THE RISK OF TRANSFER OF GENES IN THE INSURANCE PROTECTION OF AGRICULTURAL PRODUCERS

Henrikh HUDZ[1]
Taras Shevchenko National University of Kyiv, Ukraine

Abstract. The paper deals with the risk of transfer of genes, its impact, and possible consequences for agricultural producers; the possibility of creating an insurance service, to address this risk. The *purpose* of the paper is to disclose the results of a study of the risk of transfer of genes in agriculture when organizing insurance coverage. The *tasks* of this paper are: to clarify the essence of genetic engineering as an object of providing insurance services; to define the concept of risk of transfer of genes, its specific features, impact, and possible consequences for agricultural producers; carry out a description of the possibility of creating an insurance service about the risk of transfer of genes. The *object* of the study is the risk of transfer of genes in insurance protection. The *subject* of the study is theoretical and methodological approaches to optimizing the risk of transfer of genes in insurance protection. *Methodology*. This work requires attracting a large number of scientists from different fields. Legal Aspects covered in the EU Regulation Terms №1829/2003 and 1830/2003 of the European Parliament and Council. A considerable attention to the legislative regulation of genetic engineering and risks in the use of genetic modification is given to the Cartagena Protocol on Biosafety. It should be noted that at present, economic literature and especially publications related to agricultural insurance protection do not pay attention to the risks associated with the transfer of transgenic organisms and the possibility of taking this risk to insurance. The work uses the experience of the US Department of Agriculture and the European Center for Insurance Legislation. The *results* of the study showed that the introduction of the insurance mechanism has the main difference in the fact that this operation takes into account as a person who suffered a loss, could get more profit than the fact of causing damage to another farmer. In this regard, the first option of insurance may be the liability insurance of the latter. In any case, the insurance mechanism can combine risks in a large group of enterprises or individual farmers that are prone to it and this group can be expanded by separate provisions or by law. Also, features of coverage of losses from the risk of gene transfer, namely, a separate factor – cross-pollination, are considered.

Key words: risk of transfer of genes, agricultural producer, insurance protection, crop insurance.

JEL Classification: G22, O13, Q13, Q18

1. Introduction

The task of world agriculture in the next 25 years is not only to meet the growing demand for food but also to help reduce poverty and malnutrition while producing an environmentally friendly product.

Due to population growth, demand in developing countries is projected to increase by 59% for cereals and 120% for meat products. Since the growth rate of yields achieved by the traditional way of plant breeding and agronomic practices is reduced. The next stage of increasing crop yields in agriculture is the new scientific achievements of biotechnology. Agro-biotechnology in Europe is at a low level. Only five countries of the European Union (EU) grow genetically modified (hereinafter called GM, GMO) crops. This situation is the complexity of risk assessment, the variation of which depends on the specific direction of the genetically engineered technologies used. There is a need to organize insurance protection, which will compensate for losses as a result of the occurrence of an insurance event.

2. Literature review

Various aspects of topical problems of genetic engineering and associated risks with this activity among foreign scientists who have dedicated their work, such as: P. Regal, B. Glick, J. Pasternak, K. Hoffmann-Sommergruber, H. Beckie, L. Hall, S. Warwick, J. Bernstein, M. Miller, S. Tierzieva, L. Hardell, M. Eriksson, I. Schuphan, B. Shmidt, G. Goldberg, B. Koch, and others.

Legal Aspects are covered in the EU Regulation Terms №1829/2003 and 1830/2003 of the European Parliament and Council. A considerable attention to the

Corresponding author:
[1] Department of Insurance, Banking and Risk Management, Taras Shevchenko National University of Kyiv.
E-mail: gudz1991@gmail.com

legislative regulation of genetic engineering and risks in the use of genetic modification is given to the Cartagena Protocol on Biosafety (available at: http://bch.cbd.int/protocol/text/), whose goal "is to promote an adequate level of protection in the safe transfer, handling, and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity, taking also into account risks to human health, and specifically focusing on transboundary movements".

