

GENETIC ENGINEERING: LIFE CREATED IN THE LABORATORY

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Abstract. This article analyzes the role of genetic engineering in agriculture, its ecological and social impacts, as well as international perspectives on the issue. The goal is to increase productivity through genetically modified organisms (GMOs) and create plants resistant to pests and herbicides. However, the long-term consequences of this technology have not yet been fully studied. The article also highlights the position of the WWF regarding genetic engineering, as well as the level of GMO cultivation in various countries.

Keywords: Genetic engineering, genetically modified organisms, GMO, agriculture, biodiversity, ecology, CRISPR/Cas, WWF, transgenic plants, biosphere.

Introduction. In recent decades, the science of genetic engineering has penetrated various areas of human life, particularly agriculture. Through genetic technologies, plant genetic codes are artificially modified to develop resistance against pests, viruses, and fungi. Producers claim this method increases crop yields and ensures global food security. However, experts and environmentalists warn of the long-term consequences of such technologies. Organisms created through genetic modification may disrupt the natural balance, harm the gene pool of wild plants, and reduce biodiversity.

1. What is Genetic Engineering?

Genetic engineering is the science of artificially altering the genes of living organisms to endow them with new, targeted traits. In this process, genes from bacteria, viruses, or other organisms are introduced into plants. Such plants are called transgenic organisms. For example, Bt-corn and Bt-cotton varieties contain a gene from the bacterium *Bacillus thuringiensis*. This gene enables the plant to produce a protein toxic to insects, thereby protecting it from pests.

2. Advantages of Genetic Modifications

According to producers, GMOs offer several advantages

Increase crop productivity;

Reduce the need for pesticides and herbicides;

Improve resistance to diseases and drought;

Provide a potential solution to food shortages.

For example, soybean varieties known as "Roundup Ready" are resistant to herbicides.

When farmers use these varieties, weeds are eliminated, while the main crop remains unaffected.

3. Environmental and Economic Risks

Despite these advantages, numerous scientific studies highlight the negative aspects of GMOs:

- Some pests develop resistance over time, becoming immune to pesticides;
- The spread of monocultures leads to a loss of biodiversity;
- Most GMO seeds are patented by large corporations, reducing farmers' economic independence;
- Pollen from GMO plants may spread to wild species, altering their genetic makeup.

4. WWF's Position on Genetic Engineering

The World Wide Fund for Nature (WWF) advocates for cautious use of genetic engineering and supports maintaining GMO-free agriculture. The WWF Germany branch

firmly opposes the use of genetically modified organisms in agriculture, forestry, and fisheries until their safety for humans and the environment is scientifically proven. Furthermore, the WWF supports strict control over new technologies such as CRISPR/Cas gene editing methods. If used without oversight, these methods could disrupt ecological balance.

Conclusion. Genetic engineering is an increasingly important field in modern biology and agriculture. It holds the potential to boost productivity, reduce food shortages, and develop plants resistant to new diseases. However, its impact on nature and human health is not yet fully understood. Therefore, before widespread implementation, it is essential to follow the precautionary principle and ensure safety for the environment, biodiversity, and human health.

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