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INSURANCE IN AGRICULTURE- SITUATION IN THE REPUBLIC OF MACEDONIA

Abstract

Agricultural production faces many risks that makes agriculture a notoriously risky business. Issues of high price risk caused by potential price instability and production risk resulting from variations in the levels of production that primary producers can achieve from their current activities, are the main concerns to the agricultural sector. This is especially highlighted in developing countries where agricultural producers are severely exposed to uncertainties of the weather, prices, disease and socio-economic environment that makes them live in extreme uncertainty and on the line of survival. It is clear that risk management in agriculture is a crucial issue. In this since, insurance, as a market based risk management instrument, is of great importance for agriculture, particularly in developing countries.

Objectives of this paper are to review and analyze conceptual framework of agricultural risk management and insurance, as a risk management strategy. Focus will be given to the situation with agricultural insurance in the Republic of Macedonia. At the end of the paper, conclusions and some recommendations will be drawn.

Key words: risk management in agriculture, agricultural insurance, Republic of Macedonia

JEL Clasification: Q10, G22, G31, Q18, Q19

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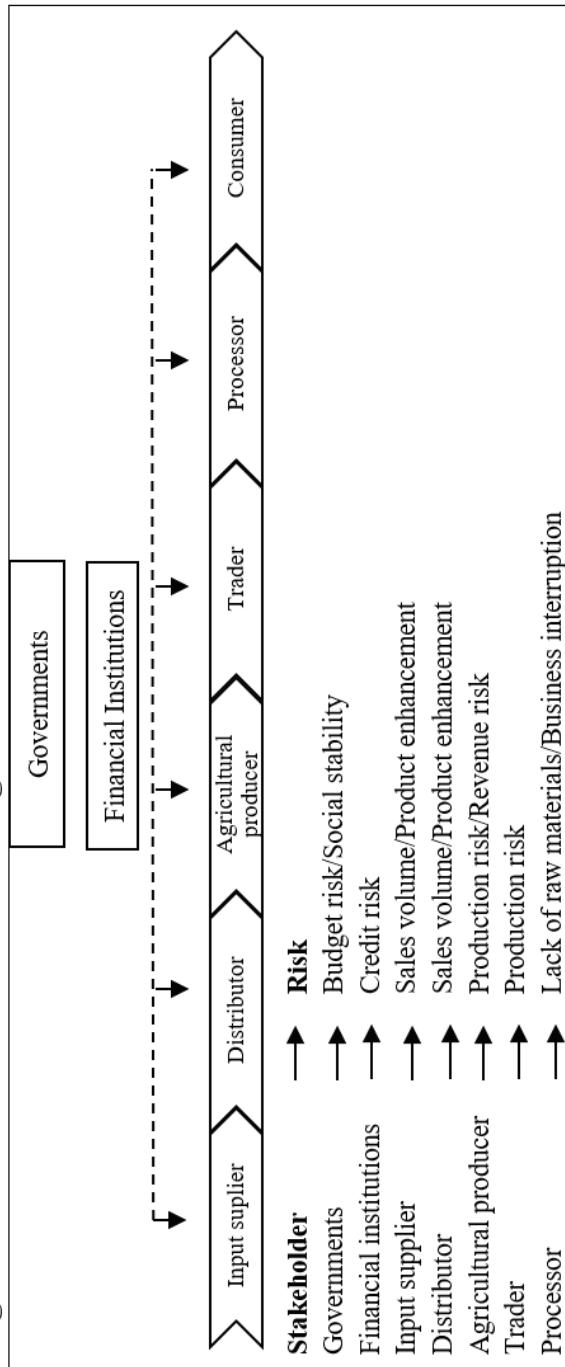
Introduction

Agricultural producers make decisions every day that affect their operations. Many of the factors that influence the decisions they make cannot be predicted with complete accuracy-this is risk. Agriculture as a production with biological characteristics and depended on the climate conditions, is predetermined to be risky, but its riskiness rise as it becomes more market-oriented. Nowadays, two major risks that concern agricultural sector are price risk due to liberalization of trade and production risk caused by the effects of climate change. In the modern dynamic environment, both in natural and socio-economic aspect, it is likely that these major risks will increase in the future.

