

**SCTCMG 2018**  
**International Scientific Conference «Social and Cultural  
Transformations in the Context of Modern Globalism»**

**REGULATION MECHANISM OF SYSTEMIC RISK IN  
AGRICULTURAL INSURANCE**

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*Abstract*

This paper deals with studies into possible stabilization of the Russian system of agricultural insurance in conditions of increased systemic risk. Presence of a systemic risk in activities of the national agricultural insurance has been confirmed. Risk-contributing factors in activities of participants of the Russian agricultural insurance are identified and grouped by cause and source of the systemic risk. In operational conditions of the Russian agricultural insurance system, the most significant source of the systemic risk is farmer, then the state, while the agricultural insurance underwriter is only third in significance. A mechanism is proposed for regulation of the systemic risk in the Russian agricultural insurance, providing, identification and analysis of systemic risk sources, causes and factors, development and implementation of preventive measures aimed at reducing the systemic risk on the basis of public-private partnership. The mechanism recommended by the authors is based on employing a mathematical apparatus that includes Ishikawa charts, STEEPL analysis, hierarchy analysis method, Pareto principle (20/80 rule) and a software solution for priority evaluation of alternative preventive risk aimed at risk localization. A differentiated list of 8 alternatives is given that allows localizing the conflict of interests in the subsidized agricultural insurance in Russia. Balanced development of the agricultural insurance in Russia is justified based on using advantages of both combined and mixed models. It has been shown that to use these models, the Russian agricultural insurance shall provide real public-private partnership allowing leveling a negative influence coming from sources of systemic risks.

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**Keywords:** Mechanism, risk, conflict, agricultural, insurance, partnership.



## 1. Introduction

Insurance as an economic phenomenon should be considered along various cross-sections. For example, from the beneficiary's point of view, it is a method of managing risks, to which the beneficiary is subjected throughout their life cycle that provides a possibility to transfer the insured risk in full or in part. External outsourcing may serve as an alternative for agricultural producers in the production sphere. From the insurance underwriter's point of view, it is a type of commercial activity with all the resulting risks for the insurance company that takes beneficiary's risks for a certain insurance premium. Finally, insurance may be seen as a systematic set of certain economic relations that may be either in stable or unstable state. This system of economic relations between all the participants in agricultural insurance is the subject of our research in this paper.

According to the theory and practice of the agricultural insurance (Mahul & Stutley, 2010), there are various models of the agricultural insurance. For example, basic models of the agricultural insurance include: the model of crop insurance and/or loss of farm animals insurance; a model of insurance of farmer profits that guarantees a compensation of losses due to crop shortfalls and/or loss of farm animals, as well as fall in prices for the agricultural produce; a model of combined insurance of farmer's activities: insurance of both crop harvest and/or loss of animals and farmer's profits. The model of insurance of crop harvest and/or loss of farm animals is the one used nowadays in Russia.

According to the source of financing, the basic models of the agricultural insurance include: the model of agricultural insurance with the governmental support that provides subsidizing the insurance premium; the model of agricultural insurance without the governmental support; the model of mixed agricultural insurance. Nowadays in Russia, the mixed agricultural insurance model is used in practice that assumes simultaneous possibilities for agricultural insurance with or without participation of the state in financing of a part of the insurance premiums.

Features of the agricultural insurance include, first, insufficient information foundation and comparative narrowness of data on insurance risks (events insured). Second, there is a significant correlation between the risk factors (of the event insured) among the insured properties in the same natural and climatic zone. Third, increasing human influence onto the productive activity of agricultural insurance beneficiary and operational activity of the agricultural insurance underwriter. Fourth, there are not two (as in the classical case), but three participants to an insurance operation that now involves the state. For example, stakeholders in the current system of agricultural insurance in Mexico are the government, the private sector and agricultural producers through so-called mutual insurance funds (Kulenkampff & Aizpun, 2016). In different countries the conflict of interests between these participants of the agricultural insurance manifests differently. In countries with prevailing subsidized agricultural insurance, the conflict of interests is manifested to a larger degree. (Zarkovic et al., 2014).

