лизации) продукции (услуг), прогнозировать поведение совокупных затрат предприятия в зависимости от изменения объемов производства, рассчитывать прибыльность (убыточность) предприятия, получать оперативную информацию о финансовом состоянии предприятия, определять изменение прибыли вследствие изменения цены реализации, структуры выпускаемой продукции (услуг). Применение данного метода сельскохозяйственными организациями Республики Беларусь позволит повысить прибыльность их работы за счет принятия эффективных управленческих решений в условиях рыночной экономики.

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IMPACTS OF CONTROLLED-ENVIRONMENT AGRICULTURE ON THE INVOLVED ACTORS

Key words: controlled-environment agriculture, vertical farming, innovative agriculture

Abstract: The economic benefits of controlled agriculture, such as vertical farms or greenhouses, compared to classical methods of crop cultivation are described quite a lot in the literature. In this paper, we focus on the impacts of controlled-environment agriculture on entrepreneurs and customers of products provided by this type of agriculture. In particular, we will try to compare the difference in the motivation thinking of entrepreneurs and hired persons as well as motivation of potential entrepreneurs for the industry and society from the point of view of the end users.

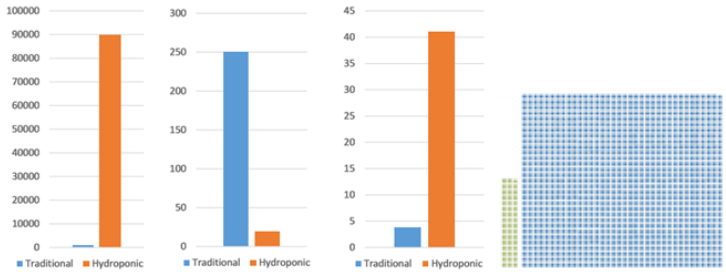
In conclusion, we will try to emphasize the aspects of the positive impact on human resources for the food market as well as society.

The global population is projected to reach 9.8 billion by 2050. National populations are expected to more than double in 40 countries. In order to feed the population in 2050, we need to produce an additional 6,000 trillion kcal per year. However, conventional industrial agriculture is not sustainable. It is one of the most harmful industries to our planet, responsible for: 70% of the planet's water use; up to 24% of greenhouse gas emissions; degradation of soil and groundwater pollution [1].

The perspective solution for the mentioned predicted food crises is the development of controlled enviromental argriculture systhems aimed to solve multilayers issues such as sustainable agriculture products providing, diversification of emloyement in the green sector, ensuring of the source and energy autonomie, rational use and recycling, etc. Controlled Environment Agriculture (CEA) is defined as a combination of engineering, plant science, and computer managed greenhouse control technologies used to optimize plant growing systems. CEA provides secure, healthy, and cost effective year-round production of many premium edible and high value plant species [2].

Vertical farming (VF) often incorporates CEA. This is the practice of growing crops in vertically stacked layers. It aims to optimize plant growth with soilless farming techniques such as hydroponics, aquaponics, and aeroponics. Some common choices of structures to house vertical farming systems include buildings, shipping containers, tunnels, and abandoned mine shafts [3].

CEA technology helps in controlling humidity, nutrients, gases, temperature, and light. Vertical farming causes less ecological influence and enables the manufacturer to utilize reduced water and energy than the customary farms. The manufacturers can efficiently utilize their resources and produce significantly more food with minimum consumption of land [4]. A study published in 2015 in the IJERPH compares lettuce grown on traditional fields with CEA hydroponic method, looking at the factors of yield, energy use and water use (Figure 1) [5].



a)Energy use (kl/kg/y) b)Water use (L/kl/y) c)Yield (km/m/y) d) Land ratio of VF to tradition- 1:23.29 (Ha)*

*-Calculated by the authors for the same crop output.