As the agricultural production is subject to many uncertainties, thus it is typically associated with multiple potential outcomes with different probabilities. Weather, market developments and other events cannot be controlled by the agricultural producers but have a direct incidence on the returns of its activities. In this context, producers, although well known by their rigid live and management philosophy, have to manage agricultural risk as part of the general management of the agribusiness. Hazards and unforeseen events occur in all economic and business activities and are not specific to agriculture. However, agricultural risk and risk management instruments in the sector do have a certain number of specificities.

One of the main specifics of agricultural risks is their wide range of impact. Being that agriculture is complex activity, depended on many other sectors in the economy, agricultural risks have negative repercussion to the whole agribusiness value chain. Together with the agricultural producers, each of the participants along the supply chain, from the suppliers of inputs to the end consumer, are affected by these risks. In addition, as the interconnections between the participants are becoming more close and complex, negative risk effects tend to spread faster and easier. On Figure 1 we can see the connections and risks faced by each participant in the agricultural value chain.

Figure 1. Value chain and risks in agriculture



Source: Ramiro Iturrioz: Agricultural Insurance, Primer series on insurance, Issue 12, The Word Bank, November 2009, p. 2.

Figure 1 clearly shows that the number of subject affected by the agricultural risks justify all resources and efforts invested into their management. Risk management strategies in agriculture are as complex and the sector itself. However, they all start with decisions of the agricultural producer: on the set of outputs to be produced, the allocation of land, the use of other inputs and techniques, including irrigation and the diversification of activities on and off-farm. Agricultural producers can also manage risk through market instruments which include insurance and futures markets. In this paper focus will be given to the agricultural insurance, both as agricultural policy instrument and a veritable tool that agricultural producers can potentially use to adapt and even mitigate the risks associated with adverse risk events.

1. TYPES OF RISK IN AGRICULTURE AND ATTITUDE OF AGRICULTURAL PRODUCERS TOWARDS THE RISK

Risk in agriculture is an everyday issue. Since the production is mostly carried out in the open air, and always entails the management of genetically variable living plants and animals, agriculture is especially exposed to risk. Risk affects production such as changes in the weather and the incidence of pests and diseases. Equipment breakdown can seriously endanger production and market price fluctuations can make it not economic. With sudden changes in interest rates, borrowing money can also be risky, as can high collateral demands. Risk also occurs as a result of changes in government policies. Such risks often have a major impact on the income from agricultural activity. Finally, there are risks related to the health and wellbeing of the agricultural producer and his family and the supply of labour, particularly regarding seasonal workers. Thus, risks and sources or risks that are relevant in agriculture have different characteristics, thus they can be classified in very different ways.

One of the basical classifications of agricultural risks is their categorization into 2 groups: systematic and unsystematic risks, as given in Table 1.

Table 1: Types of risks during agricultural production

Type of risk	Description
<i>Systematic agricultural risk</i>	
Production	Climatic aspects, plant and animal diseases
Market	Uncertainties about prices for both inputs and outputs
Institutional	Policy changes
Financial	Interest and exchange rate movement
<i>Unsystematic agricultural risk</i>	
Assets	Loss or damage of assets because of fire, accidents or theft
Operational	Uncertainties and risks related to health and personal

Source: Adaptation from: Danuletu Adina Elena, Danuletu Dan Constantib, Barna Flavia: Agricultural Insurance In Romania, Annals of Faculty of Economics, University of Oradea, Faculty of Economics, vol. 3(1), May, 2009, pp. 169-175

Systematic risks such as production, market, institutional or financial are unforeseeable and uncontrollable, while unsystematic risks like assets or operational happen randomly, have isolated effect and can be controllable. There are many other classifications of risks that can affect agriculture. Some scientific approaches prefer to stress more the specifics of agriculture and make differentiation between risks that are common to all businesses and risks that affect agriculture more specifically² Another particular view on risk management in agriculture is the one that makes differences regarding developing countries. This approach includes non-agricultural specific risks in the classification and lists six different types of risks: natural, health, social, economic, political and environmental. When the assessment of this six types of risks is intended for developing countries, they need to be crossed with an additional dimension of systemic characteristics of different risks: Micro or idiosyncratic risk that affects the individual, Meso-risk affecting a whole community, and Macro or systemic risk affecting a whole region or country. As a result of the interaction of individual agricultural risk with certain systemic dimension, most of these risks eventually take the form of economic risk, implying that an individual agricultural producer may be facing very different risks at the same time.³

