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Development of risk management instruments in the EU[1]

Abstract: *The paper aims at reviewing the EU 2014-2020 CAP with regard to the risk management provisions in the agricultural sector and analyses the potential future CAP developments related to risk management in order to manage more effectively agricultural production risk, income uncertainties and market volatility.*
Currently, the EU farmers covered by CAP 2014-2020 have different types of risk management instruments at their disposal: insurances, mutual funds, savings accounts, hedging strategies, fiscal-tax measures and ad-hoc payments.
The EU has a flexible regulatory framework to support risk management instruments, which allows coping with very diverse and heterogeneous agricultural risks faced across Member States. This framework is delineated by the CAP as well as by the rules applicable to State aids in the agricultural sector.
Major weakness of the CAP 2014-2020 risk management policy is the ample margin of flexibility and optionality permitted in Pillar II that might lead to an uneven application, not only among but also within Member States. As a consequence, it can be noted that the EU does not take account of the harmonized EU-wide agricultural risk management scheme. The types of and extent to which risk management tools have been adopted differ widely across Member States.
The EU support in development of agricultural risk management instruments has huge perspective, mainly based on two factors. Firstly, climate change is expected to continue and affect the agricultural production even more severely. Secondly, the World Trade Organization, under certain conditions, allows for support of risk management, providing an opportunity for long-term government support. Under the new CAP, the EU risk management policy should be more harmonized among the Member States.

Keywords: *risk management in agriculture, insurance, hedging strategies, farm income stabilization, CAP.*

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Introduction

Farming could be considered as a high-risk profession. Beside the risks common to all economic sectors, agriculture has been facing some additional risks primarily coming from its specificities (related to land, production process or farmers) (Durić, 2015).

The major specificities include natural characteristics of the agricultural land (its limitation, inexhaustibility, immobility, inability to multiply, different level of fertility, and the role of intermediary between the crop and available nutrients needed for its adequate growth) (Milić et al., 2011; Vukoje et al., 2015), primarily biological character of the production process (based on biological character of processing material) which is deeply affected by natural, climatic and geographical conditions, mismatch between the production period and working time, leading to great seasonality in the conduct of working activities, possibility for self-reproduction of processing material (multiplication of the initial biological material) and many more (Vasiljević, 1998; Vujatović Zakić, 2001).

Not just in developing countries farmers are usually exposed to the uncertainties of weather, prices and diseases (pests), uncertainties related to their economic strength, size of property, proper labour accessibility, condition of owned mechanization and equipment, adequacy and contemporaneity of applied technology, blissfulness of the natural and conformity of business environment, level and importance of present state support, exposure to globalization, etc. Many farmers live on the edge of extreme uncertainty, very often reaching the threshold of survival (Kahan, 2008). In line with the generally changeable economic and biophysical environment, activities within the agrocomplex are subject to major risks and uncertainties (Ullah et al., 2016).

The two main reasons that influence necessity for development of risk management instruments are: a) climate change (in recent decades they affect intense growth of production risk in all sectors of agriculture); b) significant price volatility of agricultural products (regardless of the observed level of market). For successful control of production and market risks, agricultural producers need to have at their disposal well developed risk management instruments.

Farmers are facing numerous questions, such are: What to produce, at what timeframe or in what quantity? Is it better to buy, or rent a land? Is it better to insure the crops and animals, or not? Do climate conditions presume continuation in the use of dryland farming system of production or implementation of irrigation? Which risk management instrument is the best to apply? What is the best time for selling the agricultural product: while it is still in the field, immediately after harvest, or is it better to store it and wait for a better price during the year?

Farmers constantly take prompt decisions in a risky environment. Risk management in the agribusiness is generally important both for maintaining of farmers' income at stable and satisfactory level and for maintaining the stability of food security at certain markets (in order to maintain a high level of food self-sufficiency), (Matthews, 2017). To manage risk successfully, it is necessary for farmers to have at their disposal various risk management instruments, as well as required knowledge to adequately use them.

