractors for rice farmers
   b. using rice planters that are remotely operated
   c. making new greenhouses for rice paddies

3   **Detail**   Students in Hokkaido developed a low-cost automatic cart because _____.
   a. farmers found it difficult to use new technology
   b. farmers didn't want to work on the farms anymore
   c. farmers couldn't afford to buy expensive machines

4   **Inference**   What will be a challenge in introducing 'smart agriculture'?
   a. producing enough food
   b. teaching farmers how to use the technology
   c. stopping bad weather from damaging crops

3 **Answer the question in English.**

▶   Why will the help of scientists, government, businesses, and investors be necessary in the future?

4 Complete the chart below with words or phrases from the passage.

Problems Facing Japanese Agriculture

✔ a decline in agricultural population and ¹_____

✔ climate change

✔ low ²_____ rate (38% as of 2019)

one solution

Smart Agriculture

Definition	any type of farming that uses ³_____
Advantages	✔ quick response ✔ ⁴_____ ✔ ⁵_____ in water, energy, fertilizers, and labor time ✔ ⁶_____ food production

⁷_____ students working with smart agriculture technology

Study 1	Study 2	Study 3
✔ ⁸_____ using machines and drones equipped with GPS ✔ Development of environment-controlled ⁹_____	Development of ¹⁰_____ for ¹¹_____ farmers <features> • ¹²_____ • ¹³_____ • automatic	Analysis of the condition of ¹⁴_____ using machines and drones equipped with GPS

Saving agriculture using new technology

= ¹⁵_____

Express Yourself

You've read about some of the new technologies in agriculture. In order to improve food production in Japan, which technology do you think is the most effective? Choose one technology from the three case studies. Discuss with your group members in terms of (1) cost, (2) environment, or (3) labor.

e.g. A: Which idea do you think is the most effective?

B: In order to improve food production in Japan, I think the idea in Study 1 is the most effective in terms of labor.

A: Why do you think so?

B: That's because you can do many jobs automatically without going to a greenhouse. It means we need less people. Also, they can save their time and labor.

Activity

You've found an example of smart agriculture being used by high school students in a foreign country. Write an e-mail introducing some smart agriculture being used by high school students in Japan. Use the examples introduced in the passage. Introduce the new technology (**1**) and the purpose for using it (**2**). Then write your opinion or comment about it (**3**).

> To: ○△×＠highschool.edu
> Subject: Japanese high school's smart agriculture
> Dear students at Cross High School,
>
> I've read the article about your school on the Internet and I became very interested in your practice of smart agriculture. I'd like to introduce some things that some high school students in Japan are doing. One school uses 1 _____ as a new technology to 2 _____ _____. 3 _____ _____.
> You might want to look into this as well. Thank you.
>
> Best regards,
> (*your name*)