² Moschini, G., Hennessy, D. A.: Uncertainty, risk aversion, and risk management for agricultural producers. In Gardner, B. and G. Rausser (eds.) Handbook of Agricultural Economics vol. 1. Elsvier Science B.V, 2001, pp. 48-53.

³ World Bank Publications: Managing Agricultural Production Risks: Innovations in Developing Countries. World Bank, Agriculture and Rural Development Department,

Another specific related to the agricultural risks is that agricultural producers differ in the degree to which they accept the risk. Some agricultural producers are willing to accept more risk than others, and thus they may be divided into three types:⁴

- Risk-averse agricultural producers-they try to avoid taking risks and usually are more cautious individuals with preferences for less risky sources of income.
- Risk-takers agricultural producers-are people who are open to more risky business options and choose the alternative that gives some chance of a higher outcome, even though they may have to accept a lower outcome.
- Risk-neutral agricultural producers- lies between the risk-averse and risk-taking positions.

These differences in attitudes of agricultural producers towards risk are often related to their financial ability to accept a small gain or loss. It also determines their acceptance of insurance as a strategy to manage the risk.

2. INSURANCE AS A STRATEGY FOR RISK MANAGEMENT IN AGRICULTURE

Regardless of the approach that will be used to classify agricultural risks, general conclusion and notorious fact is that they exist and they are many so the most logical issue to discuss next is how the party (or parties) at risk can seek to manage that risk. Before we start this discussion, it is very important to point out that risk management in general, and particularly in agriculture, should be planned before realization of an event, that is on an

Report No. 32727. The World Bank. Washington, DC., 2015, pp. 72-78.

⁴ Bard, S.K., Barry, P.J.: Developing a scale for assessing risk attitudes of agricultural decision makers, International Food and Agribusiness Management Review 3:9-25, 2000, p. 11.

ex-ante basis. Namely, managing realized risks on an ex-post basis only is not considered to be risk management, after all, if something has already happened, it is no longer a risk, although a future reoccurrence might be. There is a great deal of literature on the subject of risk management and a surprisingly large amount of differing terminology in use. For the purposes of this paper on the issue of risk management in agriculture, we will use the terminology of World Bank, according to which three separate approaches to risk management are considered:⁵

- Mitigation is the lessening or limitation of the adverse impacts of hazards and related disasters. Risk mitigation options in agriculture are numerous and varied (for example, crop and livestock diversification, income diversification, soil drainage, mulching, use of resistant seeds, avoidance of risky practices, and crop calendars).
- Transfer refers to the transfer of the potential financial consequences of particular risks from one party to another. While insurance is the best-known form of risk transfer, in agricultural sectors in developing countries the use of informal risk transfer within families and communities is extremely important.
- Coping refers to improving the resilience to withstand and manage events, through ex-ante preparation and making use of informal and formal mechanisms in order to sustain agricultural production and livelihoods following an event. Although we have noted that coping is an ex-post activity, it is possible to plan and to prepare for coping activities on an ex-ante basis. This is often fiscally beneficial, as the ability to quickly respond to events often reduces losses.

At this point, we will mention that there is a fourth risk management approach, so called risk avoidance or risk prevention (that is rarely possible in agricultural production, especially in developing countries where there are very few alternative sources of nonfarm employment),⁶

⁵ World Bank Publications: *Helping poor People Manage Risk*, The World Bank. Washington, DC., 2005, p.32

⁶ Cafiero, C., F. Capitanio, A. Cioffi and A. Coppola: *Risk and Crisis Management in the Reformed European Agricultural Policy*, Canadian Journal of Agricultural Economics,

but as intended, in this paper focus will be given to insurance as a strategy for risk management in agriculture.