## 2. Problem Statement

Nowadays, many countries, both developing and with a well-developed economy, use subsidized agricultural insurance within the framework of an optional insurance, however, observed losses of agricultural producers in such countries witness to issues with the efficiency of national agricultural insurance systems. This includes the Russian system of the agricultural insurance, which is also performing

poorly nowadays. The timeliness of the efficiently problem of the national agricultural insurance systems is linked to presence of systemic risks in insurance, as well as to various approaches in formation of national systems of the agricultural insurance, including combined agricultural insurance. The theoretical relevance of research into this problem lays in extending the set of tools used in management of systemic insurance risk, including that in the agricultural insurance. The practical relevance of this research is in the fact that efficiency of the subsidized agricultural insurance lays not only in state financing of a part of premium, but in construction of a full-scale public and private partnership for localizing the conflict of interests in the national agricultural insurance.

Necessity of a public-private partnership (hereinafter – PPP), which is an efficient mechanism for risk management in a national agricultural insurance is noted in the publication by an administrator of the Risk Management Agency (RMA) in the area of foodstuff and produce, as well as in a publication by the head of the Program for financing risks and emergencies and the Insurance program of the World Bank (Mahul & Stutley, 2015), while relevance of the PPP is noted in (Xing & Lu, 2010). As we see, the need in the PPP in the countries that subsidize the agricultural insurance is caused exactly by the presence of the conflict of interest among the participants of the insurance operation in the agricultural sector. The level of PPP development is witnessing to understanding and a degree of attention to manifestations of possible conflict of interest leading to a risk of reducing the stability of the national system of the agricultural insurance.

### **3. Research Questions**

Insurance protection plays an important and ever growing role in the modern economy, including agriculture. One of the main strategic tasks of the economic policy of the Russian government in the agricultural sector is further improvement of the subsidized agricultural insurance that has been used in Russia since 1993. There is no doubt that the real capabilities of the agricultural insurance are among the contributing factors to stability of agriculture and the most important infrastructural component in development of the agroindustrial complex (AIC) as a whole. Agriculture is a very risky use of the land resources due to a large influence from climatic and weather conditions. Agricultural insurance is, undoubtedly an important financial infrastructural component of the development mechanism of the modern agriculture. In Soviet Russia, there was a mandatory agricultural insurance, a model, which is used until now in Switzerland for farm animals, in Israel for crops, in Kazakhstan for crops, and in Belarus for both crops and farm animals (Tsakaev & Saidov, 2018). However, in most countries, including modern Russia, voluntary insurance prevails.

Regulation of agriculture on the basis of measures aimed at raising the level of market relations may lower the barriers for the market entry and improve the competition for the underwriters, but excessive state interference may distort the price signals, force out the private sector underwriters and create unstable expenses for the state (Mahul, Clarke, & Lung 2010). There is no doubt that the agricultural insurance protects the agricultural producers against loss of crops or farm animals and reduced profits risk. Modern agricultural insurance is based on indexes and has a disadvantage in a presence of a basic risk that sometimes may be quite significant. Besides, there is a controversy about advantages of subsidized and private agricultural insurance: countries with increased agriculture risk level tend to prefer subsidized

agricultural insurance; those with a well-developed agriculture and insurance business usually prefer the private agricultural insurance.

#### **4. Purpose of the Study**

The aim of this study is to improve the efficiency of the national agricultural insurance system by regulating the risk to reduce the stability of the national agricultural insurance system. Within this paper, the authors present the mechanism for managing the systemic risk in the Russian agricultural insurance appearing due to the conflict of interest of its participants.

Features of the agricultural insurance include, first, insufficient information foundation and comparative narrowness of data on insurance risks (events insured). Second, there is a significant correlation between the risk factors (of the event insured) among the insured properties in the same natural and climatic zone. Third, increasing human influence onto the productive activity of agricultural insurance beneficiary and operational activity of the agricultural insurance underwriter. Fourth, there are not two (as in the classical case), but three participants to an agricultural insurance operation, adding the state. For example, stakeholders in the current system of agricultural insurance in Mexico are government, the private sector and agricultural producers through so-called mutual insurance funds (Kulenkampff & Aizpun, 2016). In different countries, the conflict of interests between these participants of the agricultural insurance manifests differently. In countries with prevailing subsidized agricultural insurance, the conflict of interests is manifested to a larger degree.