Figure 1. Land square use, energy use, water use and yield for tradition and hydroponic agriculture [5], [6]

Proponents of the vertical farm also argue that it will supply competitive food prices. The rising expense of traditional farming is quickly narrowing the cost gap. For example, when vertical farms are located strategically in urban areas, it would be possible to sell produce directly to the consumer, reducing transportation costs by removing the intermediary, which can constitute up to 60% of costs [7].

The increased ability to cultivate a larger variety of crops (lettuce, basil, microgreens, spinach, vegatebles and fruits, etc.) at once because crops do not share the same plots of land while growing is another sought-after advantage. Additionally, crops are resistant to weather disruptions because of their placement indoors, meaning less crops lost to extreme or unexpected weather occurrences. Lastly, because of its limited land usage, vertical farming is less disruptive to the native plants and animals, leading to further conservation of the local flora and fauna [8]. Growing consumer demand for organic foods and foods free from pesticides, inherently modified organisms is the major driving force of the Europe Vertical Farming Market [9].

Within the spreading CEA in agriculture production, the new generation of farmers is expected to be affected. In the presented study it has been considered the possible effects of innovative CEA on the staff and customers.

We applied a complex analysis and systematization of available data in the field of controlled-environment agriculture. The comparative characteristic of social impacts on persons directly involved in production and society with the use of both new and classical methods of cultivation is introduced. The involved actors are proposed to be divided as follows (Figure 2)

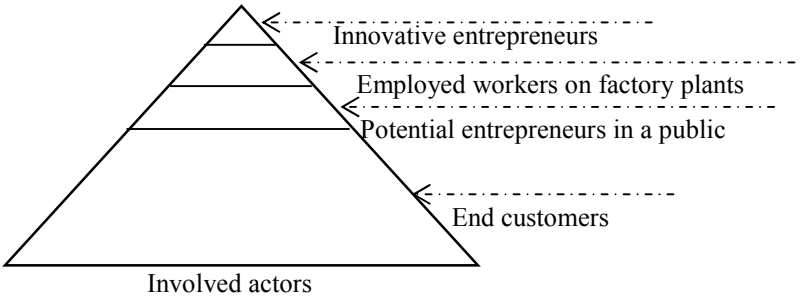


Figure 2. Estimated categorization of involved actors

The impacts of controlled-environment agriculture on certain auditory were summarized in the following Table 1.

Table 1. Summarized impacts of CEA on certain categories of actors (own processing)

Actors	Impacts
Employed workers on factory plants	• High-educated staff required • Controlled working conditions for employees
Innovative entrepreneurs (IE)	• Motivation for the most rational use of resources (land, water, energy, materials) • Intensive economic criteria for farming activity assessment
Potential innovative entrepreneurs in a public	• Easier access to the market • Reliance on the local needs
End customers	• Food independency and stability of supply • Development of the local economy • Contributions to health

IE: Motivation for the most rational use of resources

Subsidy is a policy that motivates to keep lands in good shape and condition rather than how to produce food for business. Even requirement about production with minimal quantity is a necessary attribute to call your household a farm. Those who are serious to produce crops and think by profit figures hold minimum in time folds as much as required for definite square measure by law. Moreover, according to Euromonitor data and the information that was obtained during the survey [10] in Slovakia, subsidies take about 80% of annual income of a typical farmer there and only 20% was formed by commercial activities. These activities are completely different and take different approaches in operations and mind thinking about farming by a farmer.

IE: Intensive economic criteria for farming activity assessment

In standard agriculture, farmers are forced to think by extensive criteria as Ha and tons or simple intensive criteria such as Tons per Ha and Cost price per Ha. However, in order to get better quality of production with less efforts applied, a sustainable farmer intends to use new technologies in growing cultures such as vertical farming concept with hydroponic, aeroponic or aquaponic technologies. Firstly, the figures of farm performance, like production per 1 m2, production per 1 hour of labor force, quantity of production per 1kWt of energy used or m3 of water consumed show higher performance of food production having 10 times more yields per m2 per year, much higher profitability and higher level of quality of food production at the same time.