Agricultural insurance is a special line of property insurance applied to agricultural producers and it not limited only to crops, but also applies to livestock, bloodstock, forestry, aquaculture and greenhouses. There are several features of this type of insurance that makes it being treated as a special line of business. Most prominent reasons for this include difficulties in achieving adequate diversification because of the nature of the risk, asymmetries of information in underwriting, the geographical dispersion and complexity of agricultural production. Additionally, the cause-and-effect relationships in agriculture are not always easily observable. There are many variables that affect agricultural production, not all of which are insurable, so the agricultural insurer must be able to establish the link between a loss that is insurable and the cause of the loss. All this features validate that agricultural insurance requires skilled and expert underwriting. This special expertise is needed to understand the biological and technical processes not only to set premiums commensurate with the risk but also to assess the producers' own risk management practices and assist in improving them.

In recognition of the specialized nature of this type of insurance is the offer of insurance products. Agricultural insurance products can be classified into three main groups based on the method of determining how claims are calculated, as follows:⁷

- Indemnity Based Agricultural Insurance (insurance payouts based on the actual loss at the insured unit level)
- Index based Agricultural Insurance (insurance payouts based on an index measurement)
- Crop Revenue Insurance (insurance payouts based on yield measurement and crop prices)

Indemnity based agricultural insurance products determine claim payment based on the actual loss incurred by the policy holder. If an in-

Nº 55: 419-441, 2007, p.433.

⁷ World Bank Publications: Managing Agricultural Production Risks: Innovations in Developing Countries. World Bank, Agriculture and Rural Development Department, Report No. 32727. The World Bank. Washington, DC., 2015, p. 49

sured event occurs, an assessment of the loss and a determination of the indemnity are made at the level of the insured party. The classification is often divided into two subclasses-*named peril* (damage-based products-provides indemnity against those adverse events that are explicitly listed in the policy) and *multiple peril* (yield based product-is a multiple peril crop insurance that provides insurance against all perils that affect production unless specific perils have been explicitly excluded in the contract of insurance) agricultural insurance. In named peril insurance contracts insurance claim is calculated by measuring the percentage of damage in the field soon after the damage occurs. Multiple peril insurance offers comprehensive cover to the producers but comes at significantly higher cost compared with named peril insurance.

Index based agricultural insurance products pay out based on the value of an „index”, not on losses measured in the field. The index is a variable that is highly correlated with losses and that cannot be influenced by the insured. Precondition for successful implementation of this sub class is that both parties to the contract have confidence in the objectivity and transparency of the index. Once the indexes have been created, further operational costs are low and this translates into lower premiums for insured parties. Typical application of this insurance product is trough Area yield index insurance-AYII, by which insurance contract defines an area referred to as the „insured unit”.

Crop revenue agricultural insurance products protect insured parties from the consequences of low yields, low prices or a combination of both. It is essentially multiple peril crop insurance cover with a price hedge. This is a relatively new sub-class and moves away from more traditional products where the insurable interest is the size of the crop to products where the interest is a revenue stream.

Having in mind the complexities of agricultural insurance, it is clear that design and development of suitable and affordable agricultural insurance programs require innovation and action from both the public and the private sectors.

Where governments choose to intervene, they may adopt different approaches but the most common mechanisms for public sector involvement in agricultural insurance markets are:⁸

⁸ Mahul, O & Stutley, CJ: Government support to agricultural insurance: challenges and options for developing countries, World Bank, Washington, D.C., 2010, p.67.

- Premium subsidies, as the most common type of public sector support to agricultural insurance.
- Investment in product research and development (R&D), training and information gathering.
- Agricultural insurance legislation as special legislation for crop and livestock insurance.
- Public sector reinsurance.
- Administration cost subsidies as a less common practice of public sector support to agricultural insurance.

Involvement of the public sector is critical to ensure that agriculture insurance programs meet the needs of small-scale farmers while ensuring the sustainability of financial providers. Namely, while agricultural insurance is essentially a commercial activity, it is, nevertheless, common to see governments playing a role in the industry. Governments have an interest from the perspective of maintaining productivity for the economy and safeguarding the wellbeing of the rural community. Government presence in the market fills a void left by the private sector which is sometimes reluctant to enter this market segment due to high start up costs, high distribution and administrative costs and a lack of capacity caused by difficulties in obtaining reinsurance.

