

ECONOMIC EFFECTIVENESS OF USING BIOTECHNOLOGY IN AGRICULTURE

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Abstract: *biotechnology in agriculture plays an important role in the development of this industry. From the point of view of modern science, biotechnology in agriculture is the industrial use of biological processes and agents, based on the production of highly effective forms of microorganisms, cell cultures and tissues of plants and animals with specified properties.*

Key words: *biotechnology in agriculture, genetically modified crops, development of new markets, innovations in agriculture, genome mapping, agricultural engineering*

ЭКОНОМИЧЕСКАЯ ЭФФЕКТИВНОСТЬ ИСПОЛЬЗОВАНИЯ БИОТЕХНОЛОГИЙ В СЕЛЬСКОМ ХОЗЯЙСТВЕ

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Аннотация: *биотехнологии в сельском хозяйстве играют важную роль в развитии этой отрасли. С точки зрения современной науки, биотехнология в сельском хозяйстве — это промышленное использование биологических процессов основанное на получении высокоэффективных форм микроорганизмов, культур клеток и тканей растений и животных с заданными свойствами.*

Ключевые слова: *биотехнологий в сельском хозяйстве, генетически модифицированные культуры, развитие новых рынков, инноваций в сельском хозяйстве, картирования генома, агроинженерия*

Agriculture plays a key role in ensuring food security and economic development in many countries. With population growth and climate change, it is becoming increasingly important to improve agricultural productivity and reduce its negative impact on the environment. One of the innovative areas that can improve the productivity and sustainability of agriculture is biotechnology.

Advantages of using biotechnology in agriculture:

1. Increased productivity: Biotechnology allows the creation of plant and animal varieties with improved characteristics, such as resistance to diseases, dead wood and pests, as well as increased yields.

2. Reduced costs: The use of biotechnology can reduce the cost of plant protection and fertilizer use, as resistant plants require fewer chemical treatments.

3. Resource Conservation: Through more efficient use of water, soil resources and energy, biotechnology contributes to more sustainable agricultural production.

4. Stimulating innovation and developing new markets: The development of biotechnology in agriculture contributes to the emergence of new sectors of the economy, such as the production of seeds and planting material with high added value.

Economic efficiency of using biotechnologies:

1. Increasing income for agricultural producers: By increasing productivity and reducing costs, agricultural producers can earn higher incomes.

2. Reducing dependence on imports: The development of our own high-tech agriculture allows us to reduce dependence on imported food products.

3. Attracting investment and infrastructure development: Expanding the use of biotechnology in agriculture attracts investment, promotes the development of research centers and the creation of modern infrastructure.

4. Reduced environmental impact: More efficient use of resources and reduced need for chemical fertilizers and pesticides help reduce environmental pollution.

Overall, the use of biotechnology in agriculture has great potential to improve the productivity, sustainability and economic efficiency of the industry. However, to successfully realize this potential, support from government, investors and the scientific community is required.

Biotechnology plays a key role in improving the productivity and sustainability of agriculture and reducing its negative impact on the environment. Here are some specific examples of the cost-effectiveness of using biotechnology in agriculture:

1. Increasing yields using genetically modified (GM) varieties:

- Example: GM soybeans and maize, resistant to certain diseases and pests, allow agricultural producers to reduce pesticide costs and increase yields.

2. Reducing the cost of plant protection using biological preparations:

- Example: The use of microorganism-based bioinsecticides to control pests allows agricultural producers to reduce the cost of chemical pesticides and at the same time increase crop yields.

3. Increasing plant resistance to stressful conditions:

- Example: The development of drought-resistant wheat varieties allows for stable yields even under unfavorable climatic conditions.

4. Creation of varieties with extended shelf life and transportation:

- Example: GM tomatoes, which are more resistant to damage and remain fresh longer, allow farmers to reduce product losses during transportation.

5. Development of new markets and innovations in agriculture:

- Example: The creation of genetically modified plant varieties with special properties (for example, flowering plants with changed flower color)

contributes to the development of new markets and increased demand for agricultural products.

All of these examples demonstrate how the use of biotechnology in agriculture can provide practical benefits to farmers by reducing costs and increasing productivity. In addition, the use of biotechnology contributes to economic development by attracting investment, creating new jobs and stimulating innovation in the agricultural sector.

Advanced biotechnologies in agriculture are used throughout the world, and some of the most prominent examples include:

1. Genetically modified (GM) crops in the USA: The USA is the largest producer and consumer of GM agricultural products. They have successfully used GM corn, soybeans, cotton and other varieties to increase yields, disease and pest resistance, and improve product quality.

2. Biologicals in Europe: Some European countries such as Germany, the Netherlands and France have successfully used microorganism-based biologicals to protect plants from pests without the use of chemical pesticides.

3. Breeding resistant varieties in Asia: Southeast Asian countries such as India and China are actively developing resistant varieties of rice, wheat and other crops that can withstand drought, salinity and other stress conditions.

4. Application of genome mapping in Latin America: In some Latin American countries, such as Brazil and Argentina, research is being carried out to map and analyze the genomes of crop plants, which allows more efficient development of new varieties with desired properties.

5. Use of Agricultural Engineering in Africa: Many countries in Africa are using agricultural engineering to develop crop varieties that are resistant to diseases, pests and stress conditions such as drought and low soil nutrients.

These examples demonstrate that advanced biotechnologies are widely used in agriculture around the world and play an important role in increasing

crop yields, crop sustainability and improving the livelihoods of agricultural producers.

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