It is worth noting that currently in the economic literature and especially publications relating to insurance protection of agriculture, attention is not paid to the risks associated with the transfer of transgenic organisms and the possibility of taking this risk for insurance. This issue, taking into account the organization of insurance protection of agricultural production, concerning issues, has been investigated to some extent by the US Department of Agriculture and the European Center of Tort and Insurance Law. There is a need to conduct an in-depth study of the theoretical and practical aspects of the impact of the risk of transfer of genes in the context of insurance protection organization.

3. Methodology

A genetic modification, also known as genetic engineering or recombinant DNA technology, was first introduced in 1970. The term "genetic engineering" was first defined by any operation on a wide range of methods for modifying or manipulating microorganisms through heredity and reproduction processes. Thus, the term includes both artificial selection and all presentations of bio-medical methods, among them artificial insemination, in vitro fertilization (for example, "from a test tube"), cloning. But, at the moment, the term refers to the technology of recombinant deoxyribonucleic acid (hereinafter called DNA) or cloning of genes. This method allows the selection of individual genes for transmission from one organism to another, as well as between unrelated species. This is one of the methods used to introduce new features and characteristics into microorganisms. The products derived from this technology are usually called genetically modified organisms (hereinafter called GMO's).

It is necessary to find an answer to the question of – "how much the use of GMO's is safe?" This work requires attracting a large number of scientists from different fields. The Cartagena Protocol on Biosafety to the Convention on Biological Diversity uses the term "living modified organism" (hereinafter called LMO). Article 3 of the LMO's Protocol defines it as any living organism containing a new combination of genetic material derived from the use of modern biotechnology, and "living organism" – like any biological entity capable of transferring or replicating genetic material, including sterile organisms, viruses (available at: http://bch.cbd.int/protocol/text/). GMO's are officially defined in EU legislation – as "organisms in which the genetic material (DNA) has been altered in a way that does not occur naturally: mating and/or recombining" (Commission Regulation (EU) No 1829/2003).

Genetic modification of plants is often linked to improve their ability to survive in harsh conditions, to provide greater resistance to pests and diseases, improve nutritional properties, and create conditions for resistance to the action of certain herbicides.

Biotechnologies create advantages of the perspective; however, the risks and threats that may arise in use remain to be investigated.

The gene revolution historically consists of three generations of GMO's (Balasynovych, 2012):
- First generation – crops with resistance to herbicides, insects, and viruses (grown since 1996);
- Second generation – crops with built-in vaccines and vitamins;
- Third generation – GM plants that can produce pharmaceutical materials (biopharming – the cultivation of medicinal products in the body of the plant).

4. Legal and regulatory framework

The development of genetic engineering influenced the accessibility of information systems, opening the possibility of sharing genetic information with living organisms. Ray Goldberg, a professor at Harvard Business School, predicts that the traditional agro-industry and market relations system, as a result of widespread use of genetic engineering until 2028 will become a global industry with a turnover of $8 trillion US dollars (USDA Advisory Committee on Biotechnology and 21st Century Agriculture (AC21)).

To assess safety, genetically modified food and feeds undergo a series of tests and studies. In the EU, genetically modified foods and feeds can be approved only after a through consideration by the principle of gradation, which often takes several years. First, the plant is tested in the laboratory or in greenhouses, and then for a limited time and in conditions of limited space, field trials are conducted. Only if all of these tests show acceptable risks, a permission to sell a genetically modified plant can be granted. Allowed sown areas are entered in the state register. As an additional security measure, the marketing authorization must be limited to a term of up to 10 years. After this, the request can be extended, and the plant is again tested based on the current state of scientific knowledge and confirmation that all the necessary conditions for the resolution are still being fulfilled. If it turns out that there is concern about the safety of the plant, the permit may be withdrawn at any time (Federal Office of Consumer Protection and Food Safety).

In developing countries and developed countries, determining the impact of risk and controlling them are important aspects of farming. Changes in weather conditions, climate, yield, price values, state policy, and the situation in world markets can lead to large-scale fluctuations in the production and, as a consequence, affect the incomes of agricultural producers. Risk management includes the choice of strategies that reduce the social and financial consequences of possible changes affecting the production and profits of farmers.