3. AGRICULTURAL INSURANCE IN THE REPUBLIC OF MACEDONIA

Agriculture is one of the leading sectors in Macedonian economy. Data in the table below shows that big share of national territory is used for agricultural production. Also, big part of the population provides for live from agricultural activities.

Table 2. Basic indicators for Macedonian agriculture

Total area	25.713 km ² ; (41% of the total is agricultural area/ 1/3 is classified as farmland)
Share of the primary agriculture including the sectors of Hunting and Forestry in GDP	9, 40%
Workforce in the agricultural sector	167.992 (18%)

Number of agricultural holdings		170.885
Total share in international trade	Import	19%
	Export	13%

Source: State statistical office, 2015

In same time, to the notorious fact for agriculture being a risky business, we must add that in the last decades, Macedonia has been affected by the climatic changes. That has results in incensemement of middle temperatures, decrease of humidity, as well as sudden and extreme weather changes (draught, hot flashes and forest fires, frosts). In order to help to the agricultural producers to manage this risks, in 2008 Government of the Republic of Macedonia, within the national agricultural policy, introduced insurance subsidies. Namely, as a preventive measure to reduce potential damage and loss to the agricultural producers, caused primarily from the impact of bad weather conditions, starting from 2008 onwards, Macedonian Government regularly provides financial support for co-financing the insurance policy. The insurance subsidy program started with 30%, but by 2013 arrived at 60% of the amount of the insurance premiums that any agricultural producer (holding) will purchase in order to protect its production from the negative impact of major risks. This subsidized percentage covers only defined crops and defined maximum area insured per user, that are as follows:⁹

- 10 hectares of vineand fruit plantations;
- 2 hectares of horticultural crops;
- 2 hectares of tobacco;
- up to 20 hectares of crops and
- up to 100 beehives.

The amount of subsidy cannot exceed 60% of the cost of the insurance premium for compensation of damage to the agricultural production occurred as a result of adverse climatic event, but not more than 200.000 MKD (3.253 EUR) per agricultural producer (household).¹⁰

⁹ Republic of Macedonia, Ministry of Agriculture, Forestry and Water Economy: National Strategy for agricultural and rural development 2013-2010, Skopje, December, 2014, p. 229.

¹⁰ Law on agriculture and rural development, Official Gazette of the Republic of

Beside insurance subsidies, for risk management Macedonian agricultural producers can apply for 50% of governmental co-financing on investment for protective equipment (hail nets and shading) and for efficient irrigation systems (drip, etc.).

Financial state support for subsidizing agricultural insurance premiums in Macedonia has been increased gradually, and so in 2013 was 568 000 EU and by 2016 it arrived at nearly 1.130.000 EU.¹¹

In its effort to support and foster agricultural insurance, Republic of Macedonia in 2012 joins to the regional programme created to address very low levels of catastrophe and weather risk insurance penetration in Southeastern Europe. Activities are managed by the Europa Reinsurance Facility Ltd. (Europa Re), a Swiss-based specialty property catastrophe reinsurance company owned by countries of Southeastern Europe (SEE). On 15 September, 2014, this Company presented the first Area Yield Index Insurance (AYII) product for protection of specific crops in the Macedonian agriculture sector. The AYII product became operational in 2015 and is sold by certified local insurance companies that participate in Europa Re programme. Europa Re provides appropriate expertise, technical support and quality reinsurance for all policies issued by local partner insurance companies. By providing an opportunity to agricultural producers to insure the expected yields of their crops, AYII aims to protect agricultural producers from all types of adverse weather risks, such as drought, floods, frost, torrential rains, hail and other risks, which affect wider areas (e.g. municipalities) and can significantly reduce crop yields.

In same time, Macedonian insurance industry can be described as small and underdeveloped, but with a high potential for further growth and development. The structure of the insurance system of the Republic of Macedonia rests on the Law on Insurance Supervision¹² complemented by other laws and bylaws that are harmonized with EU's insurance legislation.