According to certain changes in farmers' attitudes toward the risk, risk management usually cannot offer unique "one size fits all" approach. Different farmers are facing different situations, where their preferences related to risk and expected balance between the tolerable level of risks and gained profit have major effect on decisions in any specific situation. Certainly, balancing the level of exposure to certain risk with the level of desired, but objective volume of production and income, for farmers does not mean the total exclusion of risks. It implies finding the best available combination of present risk and production results. In other words, risk management could be defined as the choice of the best possible solution among offered alternatives that will lead to the mitigation of certain risk effects (Harwood et al., 1999).

Risk management is an essential part of agriculture. Its logic requests the farm to ensure, in accordance with identified risk, risk intensity and farms' economic strength, conditions that will diminish the presence of perceived risk. That considers application of adequate combination of available instruments, or at least one particular instrument, avoiding the practicing of zero-risk aversion (hoping that the farm will avoid negative events during the current production cycle), (Anton, 2015).

Risk management is a farmer decision oriented to modify exposure to risk (business or financial) in line to its personal economic strength and risk aversion. It is a necessity that enables realization of proper production decisions, as are the selection of particular sector and production line, seed material or animal breed, i.e. the level of intensity of input use or optimal investment alternative (investment in technology, facilities or machinery and equipment) (Cordier, 2015).

The rule that with greater risk the expected profit may increase, usually does not work in agriculture, since farmers generally show risk aversion. Therefore, in order to properly manage the several types of risk they are facing on a daily basis throughout the time of the farm functioning, farmers are adopting a number of strategic instruments, such as diversification of production, selection of low-risk production lines/production methods, certain financial instruments, technological innovations, etc. (Meuwissen et al., 2001).

It is estimated that the safety net for the USA farmers is the possibility to use the most diverse and the most developed set of risk management tools (Miller et al., 2004). Certainly, there is a broad array of established risk management

tools ready to be used and new tools are continually being developed (Crane et al., 2013). The agricultural producers in the EU do not have all the instruments at their disposal, so the task for the EU CAP is to implement, improve and adjust to the EU business environment the missing instruments, above all, by supporting agricultural insurance systems, but also by developing futures joint markets.

In scientific and professional literature, the most common classification of risks present in the sector of agriculture recognizes the following five types (groups) of risks (Girdziute, 2012; Theuvsen, 2013; Vasiljević et al., 2014):

- *Production risks* that directly affect the quantity and quality of produced primary product. They are usually linked to the fact that agricultural production is organized at open fields. Typical sources of mentioned risks are unpredictable climate events and climate variability, destructive power of diseases and pests (the primary subject of agricultural production is living organisms), use of inadequate inputs and technological solutions, manipulation of products of organic origin (rotting of products), etc.
- *Financial risks* are characteristic for all business sectors and mainly relate to all aspects of constriction of possibilities for financing (lack of available funds or offering them under unfavourable conditions) of farm's core business operations.
- *Market risks* represent the risks of unfavourable and unpredictable oscillations of prices of agricultural products and inputs at certain level of the market.
- *Institutional risks* arise from the unpredictable changes in official (national or international) policies focused on agriculture.
- *Human risks* represent all types of deviations from the planned business results that may be affected by the human factor, such as illness, injury, issues related to ethics, education or way of management, etc.

The key issues of CAP include agricultural market stabilization that covers risk management. According to that, the most important risk management instruments linked to agriculture are (Dismukes, Durst, 2006; Baltussen et al., 2008; Zakić, Stojanović, 2008; Janowicz Lomott, Lyskawa, 2014; Castaneda Vera, Garrido, 2017):

- Agricultural insurance that is based on the premiums paid by the farmers for the potential compensation received against losses caused by contracted risks from an insurance company. At the level of the EU, the most common type of insurance is the single peril insurance (mainly against hail). Unfortunately, revenue insurance is less developed within the EU, compared to the USA and Canada, this paper aims also at increasing the readers awareness of the above-mentioned issue.
- Mutual funds represent financial reserves in function of risk management. They are made of participants' (farmers) contributions. Their main function is to be withdrawn by members in case of catastrophic event according to

predefined rules. This system is based on the principle of risk spreading within a pool of members, as a consolidated fund established for income accumulation that must stabilize farmers' income over the longer period.

