

## INNOVATIVE TECHNOLOGIES AND ROBOTICS IN AGRICULTURE

**Zablotska I.O.** Bachelorette  
Odessa State Agrarian University

**Artemov V.**

PhD, Odessa State Agrarian University, Odesa, Ukraine

In the modern world and modern life, it is impossible to avoid the use of technologies that are actively implemented in all spheres of human activity, including the agricultural sector. Innovative technologies provide farmers with significant advantages, which contribute to the development and prosperity of business. They are used to ensure the stability of production, monitor the state of agricultural land, increase productivity and control the quality of products.

The practical application of robotics in crop production can be divided into 5 stages:

Table 1

Stages of cultivation

1	soil cultivation
2	application of fertilizers
3	sowing
4	application of plant protection products and weed&pest control
5	harvesting
6	efficiency analysis

According to Artur Andilakhai - Research Agronomist (Smart Farming) [1], the entire growing process begins with monitoring of weather conditions, which helps in effective production planning. For this, it is important to study weather conditions in detail, and not to be guided by general information provided by hydro meteorological centers. A basic weather station on the farm is used. Monitoring of weather conditions can be done by mobile stations that are installed on equipment and transmit data on temperature and wind strength.

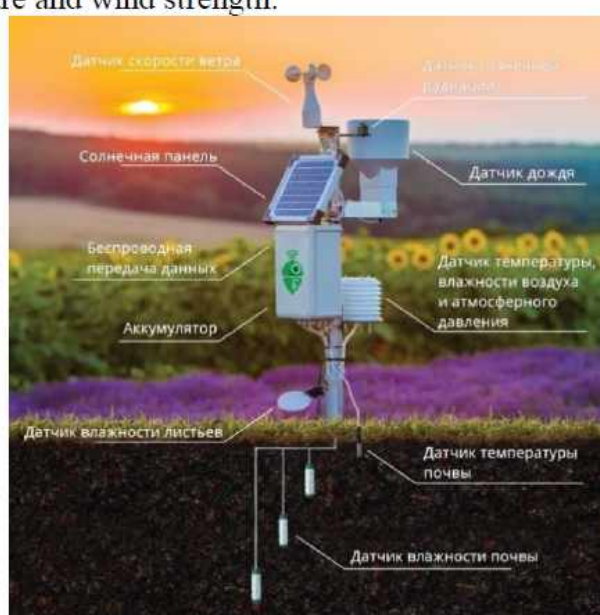


Figure 1. Weather station

After determining the climatic conditions, the first technological stage is soil cultivation. With the help of a penetrometer and a hardness tester, field analysis is carried out for high-quality performance of works. This gives information about the acidity, density of the soil and the depth of the plow sole. Previously, agronomists went out into the field and pierced the soil with a rod to determine the location of the plow sole, after which they adjusted the plow to the required depth and plowed the entire field [1].



Fig. 2 Penetrometer

For the second stage, namely the application of fertilizers, the individual features of the field, its topography and the content of organic matter are taken into account, and a map is created for sampling. After sampling, a second new map is created for applying fertilizers: complex or nitrogen. Direction indicators and RTK signals are used to save mineral fertilizers and provide optimal soil nutrition. Fuel consumption, seed material and the amount of fertilizer consumption are reduced while using a direction indicators.



Fig. 3 Course guide

The third stage is sowing. The most important operation in the field is the sowing of crops. Sowing is a complex process, and therefore the correct sowing depends on the successful cultivation of agricultural crops. One of the options for sowing is precision sowing from Precision Planting, which allows you to improve any planter of foreign manufacturers and control data during sowing. This makes it possible to increase the efficiency of sowing and to achieve uniformity of seedling germination, to avoid gaps.