In 2009, national Insurance Supervision Agency was established as an independent body whose competence and authorizations are in the field of guaranteeing lawful and efficient functioning of the insurance market

Macedonia, No. 49/2010; 53/2011, 126/2012, 15/2013 и 69/2013, Article 98

¹¹ National program for agricultural and rural development 2013-2017, Official Gazette of the Republic of Macedonia, No. 134/2012., p. 16.

¹² Law on Insurance Supervision, Official Gazette of the Republic of Macedonia, No. 27/2002, 98/02, 79/07, 88/08, 67/10, 44/11, 112/11, 188/13, 30/14, 43/14, 112/14, 153/15 и 92/15),

for the purpose of protecting policyholders' rights. Insurance Supervision Agency (ISA) is the key state regulatory body that controls the insurance market in Macedonia. Currently, on the insurance market in Republic of Macedonia are active 15 Insurance undertakings (11 non-life and 4 life), 30 Insurance brokerage companies, 10 Insurance agencies and 2 Banks which acts as insurance agency. Until to 2015, 6 out of 11 insurance companies for nonlife insurance perform business in agriculture insurance line of business. Namely, till 2013 only 4 insurance undertakings were offering products for agricultural insurance, and in 2014 two other companies began selling policies for agricultural insurance.¹³

Insurance products available to the Macedonian agricultural producers are crop insurance, livestock insurance and agriculture yield index insurance (AYII), are the

Crop insurance covers basic risk (hail, fire and thunder) and additional risks (spring ice, flood and storm) and subject to the insurance contracts are:¹⁴

- crops and fruit,
- meadow grasses,
- herbs,
- ornamental plants,
- fruit,
- vine and forest seedlings,
- young orchards and vineyards before entering the race,
- young forest plants and
- plaiting willows and reeds vine yards.

Within the animal insurance, almost all domestic animals (equidae, cattle, pigs, sheep and goats, feathery animals, cats and dogs), bees, fish and exotic animals) can be insured against following risks:¹⁵

¹³ INSURANCE SUPERVISION AGENCY: 2015-Annual Report on the insurance market in the Republic of Macedonia, Skopje, 2016, p.12

¹⁴ National program for agricultural and rural development 2013-2017, Official Gazette of the Republic of Macedonia, No. 134/2012., p. 38.

¹⁵ Ibid, p. 42

- Death due to accident or illness;
- Emergency slaughter;
- Health care expenses (if agreed as an additional coverage);
- Emasculation.

Regarding the agriculture yield index insurance (AYII), as mentioned previously, it is a multiple-peril loss of crop yield policy that insures against all climatic, naturally occurring and biological perils-it is an „all risks” loss of yield policy. This insurance product, for Macedonian agricultural producers utilizes measurement of potential losses of their crops caused by adverse weather based on the index of the average yield at a municipal level for each particular crop. In this way, the insured agricultural producers receive compensation for damages if the realized average yield at the municipality level in a given year is lower than the contractually agreed reference level of crop yields which in turn is set based on the historic yield average for the index municipality.

Even when 60% of insurance premiums are covered by the Macedonian Government, and with couple of insurance companies involved, yet, agricultural insurance in the Republic of Macedonia is not at satisfactory level.

According to the ISA, some dynamism in agricultural insurance, as a part of non-live (property) insurance can be seen just in last 3 years. Namely, out of 70.000 registered agricultural producers, in 2013 were signed 2.559 agricultural insurance contracts, in 2014 were signed 3.704 contracts and 2015 concluded with 5.021 agricultural insurance contracts. Total participation of Gross written premiums (GWP) for the year 2014 was 114.52 million MKD and for 2015 GWP was 181, 83 million MKD. If we compare year 2014 and 2015 both in terms of signed contracts and GWP, we can see an increase of 58.78% in the realized GWP with growth of 35, 56% in the number of contracts. In the segment of property insurance, agricultural insurance has a share of 33, 21% and 211, 38 million MKD Gross paid claims total amount.¹⁶

Table 3. Share of agricultural insurance by peril in Gross written premium in Republic of Macedonia, for 2015

¹⁶ INSURANCE SUPERVISION AGENCY: 2015-Annual Report on the insurance market in the Republic of Macedonia, Skopje, 2016, pp.15-16.