The five main types of risk in the agricultural sector are identified by the USDA (United States Department of Agriculture):

• Production risk. Occur from uncertain processes of natural growth of crops and livestock. Weather, disease, pests, and other factors affecting both the quantity and quality of manufactured goods;

• Market risk (price). Refers to the uncertainty about the prices that producers will impose on the goods or prices that they have to pay for the necessary resources. The nature of the price risk varies considerably depending on the goods;

• Financial risk. Refers, for example, a situation where the producer takes the money and, accordingly, creates an obligation to repay the debt. The growth of interest rates and restrictions on the availability of loans are also aspects of financial risk;

• Institutional risk. The results of institutional risk lie in the uncertainty associated with government actions. Tax laws, rules for the use of chemicals, rules for the disposal of livestock wastes, and the level of prices or financial support – are examples of government decisions that can have a significant impact on households and businesses;

• Human or personal risk. Refers, for example, problems with human health. This can affect the reputation and financial condition of the enterprise. Accidents, illness, death are all factors that can threaten business.

Insurance of risks of agricultural production in the world is an important element of the system of financial and credit support to farmers. The insurance system of the agro-industrial complex is a regulator of the processes of social and economic development in the agricultural sector, its task is not only to protect property at the time of the occurrence of the insured event and to compensate for immediate damage, but also to eliminate other violations – indirect damages resulting from the destruction or damage to property. Thus, the purpose of insurance as an effective regulator of the insurance system of the agriculture industry complex is not only the protection of property but also the provision of conditions for the harmonious development of the industry (Lobova, 2014).

This article focuses on production risks, and in particular, related to the use of genetic engineering and biotechnology. In this context, production risk is the risk associated with the undesirable and often unintended consequences of the transfer of genetically modified characteristics that affect the quality and productivity of crops and the environment.

To date, when the breakthrough of genetic engineering plays a big role in the world agriculture, it is impossible to fully understand all possible threats and challenges. Since in the process of embedding a certain gene, the modified organism acquires or can acquire a number of properties, the appearance and features of which cannot be envisaged because of insufficient knowledge of the mechanisms of the functioning of the plant genome and the principles of environmental impact (soil, other plants, etc.). As a result, in the production of GMO's, their commercial use, distribution, and consumption, a number of undesirable phenomena and risks arise that need to be investigated in order to prevent possible negative effects and manifestations of GMO's in the future. Consider the risks associated with the spread and use of GMO's, namely the risk of transfer of genes.

5. Risk of transfer of genes

In this study, in our opinion, it is advisable to introduce the concept of "risk of transfer of genes", covering all the features of the transfer of genetically modified materials in conditions of agricultural activities. The risk of transfer of genes can be characterized as the likelihood of an adverse or undesired event in the case of the transfer of genetically modified characteristics to organisms, not subjected to genetic modifications, and the severity or magnitude of consequences of this event.

The risk of transfer of genes consists of the following possible factors of influence:

- Horizontal gene transfer;
- Cross-pollination of crops;
- The appearance of resistance transgenic toxins in insects;
- Impacts on biodiversity.

The consequences of the transfer of genetically modified characteristics to related (vertical gene transfer) and to foreign organisms, such as soil bacteria, are verified by testing in the approval process.

Horizontal gene transfer is extremely rare and does not lead to any side effects in previously approved GM crops since genes are used almost exclusively from those found in the nature of organisms. Vertical gene transfer in plants occurs on a regular basis on plants with a similar degree of kinship in nature. Therefore, we should expect this for genetically modified plants. The permission for the cultivation of genetically modified rapeseed in Europe because of this remains very controversial. Rape has some distant relatives in the wild, therefore, it is impossible to completely exclude outcrossing (unrelated or far related organisms), and thus, it is necessary to analyse, you can consciously reconcile with such a spread. For the genetically modified crops – maize and potato, which are allowed to grow and are allowed to date in Europe – the transfer of genes is excluded due

to the absence of related wild plants. The homeland of corn is the tropics and subtropics and in the Europe itself, corn is not viable. Potatoes cannot reproduce themselves in a natural environment in Europe.

Europe is characterized by the largest share of collected insurance premiums in the world, followed by the insurance market of America. However, over-saturation with insurance products of most developed insurance markets in Europe and America limits their ability to grow, while the insurance market in Asia is characterized by rapid and significant growth potential (Prykaziuk, 2012).

