ECRONICON
OPEN ACCESS

EC AGRICULTURE
Opinion

About Some Hesitation in Connection with the Robotization of Agriculture

Edvin Nugis*

Estonian Freelancer Scientist of Soil Management and Agricultural Engineering, Honoured Inventor, Estonia

***Corresponding Author:** Edvin Nugis, Estonian Freelancer Scientist of Soil Management and Agricultural Engineering, Honoured Inventor, Estonia.

Received: December 15, 2020; **Published:** December 31, 2020

Wherever we look in relation to agriculture, there is an assertive development in connection with the robotization of agriculture [1]. For a number of countries, this process is still a distant future, but for highly developed countries it is already today. We would not have paid attention to this problem at all if it were not for the soil. We consider it a living organism with all its physical, chemical and biological characteristics. For today's robot, the soil is only a mechanical body with which, according to the appropriate program, some mechanical operations should be performed in relation to it. Naturally, when performing the appropriate operations, the robot has a GPS system and a number of sensors that send the necessary information to the operator, who sits at the table in the office and monitors the robot's actions on the field in real time. Here you should not fantasize too much, knowing that the robot is able to determine in real time the moisture and chemical composition of the soil. It seems to us that at this, until the near future time, the possibilities of the robot will be exhausted. What worries us today?

Before answering this question, we will try to make a small excursion to the grandmother's garden, which, both as an image, and also in reality, can be taken as a kind of standard of soil condition for the field of any farmer. It is no secret to anyone that thanks to many years of experience, as well as the care and diligence of our grandmothers, their beds provide a high yield of any crop. If you let the robot go there, then you can assume that from the grandmother's garden the same information will be transmitted to the operator as from the field. But no robot is able to do the necessary work with love. It is precisely the spiritual side that distinguishes grandma's work from the work of a robot.

Another aspect of the soil state that, in our opinion, may not be within the power of the robot to ensure reliable results. This is the bulk density and structure. As you know, the bulk density of the soil is the most important indicators for the growth and development of a cultivated plant. In the grandmother's bed, the bulk density value usually does not exceed 1.2 Mg cm-3. This raises the practical question of how a robot can determine this indicator while working in the field. Indeed, this requires a voluminous metal cylinder with a volume of 100 cm3 and a device for introducing this cylinder into the soil. After that, you will need to remove this cylinder from the soil and transfer it to the laboratory. There it should be weighed and placed in a thermostat for drying at a temperature of 92°C. After drying, the robot should remove the dried cylinder with soil from the thermostat and put it in a desiccator. After the cooling process, remove the cylinder with dry soil from the desiccator again and weigh. We believe that the robot can do all this and automatically calculates the bulk density (Mg cm-3) and soil water content (g g-1, %). Maybe in the distant future the robot will be capable of all this, but in the next 5 - 10 years it is unlikely.

If now we imagine how the robot will assess the structure of the soil, that here it will be more capable of it. Let us assume that the robot is able to suck in a determined portion of soil from the arable horizon into its special container, where there are sieves with mesh sizes of 5 mm and 2 mm. After shaking these sieves for 5 minutes back and forth, the structural differences in the soil should then be separated in such a way that large lumps with a diameter of more than 5 mm remain on a sieve with 5 mm meshes, and small ones fall on a sieve with 2 mm meshes. Those lumps of soil that turned out to be more than 2 mm in diameter remain on a sieve with 2 mm cells. Those lumps of soil that turned out to be less than 2 mm in diameter pass through the mesh of the sieve and fall on the corresponding base in the form of some kind of container. It shouldn't be a problem for the robot to weigh the soil on the above mentioned sieves. Now it only remains for the robot to calculate the ratio between the mass of a lump of soil on a sieve with cells of 2 mm (in the numerator) and the sum of masses with lumps on a sieve of more than 5 mm and in the final container with lumps of soil less than 2 mm (in the denominator). As a result, the indicator of the structure coefficient will be recorded on the screen of the robot and, accordingly, in its memory. Depending on the result, the corresponding indicator of soil structure will be displayed on the operator's computer screen in the office [2]. If this indicator, i.e. the structure coefficient will be higher than 0.5, then a green number will be displayed on the screen, but if this indicator is less than 0.5 then a red number will be displayed on the screen. Of course, to perform all of the above operations, you need to have a kind of robot tractor.

Despite the fact that such a robot tractor must be equipped with soil-sparing running systems, here, too, one should doubt to some extent about the advisability of using it in agriculture. Still, such a robot tractor can be quite complex. The more parts, the greater the mass of the tractor robot. And as you know, heavy machines working in the fields over compact the soil, the latter is known to negatively affect the growth and development of cultivated plants.

As an alternative, it will be possible to carry out all the above operations to determine the characteristics of the physical state of the soil not with a single robot, but with several. For example, one robot will be used to determine the bulk density of the soil, and another will be used to determine the structure of the soil. Be that as it may and whatever doubts now or in the future about the robotization of agriculture, technical progress cannot be stopped by any forces. It seems to us that, despite our doubts, as technology and robots improve, the sharp line between agricultural science and practice may decrease. Agricultural science will then be concentrated in robots and the operator at the table of the information center only has the role of tracking the progress of field work and obtaining analytical results for a comprehensive assessment of the soil state. Perhaps by doing so it will be possible to preserve nature and improve the well-being of our peoples.

Bibliography

1. Koerhuis R. "AGXEED robot tractor". Future Farming (2020): 7.
2. Tamm K., *et al*. "Impact of cultivation method on the soil properties in cereal production". *Agronomy Research* 14.1 (2016): 280-289.

Volume 7 Issue 1 January 2021