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URBAN VERTICAL FARMING: CAN MODULAR GREENHOUSES ENSURE VEGETABLE SECURITY IN FRONTLINE CITIES

У публікації розглядається вертикальне фермерство в умовах міста як інструмент забезпечення продовольчої безпеки під час кризових ситуацій. Основну увагу приділено модульним контейнерним теплицям, що дозволяють цілорічне вирощування овочевих культур у контрольованому середовищі за допомогою безґрунтових технологій. Наведено приклади практичного застосування, зокрема вертикальну ферму у бомбосховищі в Дніпрі. Результати демонструють, що такі системи можуть підвищити стійкість міських продовольчих систем навіть за обмеженого доступу до традиційних ресурсів.

Ключові слова: фермерство, міське фермерство, вертикальне землеробство, аграрний сектор, безґрунтові технології, продовольча безпека, модульні теплиці.

This publication examines urban vertical farming as a tool for ensuring food security in Ukraine cities under crisis conditions. Special attention is given to modular container-based greenhouses, which allow year-round vegetable production in controlled environments using soilless technologies. The study highlights practical applications, including a vertical farm established in a shelter in Dnipro. Results demonstrate that such systems can enhance urban food resilience even under limited access to traditional agricultural resources.

Key words: farming, urban farming, vertical farming, agricultural sector, soilless technologies, food security, modular greenhouses.

The majority of cities are reliant on external sources for goods necessitating external deliveries to meet all their needs. This will expose them to possible supply disruptions when it comes to delivering goods. In periods of calamity, especially during Warfare, the provision of fresh produce is drastically hindered and complicated due to Limited availability and a decline in agricultural production, making the urban agriculture more important as a means of localizing food production within the city [2].

Vertical farming is a type of urban agricultural practice where growing plants in multi-tiered systems indoors with the aid of controlled environmental technologies (CEA) and therefore do not use traditional soil based systems [2]. The plants are grown using hydroponics and/or aeroponics in these soilless technologies [1]. Vertical farming makes the most out of scarce space, conserves water, and the best thing is that it makes crops all through the year irrespective of the weather outside the farm.

Available vertical farming options are container-type greenhouses units that implement modular systems. The most convenient aspect of them all relates to their size as well as their ability to be moved around. They can be installed quickly and with minimal resources into any city type of infrastructure. They are very self-sustaining structures, which allows these modules to be installed within small spaces or even secured zones [1]; this is a very critical factor in today's environment.

Full-scale War In Ukraine Has Caused Many Crop Production Losses In Its Agriculture Sector [4]. It Has Also Caused Cropland To Decrease And Fresh Vegetables To Be Difficult To Supply. Under These Conditions; Vertical Farms as well as Urban Farming can help ensure Food Security. As an example of this, a vertical farm exists within a bomb shelter in Dnipro. The farm produces mainly green crops (Lettuce, Arugula, Mustard, Spinach, etc.) [3]. Through various trials on this farm, the amount of green products available for sale in Ukraine has doubled because of the vertical farming process. This case does show that with less than conventional land access, vegetables can be grown even under extreme limits of cultivation.

Thus, modular vertical farming systems could be a step into the future in the agronomic and food sectors. They could become a tool for increasing the resilience of food systems in crisis conditions, not only in Ukraine but also worldwide.

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COMPUTATIONAL APPROACHES TO OPTIMIZING REGIONAL PLANNING

Досліджено стратегічне значення та кар'єрні можливості здобуття ІТ-освіти в галузевих аграрних закладах вищої освіти. Розглянуто вплив новітніх цифрових рішень, систем штучного інтелекту та інженерії програмного забезпечення на процеси модернізації сільського господарства (AgriTech).

Ключові слова: ІТ-освіта, цифровізація сільського господарства, AgriTech, інтелектуальні системи, програмна інженерія, аграрний ЗВО.

The strategic importance and career opportunities of acquiring IT education within specialized agrarian higher education institutions are investigated. The impact of cutting-edge digital solutions, artificial intelligence systems, and software engineering on the modernization of agriculture (AgriTech) is examined.

Keywords: IT education, agricultural digitalization, AgriTech, intelligent systems, software engineering, agrarian HEI.