Originality and novelty of this research lays in considering the conflict of interests in the subsidized agricultural insurance as a systemic risk: a risk of reducing the stability of the national agricultural insurance system. This risk manifests differently, depending on the level of the country's economic development: in developed economies the consequences are milder, while in developing economies they may be very significant.

#### **5. Research Methods**

A systemic approach (O'Connor & McDermott, 1997) was used as a methodology for this research of the problem that impedes the development of agricultural insurance in Russia, as this approach allows considering the agricultural insurance in Russia as a social and economic system. Development of any national system of the agricultural insurance is determined by manageability of its inherent systemic risk. Features (peculiarities) of functioning of the agricultural insurance system in a country shall be considered its systemic risk. The risk of reducing the stability of the national agricultural insurance system as a systemic risk is influenced by a conflict of interest between the following three participant of the agricultural insurance: state (represented by governmental institutions), agricultural producers (enterprises and personal farms) and agricultural insurance underwriters (insurance and reinsurance organizations). It is especially vivid in the subsidized agricultural insurance.

To identify the sources, causes and factors of the risk to reduce the stability of the Russian agricultural insurance system, the authors used the cause-and-effect diagram (Ishikawa, 1985), which is known as the most efficient method for revealing the cause and effect phenomena while determining their relative significance, that is, in a qualitative form. Prioritizing the sources, causes and origins of

manifestation of the risk to reduce the stability of the national agricultural insurance system on the basis of plotting a cause-and-effect diagram provides utilization of STEEPL analysis (Walden, 2011) for registration of the origins (factors) of the systemic risk. Application of the hierarchy analysis method (Saaty & Shang, 2011) to prioritize the preventive measures for localization (neutralization) of the risk to reduce the stability of the national agricultural insurance is based upon applying the 20/80 rule (Koch, 2002) to the origins (factors) of the studied systemic risk. MPriority 1.0 (Belov, 2014) software solution was employed by the authors to make the calculations involving large data bases more convenient.

## 6. Findings

The analysis of dynamics of premiums, insurance benefits and payoff ratio in the Russian market of agricultural insurance as a whole and in its subsidized part during the sanction period (Tsakaev & Saidov, 2018) witnesses to the following: agricultural insurance in Russia as a whole and in its subsidized part preserves a lower level of benefits as compared with the Russian insurance market (the difference is - 3,5%). Within the structure of the agricultural insurance, the amount of insurance benefits in contracts with individuals reduced by a factor of 4.6, and in contracts with sole proprietors by a factor of 6.6. The payoff coefficient for the agricultural insurance contracts with sole proprietors reduced by a factor of 16.0. In 2017, as compared to 2014, the number of federal subjects of Russia that subsidized agricultural insurance contracts reduced almost twofold, the number of agricultural producers obtaining subsidies for the insurance contracts reduced by a factor of 18.2, insured crop area reduced by a factor of 9.8, insured value (in transaction prices) reduced by a factor of 5.6. In animal husbandry the insurance-related situation, while developing in a positive trend, still has some negative moments: involvement of federal subjects and agricultural producers continues to reduce.

Among the features of the agricultural insurance, the first is insufficient information foundation and comparative narrowness of data on insurance risks (events insured). Second, there is a significant correlation between the risk factors among the insured properties in the same natural and climatic zone. Third, increasing human influence onto the productive activity of agricultural insurance beneficiary and operational activity of the agricultural insurance underwriter. Starting from 2017, allocation of subsidies for the agricultural insurance within the framework of the unified subsidy to facilitate achievement of regional target figures of agribusiness development significantly worsened the dynamics of both subsidized agricultural insurance and the Russian agricultural insurance as a whole. All this is an evidence of imperfection and, as a result, of instability of the Russian agricultural insurance system, which mostly uses the subsidized agricultural insurance model.

