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ECONOMIC EFFICIENCY OF HYDROPONIC FEED PRODUCTION FOR LIVESTOCK COMPLEXES

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Abstract: *This article provides a scientific basis for the need for hydroponic feed production for livestock complexes, its advantages, cost-effectiveness indicators and ways to encourage hydroponic feed production.*

Keywords: *livestock complexes, feed, hydroponics, cost-effectiveness, astrakhan cluster.*

Introduction. The rapid growth of the world's population is leading to an increase in the demand for food, which requires an increase in the quantity and quality of products per unit area.

At the same time, agricultural production is becoming more complicated under the influence of natural factors such as limited land and water resources, global climate change, natural disasters, degradation, drought, man-made soil pollution. This is especially evident in the livestock sector, which requires the development of modern agro-technologies in today's conditions, when the volume of fodder production and the level of nutrition for these livestock is declining from year to year.

In this regard, a number of agrarian reforms have been carried out in recent years, which are complicated by conflicting factors, such as the preservation of biodiversity in coastal areas, as well as the provision of livestock products at the level of medical standards.

Therefore, the system of soil cultivation (hydroponics) is of special importance among the technologies developed by scientists around the world. In soilless cultivation, a variety of materials used in place of the soil serve as the root environment, plant nutrition is carried out using an aqueous solution of mineral salts. Growing plants in soilless, artificially adjustable conditions has many advantages over growing them in normal field or greenhouse soils .

Against this background, the demand for agro-technical and environmentally friendly products is growing. According to SBS Consulting, from 2004 to 2020, the eco-products market grew from 21 to 93 billion euros. At the same time, the consumption of environmentally friendly and organic products has more than doubled over the same period. Analysts predict that by 2030, the global organic market capitalization will reach $ 143 billion. In terms of consumption, countries such as the United States (43 percent of the market), Germany (11 percent), France (9 percent), China (8 percent) and Canada (3 percent) are leaders. The direct hydroponics market, meanwhile, is valued at $ 8.1 billion in 2019, with an average growth forecast of 12.1 percent per year and $ 16 billion by 2025 .

If we look at the history of hydroponics, a number of scientific sources date back thousands of years to the earliest examples of hanging gardens in Babylon, as well as floating rafts in ancient Africa. But it was formed naturally at that time without a scientific basis.

Philosophers such as Aristotle and Helmont also left their first impressions in their research on the growth and development of plants, the biological processes by which plants assimilate nutrients in solution .

Later, British scientists John Woodward and Marcello Malnigi Later, British scientists John Woodward and Marcello Malnigi contributed to the development of hydroponic crop production.

They found that plants use chemically modified substances to grow their cells using oxygen, which plays an important role in this process.

In the 19th century, the German agricultural chemist Husmus von Liebig discovered that the source of plant nutrition was not organic nature. In 1856, botanists Julius von Sachs and Wilhelm Knoop cultivated the plant from seeds in an artificially created solution. Russian scientists Timiryazev and Pryanishnikov developed a method of growing plants in inorganic solutions .

Materials and analysis To date, with the development of science, the advent of new technologies, many methods of plant cultivation have emerged, such as hydroponics, aggregateoponics, ionoponics, chemoponics, aeroponics.

In recent years, special attention has been paid in our country to the cultivation of products by hydroponics, and research is being conducted to develop the scientific basis of its magnificent system and technical equipment in accordance with the conditions of our country. It is widely used, especially in greenhouse vegetables. As of 2020, the total area of hydroponic farms is 1,800 hectares .

Due to the sustainable development of the livestock sector, the growing demand for meat and dairy products, the volume of fodder lands is not commensurate with the increase in the number of livestock, it requires the introduction of modern resource-saving technologies in the livestock sector. One of the main problems for livestock farms, as well as the fact that 60% of their costs are spent on this feed, is the introduction of modern methods of providing nutritious fodder, in particular, hydroponic feed technology.

According to industry experts, the development of the livestock sector depends on three main factors: breeding, feed and infrastructure. Apparently, feed is one of these key issues for the livestock industry.

Hydroponics-based fodder production is the production of green mass, nutritious fodder without the use of soil for the care of livestock. By cultivating this type of product, all the necessary vitamins and biological elements are preserved in the feed.

In addition, one of the promising areas of the livestock industry is organic farming, the use of hydroponic green fodder as a method of growing high-tech waste-free crops and fodder in the production of organic beef and milk.

There are a number of advantages of hydroponic forage production for livestock, which can attract growers due to its high economic efficiency (Figure 1).

In particular, hydroponic fodder production for livestock is an economically low-cost method due to

the fact that it does not require large areas of land, mechanization (combine harvesters, tractors, seeders), storage space, large amounts of water, feed and a large number of workers.

At the same time, green mass is a biologically active feed due to its convenience for animal consumption, wetness and juiciness, richness of tissues and organic compounds for digestion, digestibility, productivity of livestock, health and immunity.

Hydroponically grown feed minimizes the impact of natural factors on other nutrients. Climate change (sudden cooling or heating, precipitation, natural disasters) does not affect food quality and quantity.

In recent years, the demand for agricultural technologies in developed countries has increased, and the market for organic products is developing rapidly. Hydroponically grown feed is considered to be organic pure feed, as it does not require the use of chemicals (nitrogen, herbicide, nitrate).

A number of livestock farms operating in the country have organized hydroponic fodder production, which is characterized by high economic efficiency. In particular, in the karakul cluster of Panaev Karakul LLC operating in the Republic of Karakalpakstan, this modern fodder production technology has been effectively introduced (Table 1).