	Share in GWP-property insurance	Share in total nonlife GWP
Crop insurance	5, 48%	1, 12%
Fire	0, 18%	0, 04%
Flood	0, 00%	0, 00%
Hail and frost	5, 30%	1, 09%
Other property insurance	22, 83%	4, 67%
Fire	14, 04%	2, 87%
Earthquake	4, 58%	0, 94%
Flood	2, 32%	0, 48%
Hail and frost	1, 89%	0, 39%

Source: ISA, 2015

On Table 3. are given shares of agricultural insurance by peril in Gross written premium in the Republic of Macedonia for 2015 and can be concluded that it is only 1.2 % in total insurance. Contracts are predominantly made against hail and frost, while in property insurance, fire is most insured peril. In the structure of agricultural insurance, dominant is fruit production with 350 ha. of vineyards and apple with 270 ha., followed by wheat on about 210 ha.¹⁷ This imply that the risks in agricultural production are very large, and the insurance companies are often reluctant to provide insurance of agricultural production, or if they do it, they do it with a high premium rates that affect dissimulating for individual farmers and legal entities engaged in agriculture to ensure their production. This entire situation indicates that insured agricultural area is relatively small in relation of total agricultural area, quantities of Macedonian agricultural production, number of agricultural producers and the opportunities afforded by the program for financial support in agriculture by subsidizing insurance premiums.

Conclusion

The sources of risk in agriculture are numerous and diverse and they expose agricultural producers, suppliers, distributors, financial institutions and governments to potential losses. Many approaches can be

¹⁷ Zoran Stojanovski: Agricultural insurance in Macedonia, Paper presented at the IIF 2015-Property Insurance in a Stormy Era, Munich, June, 2015.

used to manage agricultural risks. One of the possible risk management strategies is the risk transfer or agricultural insurance.

Regarding the situation in the Republic of Macedonia, unfortunately, despite governmental subsidy of 60% of insurance premiums, the insurance of agriculture is not giving satisfactory results. Although the agriculture in the structure of GDP of the Republic of Macedonia is 12%, still insurance in agriculture in the country in total premium paid for insurance in the Republic of Macedonia is only 1.2 %, suggesting that the risks in agricultural production are very large. With less than 1, 5% of insured agricultural producers in the country, we can say that they are still very vulnerable to weather risks, especially because the government has not created an effective system for protection from negative natural influences i.e. drought, flood, hail, fire etc. This makes the money spent for subsidizing agriculture not efficient since they are not sufficient to cover the damage. Existing insurance packages offered at the Macedonian insurance market are against hail, but not protection against drought or. Also, insurance companies either avoid dealing with agricultural insurance, or they carry a high premium rates that are quite unaffordable and thus dissimulating for agricultural producers.

In order to increase the interest of Macedonian agricultural producers for insuring their production, it is necessary to educate and inform them about the positive aspects of insurance, especially for agriculture yield index insurance (AYII). Spending from national budget should be in building modern infrastructure that can provide valued, accurate historical and forecasted data of weather and market, enhancing legal and regulatory system and providing educational programs to agricultural producers. In addition, insurance companies should consider lowering their premium rates and engage experts who would professionally assess the damages of the eventual natural disasters.

At the end, it must be pointed out that even when there are many institutional agricultural insurance systems and market products, insurance is not the universal solution to the risk and uncertainties that agricultural producers face. It can only address part of the losses resulting from some perils and most certainly not all risks that threaten modern and global agriculture. In fact, it would even be wrong since it would be a linear approach considering only a specific source of risk, a specific strategy, or a specific policy measure, that is likely to result in inefficient choices. Risk management in agriculture should be analyzed as a system in which there is interaction be-

tween many elements and complemented the set of outputs to be produced and political measures and instruments to be employed, the allocation of land, the use of other inputs and techniques, including irrigation and the diversification of activities on and off-farm.

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