The insurer must use standardized provisions to determine whether the insurance risk includes the following issues, such as:
- Can the frequency and severity of possible events be evaluated?
- Are the occurrences of this harm always random?

At the moment, for risks associated with the use of GMO's, there are clearly more unknowns than known variables for insurers. The following variables can be referred to unknown variables:
• Lack of statistical base for losses (for short or long term);
• The technologies used to create GMO's are constantly developing;
• Variation of available varieties of GM crops is constantly growing.

Thus, assessing the risks specific varieties of GM crops or influence of several species at once, it is difficult to characterize the long-term consequences. Obviously, at the moment, the data are unknown variables by actuarial methods difficult to evaluate.

Therefore, assessing the risks inherent in specific types of GM crops or the influence of several species at once, it is difficult to characterize the long-term consequences. Obviously, at the moment, the data are unknown variables by actuarial methods difficult to evaluate.

6. Concept of insurance service

One of the key problems that concern all types of insurance is a wide range of risk scenarios due to the difference in the potential of different plant species to transfer of genes. Therefore, the achievement of a single insurance solution for all types of plants is almost impossible. The administrative expenses of the insurer at the same time (for production, marketing, risk management of specific insurance products) will be significant.

Another important issue concerns the degree of probable harm, should be covered under the terms of the insurance contract. This study examines the economic consequences of cross-pollination of GM crops with crops that do not contain genetically modified organisms. Genetically modified and non-GM crops can probably be mixed during planting, during harvesting, seed drying, or during transportation for storage.

Pollen can spread from GM to non-GM plantation areas because of the influence of: wind; insects, are able to carry GMO's; other animals. Contamination can occur at one or several stages of production. This probability depends on several variables (Koch, 2007):
- Harvest of the specific culture;
- Location;
- Cross-breeding of related organisms/compatibility of crops;
- Competitive features (advantages/disadvantages) of introduced features and environmental consequences.

Testing for the presence of genetically modified content in cereal crops becomes critical in assessing losses. In addition, testing is necessary to preserve the specific characteristics of culture behind all stages of the production chain. The concept of "segregation" is used in this article to explain the process, by which the crops are stored (GM and non-GM) separately to avoid mixing during harvesting; loading and unloading; transportation and storage. Thus, this process requires that equipment (for example, a harvester) for planting and harvesting, freight transport for the transportation, storage facilities/elevators, subject to mandatory maintenance and regular cleaning. At the same time, this process can not include containerization – as the handling of goods by highly mechanized methods.

Unlike segregation, there is a hard and expensive process of differentiating products that require strict distribution, usually involving containerization. This process is called "IP-certification" (Identity preservation certification). IP-certification is an international system of voluntary certification, provides for an independent certification body to certify the supply chain of non-GM agricultural raw materials or food products derived from it, as well as verification of the quality management system in place, from the seed of crops to the shelves of stores. IP-certification is carried out in accordance with the European Union regulations for non-GMO's, including the EU Directive 2001/18 and Rules 1829/2003 and 1830/2003 (Commission Regulation (EU) No 1829/2003; No 1830/2003). These documents establish requirements for all processes in the supply chain, including up to the supply of seeds, cultivation, sale, industrial processing, storage of agricultural crops, their transportation, as well as the selection and analysis of samples. IP-certification reduces the need for additional testing since the product is controlled to another subject with a reduced risk of transfer of genes. However, no segregation system can guarantee 100% purity.

At present, the US grain market is characterized by large volumes and high-speed operations. The rapid adoption of biotechnological crops and the emergence of a number of products with input characteristics

require the introduction of the enhanced monitoring system and the development of conditions to ensure safety from the onset of associated risk events.

There is a complex and expensive method called "polymerase chain reaction" (PCR), which is an experimental method of molecular biology, which can be used to identify a specific foreign genetic material in plant DNA. This method is difficult to adapt for rapid monitoring. The test takes 2 to 10 days, the cost varies 200–450$. Also, the problem lies in the procedure for determining the sample size. Most of the industrialized countries of the world set requirements for crops produced using biotechnology, which assesses their impact on the environment and safety as an end product.