For the risk of reducing the stability of the Russian agricultural insurance system, the following sources and causes are proposed for consideration, as determined by the STEEPL analysis:

Source 1: Agricultural Insurance Beneficiary Causes: reduced demand for insurance from agricultural producers, financial and economic situation of agricultural producers.

Source 2: Agricultural Insurance Underwriter: Causes: reduced supply from agricultural insurance underwriters; underdevelopment of reinsurance market in Russia; weak competition in the agricultural insurance market.

Source 3: The Russian State: Causes: Insufficient governmental attention to the sphere of the agricultural insurance; criminalization of the sphere of agricultural insurance; introduction of a regional unified subsidy in agriculture.

From the Ishikawa diagram and the results of the STEEP analysis, the authors identified and linked the origins (of the risk factors), causes and sources of the risk to reduce the stability of the Russian agricultural insurance system (hereinafter, RRSRAIS).

Two origins of the systemic risk are linked to the agricultural insurance beneficiary as a source of the considered systemic risk: reduced demand for insurance from agricultural producers, financial and economic situation of agricultural producers. The factors that influence the reduction in demand for agricultural insurance from the agricultural producers are, primarily: low level of insurance culture among the agricultural producers; low efficiency of state financial support to the agricultural insurance; distrust of agricultural insurance underwriters; governmental bailout in case of emergency even without agricultural insurance contracts; strict requirements in the area of seed use, conformance with the agricultural technology, harvesting in the optimal time window; ignoring the level of technical and process development of agricultural producers when determining the price of insurance and calculating the insurance benefit; complicated procedure for obtaining subsidies and effecting a contract for agricultural insurance; high price of the agricultural insurance; limitation of insurance protection of the agricultural insurance with state support. Major factors that influence the financial and economic situation of agricultural producers include: weak financial stability of agricultural producers; low liquidity of agricultural assets; permanent financial insolvency of most agricultural producers.

The Russian State: as a source of systemic risk primarily produces the following three causes of the systemic risk: insufficient attention on behalf of the state to the field of agricultural insurance; criminalization of the field of agricultural insurance; lacking or insufficient interaction of the state with other participants of the agricultural insurance. The factors that cause insufficient attention on behalf of the state to the field of agricultural insurance include: lack of efficient mechanisms for protection of interests and rights of agricultural insurance beneficiaries and underwriters; lack of national rating system for reliability of agricultural insurance underwriters; absence of regulatory framework and unified rules for loss adjustment in agricultural insurance; complicated procedure for applying for and obtaining the state support for an agricultural insurance underwriter; absence of a comprehensive list of required documents; low quality of consulting services in agricultural insurance issues; formally voluntary insurance in reality is a prescribed agricultural insurance. Factors that influence the criminalization of the agricultural insurance primarily include the following. Absence of systematized information on legal precedents in prevention of fraud and abuse of rights in agricultural insurance. Absence of methods and tools to fight illegal manifestations in agricultural insurance; absence of a system of countermeasures against insurance fraud; absence of a unified autonomous organizational structure/bureau to counter insurance fraud. Distortion of financial and other reports in agricultural insurance; imitation of insurance events by destroying the crops and slaughter of animals or by counterfeit sales of unaccounted produce; absence of significant sanctions to be used against agrarians who intentionally distort their agricultural accounting with a so-called agro-lawyerism. Factors that influence the level of interaction between the state and other participants of agricultural insurance primarily include: transparency of information on interaction of the state with

agricultural insurance beneficiaries and underwriters; stability of state institutions of the agricultural insurance market; or a weak interest on behalf of the state to cooperation with agricultural insurance beneficiaries and underwriters.

The following three sources are primarily linked with the agricultural insurance underwriter as a source of the systemic risk: reduced supply from agricultural insurance underwriters; underdevelopment of reinsurance market; weak competition in the agricultural insurance market. The factors that influence the reduction in supply from the agricultural insurance underwriters include: absence of reliable long-term statistics on yield of major crops and loss of animals with breakdown per regions; incomplete and untimely supply of state subsidies to cover the agricultural insurance contracts; lack of trust in business solvency of the underwriters; narrow range of insurance products. Factors that influence the state of reinsurance market primarily include: absence of a unified methodological foundation for insurance and reinsurance in agriculture; absence of specialist reinsurance companies. Factors that determine the level of competition in the agricultural insurance market primarily include: unfair competition in the agricultural insurance; dumping policy on behalf of some agricultural insurance underwriters.