Employed workers on factory plant: High-educated staff required

It is very important that there is a competent staff employed. Since one person can serve the whole chain of the growing process from planting to harvesting, accordingly, the field of applied skills of the employed persons

should be broad enough and competent, since any even insignificant mistake turns into unnecessary expenses or direct losses in the form of spoiled material or not grown crop. Thus, education programs for innovative agriculture require high enough quality, specific skills and praxis.

Workers on factory plant: Controlled working conditions for employees

Control of all inputs for growing food implies partial or complete automation of processes including a favorable environment for growing plants and serving staff. Indeed, the indoor space controls the cleanliness, humidity, lighting, oxygen and carbon dioxide content, the safety of the development of pathogens, the use of only biologically pure compounds for stimulating growth, which in turn in most cases favorably affects the working conditions and health of staff.

Potential entrepreneurs in a public: Easier access to the market

Now, the main element for engaging in agricultural business is no longer owning a large amount of agricultural land, which is very limited, but organizing the efficient use of the limited indoor square of any architectural type and original purpose. This significantly expands the number of potential entrepreneurs and increased interest for this type of agriculture.

Potential entrepreneurs in a public: Reliance on the local needs

This technology is mainly designed to saturate local demand with a fresh food. Therefore, entrepreneurs from different regions are anxious to satisfy the local population with the price and quality of products. There is a basement for developing a healthy competition in the regions as well as the potential to supply local markets, retail chains, bars, hotels, restaurants and catering.

End customers: Food independency and stability of supply

The development of local production contributes to food independence from other regions and increases the stability of supplies. For example, the pandemic of coronavirus infection Covid-19 (WHO, 2020) showed that this indicator of the region is extremely important for uninterrupted and stable work to provide the population with food.

End customers: Development of the local economy

The consumption of locally produced products contributes to the development of economic relations and the economy as a whole. Indeed, the consumption of local products helps to reduce local unemployment, increase tax deductions to the local budget and increases investment costs to the area from local sources.

End customers: Contributions to health

The described technology has a beneficial effect on end consumers by reducing CO2 emissions since the use of heavy machines is not required and the predictable and controlled quality of products in CEA increases its biological value. Also, important factors are the frequent use of alternative energy sources in the technology and waste reduction.

After analyzing the impacts of this technology on staff and customers, we can conclude that innovative technology of CEA has beneficial effects on the economic and social development of the region. Given the economic efficiency and prospects of such technology described in the literature, it is possible to assume with great confidence that crops which are capable to grown with this way have to inevitably switch to this form of agriculture and transfer the economy to a mode of sustainable growth and development.

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ОСНОВНЫЕ ФАКТОРЫ ЭКОНОМИЧЕСКОГО РОСТА ПРЕДПРИЯТИЙ В УКРАИНЕ: УЧЕТНЫЕ АСПЕКТЫ

Ключевые слова: экономика, экономический рост, учетные аспекты, инновации.
Key words: economy, economic growth, primary aspects, innovation.

Аннотация. В сегодняшних условиях насущными стали вопросы исследования имеющихся тенденций закономерностей экономического развития территории Украины, обеспечение условий и возможностей экономического роста. Главной целью экономического роста является увеличение объемов экономических и как производных – социальных благ, способствуют улучшению уровня жизни населения, созданию стабильной, благоприятной социально-экономической ситуации в стране, повышению ее международного авторитета.
Abstract: In today's conditions, the issues of studying the existing trends in the laws of economic development of Ukraine, providing conditions and opportunities for economic growth have become urgent. The main goal of economic growth is to increase the volume of economic and, as derivatives, social benefits, contribute to improving the standard of living of the population, creating a stable, favorable socio-economic situation in the country, increasing its international prestige.

Осуществление хозяйственной деятельности предприятиями предусматривает эффективное сочетание большого количества организационных, трудовых, материальных, финансовых и других ресурсов. Успешность таких действий измеряется путем сопоставления полученного результата с расходами, понесенными для его достижения. В величине финансовых результатов непосредственно отражаются все аспекты деятельности предприятия: разработка и организация производства, система