The regulation of GM products in the EU is carried out according to the rules for different types of GM crops. The allowed varieties of GM crops in Europe are smaller than in the US.

Concerning the potential impact of large-scale production of biotechnological crops on the environment, the following problem areas can be noted:

- Potential for the spread of transgenes in other plants leads to harmful consequences, namely, the development of weeds with increased resistance and contamination of non-GM or organic crops;
- Increased resistance to transfer to pests (insects);
- Unexpected adverse effects on various groups of organisms in the ecosystem.

At present, there is a small amount of information on the damage caused to the environment from the use of GM crops. Risk assessment aims to increase consumer confidence and promote the smooth operation of markets.

To develop a crop insurance program where the risk of transfer of genes will be introduced, it is necessary to consider how processes and procedures will be changed. In particular, the important issue is the procedure for determining the size of the insurance premium. The expected yield is sensitive to the sample, and even more so when there may be a risk factor for gene transfer. In many countries, data are used in only four years, while in some countries it is used for ten or more years to calculate the expected yield. Taking into account the risk of transfer of genes, in our opinion, data should be used for ten or more years, through changing yield trends as a result of technological changes. Also, the process of verification and control is an important issue. This issue is that the insurer needs to develop a methodology for checking and monitoring neighbouring areas (enterprises) from the insured, can carry a probable danger. Creation of a database and data reduction by area in accordance with the levels of regions, regions, holdings, individual farms, is the initial task when creating conditions for the organization of insurance protection.

Insurance coverage of income loss can theoretically include various types of insurance, depending on the structure of liability for such losses. Among them we can distinguish the following: insurance of commercial liability of GMOs to third parties; insurance of liability for product quality or coverage of the presence of GM signs of goods produced by no GM farmer; agricultural insurance against pecuniary damage no GM farmer or if the consequences of the impact of the risk of transfer of genes were discovered only after the genetically modified product was transferred to customers; insurance of liability for the quality of products produced by GM seeds. However, determining the availability of coverage for each of these types of insurance is problematic for a number of reasons.

Consider the features of covering losses from the risk of transfer of genes, namely, a single factor – cross-pollination. This study was given attention in the report of the European Center for Tortious and Insurance Law (Koch, 2007). Losses from cross-pollination, as a rule, are not included in the insurance coverage through the computability of a number of associated risks. Especially in countries where the responsibility of farmers growing GM crops is rigidly regulated, there is no problem of finding evidence of causality.

Two alternatives for settling such losses from cross-pollination incurred by farmers were developed in practice in parallel with the insurance decision (Goldberg, 2000; Koch, 2007): differently organized and financed compensation funds, as well as contractual features, for which the seed producer obliges itself to buy any of the farmers' crops in neighbourhoods affected by unwanted cross-pollination at the price of non-GM crops. In such cases, any need for insurance does not arise. But given the economic realities and peculiarities of doing business, legislative regulation of each individual country, these alternatives are not effective for a wide range.

If the losses from cross-pollination are covered by insurance, the question arises as to the extent and conditions, under which this insurance protection can be provided. In addition to agreeing on monetary limits, consideration in the first place should concern the development of safety standards to prevent the undesirable influence of GM in any GM culture. Let us consider features of each type of insurance separately:

1. Insurance of commercial liability of an entrepreneur who produces GM crops before third parties. Since entrepreneurs/farmers who grow GM crops, in any case, are subject to liability for the consequences of their activities, in the event of damage caused to them, there is the possibility of including this risk in commercial liability insurance to third parties. The biggest obstacle is that the maximum insurance amounts are often low compared to the available financial losses. In addition, undesirable cross-pollination can also be considered as environmental damage and, in this case, a wide variety of exceptions, by sudden pollution. In the case of losses from cross-pollination, associated with those types of

plants where growing GM crops almost inevitably leads to cross-pollination, insurance will be denied because of the lack of chance events. However, everything depends on the structure of the insurance contract. The most important factor in criticizing insurance, in this case, is the uncertainty in whether a farmer grows GM products are only liable if the legal limit of 0.9% is exceeded or the neighbouring area is insured (the other farmer) guarantees to his customers compliance with lower thresholds under the contract (Koch, 2007). This is important because even if all the necessary safety standards are followed, it is virtually impossible to avoid any traces of cross-pollination, at least in the case of commercial growing GM crops.