On the basis of the hierarchy analysis method (HAM), the authors constructed a three-level hierarchy that provides achieving the stated goal – minimizing the risk to reduce stability of the Russian agricultural insurance system; specification of criteria for agricultural insurance beneficiaries, underwriters and the Russian State: as sources of the conflict of interest; development of specific measures to influence the identified causes of the systemic risk in the Russian agricultural insurance (8 alternatives).

The following are the 8 alternatives (preventive measures) that allow reducing the RRSRAIS level, ranked by HAM with MPriority 1.0 (beta) software: 1. Stimulating the demand of agricultural producers for insurance products (24.6%); 2. Increased attention to the agricultural insurance on behalf of the state (20.3%); 3. Improvement of financial and economic situation of agricultural insurance beneficiaries (19.1%); 4. Reducing the criminalization of the agricultural insurance field (14.4%); 5. Increasing the level of interaction between the state and other participants of the agricultural insurance (9.3%); 6. Stimulating the demand on behalf of the agricultural insurance underwriters (5.6%); 7. Development of reinsurance market in the Russian Federation (3.5%); 8. Stimulating the competition in the agricultural insurance market (3.2%).

The first two alternatives cover about 45.0% of the effect to reduce the considered systemic risk in the Russian agricultural insurance. Within the framework of decision making considering the risk of reducing the stability of the Russian agricultural insurance system, the Pareto law (also known as a 20/80 rule) will work if there are more than 30 various preventive measures (alternatives), requiring developing a specific measure for each origin (risk-forming factor) identified). We have identified about 37 of such factors, thus, providing the conditions for Pareto theorem to hold.

Annually, budgetary funds are allocated within the framework of subsidized insurance by special decrees of the Government of the Russian Federation and by main executive authorities of the federal subjects of Russia.

The main results of our research are, first, the statement that while by law the insurance of property in Russia is voluntary, the real form of insurance in the Russian agriculture is a prescribed insurance, thus leading to a conflict of interest between the participants of the agricultural insurance operation and creating

a systemic risk in the subsidized agricultural insurance; second, to neutralize the systemic risk in the Russian agricultural insurance, a special mechanism is needed that allows using advantages of both combined and mixed models of the national agricultural insurance system while keeping its voluntary nature.

## 7. Conclusion

Balanced public-private partnership allows forming a special mechanism to neutralize the systemic risk in the agricultural insurance. Among recommended proposals, one shall note, first, the mechanism of minimizing the risk to reduce stability of the Russian agricultural insurance system by a complex application of Ishikawa diagram, Pareto theorem, STEEPLE analysis and hierarchy analysis method, allowing: identifying sources, causes and origins (factors) of the systemic risk, ranking them according to their significance as well as developing and implementing adequate solutions (preventive measures) for timely neutralization of the conflict of interest in the Russian agricultural insurance. Second, speaking from the experience of other countries (Spain, Canada, the US and others), Russia needs to create and develop possibilities to apply the model of combined agricultural insurance and forming a real public-private partnership in the agricultural sector of the Russian economy with the aim of efficient management of the systemic risk to reduce stability of the Russian agricultural insurance system. Third, in conditions of budgetary limitations of Russia and acute lack of funding for agricultural insurance among the agricultural producers, there are reasons to develop a more evolved list of alternatives (not just the 8 ones given above) on the basis of analysis of all the identified origins of the systemic risk (risk-forming factors) and select one fifth of them as the most realistic measures (alternatives) for stabilization of the Russian agricultural insurance system in conditions of continuing sanctions and digitalization.

Implementations of the proposed mechanism to manage the risk to reduce the stability of the Russian agricultural insurance system will allow optimizing the capabilities of the subsidized insurance model for agricultural activities even in conditions of the unified regional subsidy, thus providing balanced development of the agricultural insurance.

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