

DEVELOPMENT OF AUTOMATED ENVIRONMENTAL CONTROL SYSTEM FOR PORTABLE GREENWAY SECTION

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Abstract: In this paper, issues of green living were considered, and as result, its advantages in future agriculture were identified. In course of analysis, different types of automatic greenhouses were compared, in particular their main parameters, which are most often taken into account when choosing greenhouse.

Keywords: automated greenhouse, green circulation, automation, ecology, technology

РОЗРОБКА АВТОМАТИЗОВАНОЇ СИСТЕМИ КОНТРОЛЮ НАВКОЛИШНЬОГО СЕРЕДОВИЩА ПОРТАТИВНОЇ ДІЛЯНКИ ЗЕЛЕНОГО ПОБУТУ

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В даній роботі були розглянуті питання щодо зеленого побуту, в результаті, визначені його переваги у майбутньому сільському господарстві. В ході проведеного аналізу були порівняні різні види автоматичних теплиць, зокрема їх основні параметри, які найчастіше враховуються при виборі люди.

Ключові слова: автоматизована теплиця, зелений побут, автоматизація, екологія, технології

The relevance of automation in various aspects of human life is driven by increase in efficiency, resource optimization, and creation of conditions for innovation, thereby contributing to global progress [1-5]. A particular emphasis is placed on transition to green practices, where use of automation in agriculture and horticulture contributes to creation of more sustainable and environmentally friendly environment for plant cultivation. This, in turn, supports preservation of natural resources and reduces negative impact on environment.

Green farming refers to principles of ecological and sustainable farming practices, in particular cultivation of vegetables and other crops in greenhouse conditions. In this paper, "green living" will be used to refer to topics that refer to environment, nature or plant life. In context of our study, focus will be on greenhouse – space where plants or other green elements are located.

Now let's take closer look at essence of this approach, namely its basic elements:

- efficient water use, i.e., rational use of water, possibly using drip irrigation systems to reduce water loss through evaporation;
- use of organic farming methods to avoid chemical fertilisers and pesticides and replace them with organic alternatives to preserve soil and plant health;
- waste management, as proper disposal and recycling of waste to reduce environmental impact of greenhouses;

- use of technology to optimise production, because it is use of modern technologies and automation systems to effectively monitor and control plants, temperature, lighting and other aspects of greenhouse operations.

Next, we will look at topic of green living and its relevance to automated greenhouse, but before that, let's get acquainted with this concept. An automated greenhouse is modern system for growing plants that uses advanced technologies to automate and control environment. The main idea is to provide optimal conditions for plant growth by automating various processes. Let's define main characteristics of automated greenhouse: temperature control systems, lighting systems, automatic irrigation, ventilation systems, monitoring and sensors. All these elements combine to create optimal environment for plant growth and maximise yields. The market already has large number of automated greenhouses, farms, growboxes, etc., but they have certain disadvantages. Let's look at main models of automated greenhouses on market and compare them:

1. The first is COSTWAY, which is shown in Fig. 1 [6-10]. This is automated system for monitoring plants, climate, watering and other parameters to improve plant care.

The inside of greenhouse is made of reflective material that does not allow light to penetrate outside and thus provides plants with optimal environment for growth without large light losses.



Figure 1 – COSTWAY

2. Next is SmartGarten S, shown in Fig. 2 [6-10]. The greenhouse is equipped with auto-light, which allows both to guarantee full illumination of plant and to save light. The greenhouse also has automatic notification via SMS when it needs to be watered, as well as adding necessary minerals to plant.



Figure 2 – SmartGarten S

3. The third analogue is GrowIt Farm Smart Indoor Garden in Fig. 3 [6-10]. The greenhouse also has drip irrigation, which allows for even moistening of ground surface. It is also equipped with lighting and additional ventilation.



Figure 3 – GrowIt Farm Smart Indoor Garden

4. And another striking representative is GreenYou, shown in Fig. 4 [6-10]. The greenhouse is watered from above, which also allows for moistening of leaves, and has micro-cameras for tracking height of plants (their readiness for consumption).



Figure 4 – GreenYou

Let's consider each of options for "green living" and put results of research in Table 1. Table 1 shows main criteria for comparing automated greenhouses. For comparison, main criteria were chosen, which often play most important role when choosing product to buy.

Table 1 – Comparison of automated greenhouses

Greenhouse	Lighting	Heating	Ventilation	Watering	Price	Current consumption
COSTWAY	+	-	+	+	150 Euro	High
SmartGarteS	+	-	-	-	230 Euro	High
GrowIt Farm	+	+	+	+	172 Euro	Average
GreenYou	+	+	+	+	400 Euro	Low

After comparison, you can see that different models have both their advantages and disadvantages. Sometimes you can't call this or that disadvantage or advantage, because sometimes when buying greenhouse, person can focus on lighting and do watering themselves, or heat greenhouse themselves, but have everything work in automatic mode, and so on. So everyone makes choice for themselves as to what suits them. We also see that manufacturers use different materials, sensors, and sensors, which also affect quality of project and price.

If we move from small and medium-sized greenhouses to industrial production, we see relevance of green living systems in greenhouses and in agriculture in general growing as humanity faces number of serious environmental challenges and problems related to climate change, resource depletion and other issues.

We consider three main themes in our opinion, first is environmental benefits aimed at reducing negative impact of agriculture on environment, which can include reducing use of chemicals, careful use of resources and conservation of biodiversity.

The second equally important point is sustainability, which involves use of environmentally sustainable practices that can help ensure sustainable food production by reducing dependence on

unsustainable methods and resources. Lastly, there is legislative pressure, with many countries having standards and regulations aimed at reducing environmental impact of agriculture. The introduction of green farming systems can help meet these legislative requirements. Therefore, elements of "green living" such as use of renewable energy, efficient use of water, organic methods and waste management are key to ensuring environmentally friendly and sustainable agriculture.

Automated greenhouses, using advanced technology, provide optimal conditions for plant growth. A comparison of different models of greenhouses shows their advantages and disadvantages, taking into account individual needs of users. The environmental, economic and legislative aspects of greenhouses demonstrate growing relevance of green living and automated greenhouses in addressing current environmental issues and ensuring sustainable food production. Thus, given all of above, it is important to recognise potential of greenhouse systems to contribute to environmentally friendly and sustainable food production, especially in context of current environmental challenges and consumer demand for sustainable development.

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