2. Agricultural insurance against material damage does not belong to the GM of the farmer. Even if a farmer has concluded an agricultural insurance contract without any specific exemption (indication) that will concern GMOs, the loss of income for unwanted cross-pollination can usually be covered since the contract covers a limited number of hazardous natural phenomena. By the time, traditional agriculture is the rule, and farmers who grow GM crops are an exception.

3. Insurance of liability for product quality or coverage of the presence of GM signs of goods produced by no GM farmer. If the consequences of undesirable cross-pollination were not seen before the crop was sent to customers, then this type of insurance can be attracted, provided that the farmer is responsible for the consequences of cross-pollination under warranty provided to his client. It can be assumed that insurance coverage does include purely economic losses (provided that the legal system takes into account the consequences of cross-pollination not as harm to property but as economic losses).

4. Insurance of the responsibility for the quality of products produced by GM seeds. Covering losses from cross-pollination under the responsibility for the quality of products produced by GM seed producers is unlikely to play a significant role, since the manufacturer, as a rule, cannot be held accountable because its product is not defective. Therefore, the responsibility, which producers may be subject to, may concern the obligation of the seed producer to inform and alert the GM of the farmer (the client) about the risks associated with growing GM seeds and inform about possible safety measures. This, however, suggests that the seed producer's obligation must be reflected in the legal system, respectively.

So, insurers must decide, in which form to offer the possibility of insurance coverage for the consequences of unwanted cross-pollination. They have several options for structuring the proposed protection: in addition to the ability to negotiate certain maximum insured amounts (events and annual aggregate limits, and franchises), the question of what types of plants and GM crops should be included. Currently, more than 40 plant varieties already tested are planned to add genetically modified characteristics. Since the probability of undesirable cross-pollination may be very different from each variety and, in some cases, cross-pollination even seems almost inevitable (for example, rape). Based on this, one comprehensive insurance solution for all plant species cannot be found. On the other hand, insurers will have to clearly define the rules of professional practice in the cultivation of genetically modified plants as a prerequisite for covering losses of cross-pollination, at least where the relevant regulations are not available. This may, for example, include provisions on the erection of a clear division between no GM and GM crops; control and inspection in the compilation of agricultural machinery used in the fields of both types of crops; as well as criteria for the separation of both types of crops during storage and transportation.

7. Conclusions

Consequently, the research carried out to find ways for solving the issue of organizing insurance protection for agricultural producers regarding the risk associated with the biotechnology industry has made it possible to find out the essence of genetic engineering and to identify the essence as an object of providing insurance services.

In addition, the concept of the risk of transfer of genes, its specific features, influence, and possible consequences for agricultural commodity producers are defined. In our opinion, it is advisable to combine all considered factors, for generalization and identification of one common risk, namely, the risk of transfer of genes. By combining this group of factors with the inherent areas of genetic engineering in agriculture, it is possible to create a single program of crop insurance, which will protect agricultural producers from economic losses.

The next step was to implement a description of the concept of an insurance service, to address the risk of transfer of genes. The stages in creating the concept of insurance services are defined, among them:

- Types of compensation mechanisms are indicated. The types of compensatory mechanisms considered are to be modelled on the existing crop insurance market. In our opinion, in order to receive compensation, a separate economy (enterprise/farm), it is necessary to demonstrate the following characteristics:

1) The intention to make a product that has retained its identity to the manufacturer's standards (composition of %-GMO, if allowed by the rules);
2) The use of technologies used to produce the product (description and characteristic);
3) Actual financial losses incurred by the manufacturer for the period. Holdings that have received this insurance before planting the crop will be entitled to such compensation if the above criteria are met. The public institution should seek the help of a responsible authority to ensure that the program is designed in such

a way that it minimizes the consequences of potential adverse events.