The total cost of the facility is 6 million soums. 80 kg of wheat will be grown for a week and 560 kg of green mass will be grown. The average market price of blue mass is 1,500 soums.

Based on the above, the total production costs for hydroponically grown fodder in the astrakhan cluster of Panaev Karakul LLC amounted to 665.5 thousand soums, while it earned 840 thousand soums. He earned 174.5 thousand soums from hydroponics and the profitability rate was 26%.

Conclusion and suggestions. Considering that this amount of green mass feed (taking into account the feed unit and composition) can be obtained from 0.3 hectares of open space, it can be observed that it is possible to effectively use land resources. This is one of the innovative solutions for the livestock complexes that have been developing in recent years.

In the future, the development of this system, the promotion of hydroponic fodder production by farms with limited land and water resources, livestock breeding in adverse weather conditions is becoming one of the urgent tasks of today. Therefore, in our opinion, it is expedient for the state to support hydroponic feed farms in the following areas. Including:

- Subsidies for the purchase, installation and construction of hydroponic feeders;
- Development of a legal framework for permitting the installation of hydroponic feed production mobile buildings and structures in a convenient location for livestock;
- giving priority to subsidies for food production facilities connected to land water sources, as well as powered by solar panels;
- Compensation of farms engaged in fodder trade with up to 30% of the cost of seeds in excess of farm needs;
- Farms that employ young people and women, who are included in the social registers by organizing the cultivation of products by hydroponics, are offered financial support in the amount of 2 times the basic amount of calculation of wage costs.

In general, in the context of scientific and technological progress, digitalization of the economy, the development of new generations of resource-saving technologies, modern methods and tools, modernization of the most difficult and high-impact feed supply system in the livestock sector is one of the urgent tasks. Therefore, the continuous improvement of agricultural technologies, technical equipment and tools in this area, encouraging the introduction of new resource-saving technologies will have a positive effect.

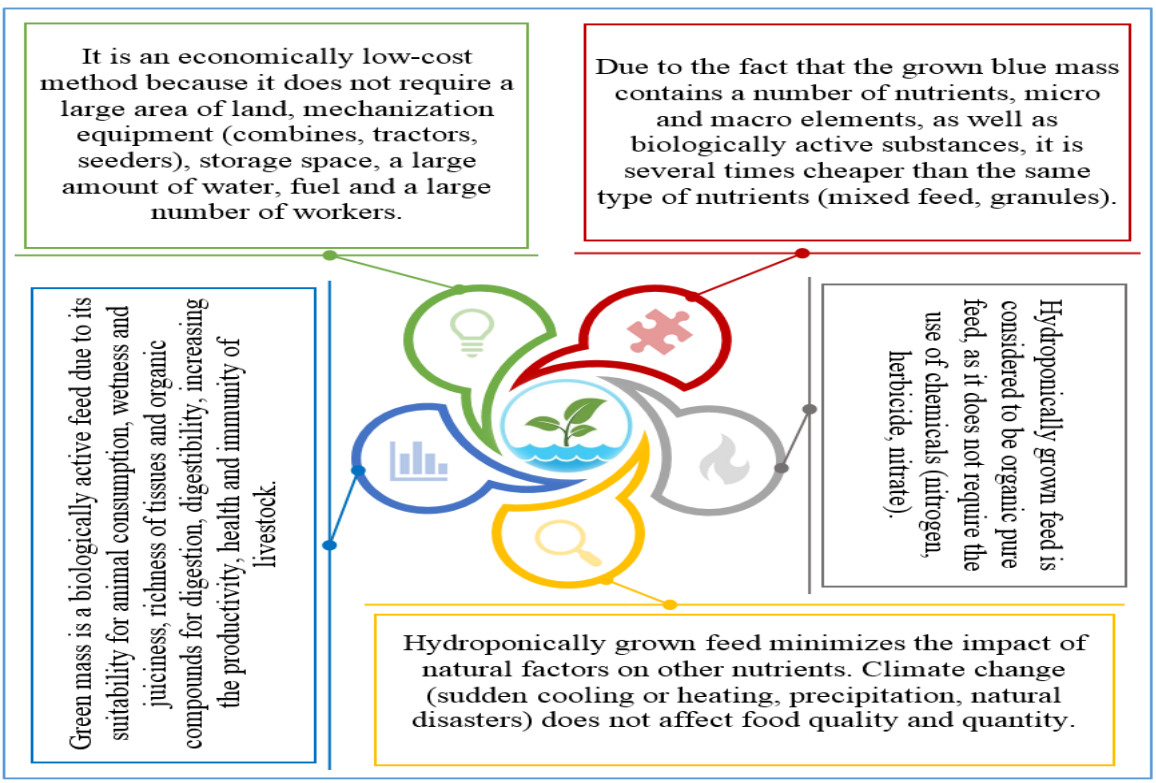

Figure 1. Advantages of hydroponic forage production for livestock care

Table 1

Efficiency of hydroponic fodder cultivation in the karakul cluster of Panaev Karakul LLC operating in the Republic of Karakalpakstan

№	Costs	Unit	Cost	Value (UZS)
1	Kit installation	pc	1	6000000
2	Production costs			
2.1	Wheat	kg	80	240 000
2.2	Water	m^3	3,5	10 500
2.3	Electric current	kvt	50	15 000
2.4	Workforce	people	1	375 000
2.5	Depreciation	year	5	25 000
	Total production costs	sum		665500
3	The amount of nutrients grown	kg		560
4	Market value of food grown	sum		840000
5	Benefit	sum		174500
6	The level of profitability	percent		26

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