Fig. 4 Precision planting from Precision Planting

The fourth stage is the introduction of plant protection products (PP) and fertilizing. Correct application of fertilizers is an important aspect of growing any crop. The main factors that affect efficiency are parallel driving, regulation management, weather control, continuous monitoring of trampling and spillage. The Augmenta field analyzer allows you to get a complete picture of the state of health and quality of crops with the help of a PnP device that scans and analyzes plants during the movement of the tractor on the field and creates task maps for the application of fertilizers.



Fig. 5. Augmenta field analyzer

The fifth stage of operations - efficiency analysis. Any technology used in the field that has a monitor provides data for digitization and analysis. Information is collected at the end of the season, as well as from each operation separately. Each action can be analyzed differently, but equally, it will lead to the application of a complex approach and the identification of certain correlations and patterns.

Therefore, the use of innovative technologies and robotics in the agricultural sector allows to increase labor productivity, harvest quality and solve many other problems. Innovative technologies bring significant benefits to farmers and contribute to the development and prosperity of their businesses. However, it should not be forgotten that technologies are constantly developing and improving.

#### **List of references:**

1. [https://blog.agrokebety.com/agrokebetypro\\_m11](https://blog.agrokebety.com/agrokebetypro_m11)
2. <https://landlord.ua/news/8-tekhnologii-iaki-nevdovzi-zminiat-silke-ospodarstvo/>
3. Krachok L I. The latest technologies in agriculture: problems and prospects of implementation.

After determining the climatic conditions, the first technological stage is soil cultivation. With the help of a penetrometer and a hardness tester, field analysis is carried out for high-quality performance of works. This gives information about the acidity, density of the soil and the depth of the plow sole. Previously, agronomists went out into the field and pierced the soil with a rod to determine the location of the plow sole, after which they adjusted the plow to the required depth and plowed the entire field [1].



Fig. 2 Penetrometer

For the second stage, namely the application of fertilizers, the individual features of the field, its topography and the content of organic matter are taken into account, and a map is created for sampling. After sampling, a second new map is created for applying fertilizers: complex or nitrogen. Direction indicators and RTK signals are used to save mineral fertilizers and provide optimal soil nutrition. Fuel consumption, seed material and the amount of fertilizer consumption are reduced while using a direction indicators.



Fig. 3 Course guide

The third stage is sowing. The most important operation in the field is the sowing of crops. Sowing is a complex process, and therefore the correct sowing depends on the successful cultivation of agricultural crops. One of the options for sowing is precision sowing from Precision Planting, which allows you to improve any planter of foreign manufacturers and control data during sowing. This makes it possible to increase the efficiency of sowing and to achieve uniformity of seedling germination, to avoid gaps.



Fig. 4 Precision planting from Precision Planting

The fourth stage is the introduction of plant protection products (PP) and fertilizing. Correct application of fertilizers is an important aspect of growing any crop. The main factors that affect efficiency are parallel driving, regulation management, weather control, continuous monitoring of trampling and spillage. The Augmenta field analyzer allows you to get a complete picture of the state of health and quality of crops with the help of a PnP device that scans and analyzes plants during the movement of the tractor on the field and creates task maps for the application of fertilizers.



Fig. 5. Augmenta field analyzer

The fifth stage of operations - efficiency analysis. Any technology used in the field that has a monitor provides data for digitization and analysis. Information is collected at the end of the season, as well as from each operation separately. Each action can be analyzed differently, but equally, it will lead to the application of a complex approach and the identification of certain correlations and patterns.

Therefore, the use of innovative technologies and robotics in the agricultural sector allows to increase labor productivity, harvest quality and solve many other problems. Innovative technologies bring significant benefits to farmers and contribute to the development and prosperity of their businesses. However, it should not be forgotten that technologies are constantly developing and improving.

#### **List of references:**

1. [https://blog.agrokebety.com/agrokebetypro\\_m11](https://blog.agrokebety.com/agrokebetypro_m11)
2. <https://landlord.ua/news/8-tekhnologii-iaki-nevdovzi-zminiat-silke-ospodarstvo/>
3. Krachok L I. The latest technologies in agriculture: problems and prospects of implementation.