- Analysed existing tools and testing methods for checking and measure the availability of GMO's. The following methods are described and characterized: segregation, IP-certification, PCR technique (polymerase chain reaction).
- The need for additional measures to ensure the economic security of the state is identified. The potential for the spread of transgenes in other plants leads to harmful effects, namely, the development of weeds with increased resistance and contamination of non-GM or organic crops; increasing resistance to pest control and unanticipated harmful effects on various groups of organisms in the ecosystem are important issues. However, in our opinion, a small amount of information on environmental damage caused by the use of GM crops is a major problem at the state level and requires a quick and effective approach to the solution.

As biotechnology in agriculture is developing rapidly, and the number of crop species that are subject to the genetically modified material is increasing, there is a need to develop a methodology to protect traditional crop producers. Also, given the insufficient level of legal and regulatory provision that would allow combining legislation in international markets and introducing a unified system of documentation for tools in checking and controlling activities.

To the considered risk, the available theoretical and practical insurance base can be applied, as well as some specific features inherent in the risk of transfer of genes and allocate it in the insurance protection system. Research on this subject requires additional justification and coverage and requires the involvement of a wide range of scientific and professional staff.

At present, despite the substantial volume of publications on genetic engineering research in agriculture, labour, there have been no problems of organizing insurance coverage. A consideration of the possibility of organizing insurance protection with proposals at the legislative level is only the report of the European Center for Tort and Insurance Law (2009), which examined the issue of responsibility for the factor of cross-pollination. Also, the report of the USDA Advisory Committee on Biotechnology and 21st Century Agriculture for 2012, considered the types of compensation mechanisms in the event of economic losses, due to the presence of genetically modified material in rural economy crops, among which the possibility of crop insurance is determined. However, further steps are identified in the development of such an insurance program.

A further direction of research on this issue is the relationship of the subjects participating in the insurance process from the positions: risk analysis; Involved instruments for determining the impact and consequences of risk; Improvement of the legislative framework governing the organization, implementation and monitoring of GMOs in the agrarian sector; Search for features in the definition and calculation to develop an effective insurance service.

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Генрих ГУДЗЬ

РИСК ПЕРЕНОСА ГЕНОВ В СТРАХОВОЙ ЗАЩИТЕ СЕЛЬСКОХОЗЯЙСТВЕННЫХ ТОВАРОПРОИЗВОДИТЕЛЕЙ

Аннотация. В статье рассматривается риск передачи генов, их влияние и возможные последствия для сельскохозяйственных производителей; возможность создания страховой услуги для устранения этого риска. *Цель статьи* – обосновать результаты исследования переноса риска генов в сельском хозяйстве при организации страхового покрытия. *Задачами этой статьи являются*: прояснить суть генной инженерии как объекта предоставления страховых услуг; определить концепцию переноса риска генов, его особенности, воздействие и возможные последствия для сельскохозяйственных производителей; провести описание возможности создания страховой услуги. *Объектом исследования* является риска переноса генов в страховой защите. *Предметом исследования* являются теоретические и методологические подходы к оптимизации риска переноса генов в страховой защите. *Методология*. Эта работа требует привлечения большого числа ученых из разных областей. Правовые аспекты, предусмотренные в Правилах ЕС №1829 / 2003 и 1830/2003 Европейского парламента и Совета. Значительное внимание к законодательному регулированию генной инженерии и рискам при использовании генетических модификаций уделяется Картахенскому протоколу по биобезопасности. Следует отметить, что в настоящее время экономическая литература, и особенно публикации, связанные с защитой сельскохозяйственного страхования, не обращают внимания на риски, связанные с передачей трансгенных организмов, и возможность взять этот риск на страхование. В работе используется опыт Министерства сельского хозяйства США и Европейского центра страхового законодательства. *Результаты* исследования показали, что внедрение механизма страхования имеет основное отличие в том, что данная операция учитывает, как субъект, которому нанесен ущерб, мог бы получить большую прибыль, чем по факту причиненного вреда другим фермером. В связи с этим, первым вариантом страхования может выступать страхования ответственности последнего. В любом случае, механизм страхования позволяет объединять риски между большой группой предприятий или отдельных фермеров, склонны к нему, и данная группа может быть расширена отдельным положением или законом. Также, были рассмотрены особенности покрытия потерь от риска трансфера генов, а именно, отдельного фактора – перекрестного опыления.