- Savings accounts are a risk management tool based on building farm financial reserves over the years with sufficient profit, with aim to use them after catastrophic events, or in low profit years. Positive example could be public support of its implementation in the USA or in Canada for them to be widely recognized among the farmers.
- Diversification is one of the most common risk management strategies. It essentially consists of the introduction of several different production lines within the farm production structure. The main motive for its use is the reduction of probability that all production lines practiced at the farm will produce poor business results. Sometimes, it could lead to disbalance of gained costs and achieved benefits for the farm, mainly as result of: 1) requirement for several specialized machines, 2) requirement for wider, but more specific knowledge and skills, as well as a number of various analyses.
- Vertical integration implies a process in which an agricultural farm, develops cooperatives or enterprises previously producing agricultural processes with own capacities up to the stage of semi-finished or final food products. For example, farm could successfully transfer crop products throughout the use of feed mixtures in livestock fattening into the meat and later in certain meat products.
- Implementation of modern agro-technical measures and technological solutions. For example, to prevent decrease in quantity and quality of produced crops affected by drought; farmers could use drought-tolerant hybrids or implement an irrigation system.
- Hedging strategies are relying on the use of soft commodity derivative market to secure future agricultural product price and farm income. It usually considers the use of non-standardized derivative instruments such as forwards and swaps, or for farmers more important standardized derivative instruments, futures, and options, which are traded at commodity exchanges. Thus, farmers transfer the risk outside the farm, to third parties.
- Agricultural production contracts have the primary function to ensure certain level of control over the production process both for farmers and contractors (e.g. wholesalers, large agricultural companies or food processors), as they provide timeliness, dynamics and quality of the delivered agricultural products and required inputs. Farm mostly benefits through easier access to the market, needed capital and hi-quality inputs or income stabilization. They are common in the USA agro-complex.

Due to the significant impact of the World Trade Organization (WTO) policy on governance of policies related to risk management instruments, it should be deeply reconsidered, primarily as it is expected that the EU CAP has to fit the above-mentioned policy (Bazerkoska, 2011).

As worldwide organization dealing with the rules of trade between the nations, the WTOs mission is to ensure that global trade is being streamlined, predictable and free (WTO, 2018a). Considering the risk management instruments in agriculture, the main provisions of the WTO policy are (Cottier, 2001; Haberli, 2014; El Benni et al., 2015; WTO, 2018b):

- Prevention of circumventing export support (Anti-circumvention) through hidden incentives, where the rules of the WTO (Agriculture Agreement) do not allow export crediting, granting of state guarantees for export, or export insurance.
- Price interventions are not allowed, although several of the old WTO members still apply this type of subsidization. Purchase of agricultural products by the state in order to form commodity reserves is allowed only for quantities that provide food security, and not commodity reserves for regulating market movements. The volume and formation of such supplies should correspond to the predetermined objectives that are exclusively related to food security. Financial issues linked to formation and disposal process should be transparent. While the purchase of commodity reserves must be exclusively at the current market prices, sales from such reserves should be made at prices not lower than current domestic prices for certain quality of the products being sold.
- Income stabilization tool (IST) – a measure that should be classified in the Green Box only if:
  - It is available to all farmers;
  - Farmers must have a revenue drop for at least 30% compared to the average revenue gained in previous three years;
  - Maximally, 70% of the farm income decline could be compensated;
  - Income is not predefined, so each country can use by itself gross or net income. The above-mentioned type of state subsidy cannot be linked to the price of a product.
- Insurance support is allowed. In recent period three changes have been introduced, such as:
  - List of insurance types covered by Green Box is extended, i.e. income and index insurance are also included, as well as the potential option for some other insurance;
  - Production losses that can be subsidized is reduced.

In the case of catastrophic events (for prevention or assistance after their occurrence), there are *ad-hoc* support measures. Involved activities and available funds are classified in the Green Box. Required conditions for *ad-hoc* measures are:

- Government should declare a natural disaster;
- Obtained losses must exceed 30% of the average production gained within the previous three years, or they represent the five-year average;

- Payments may be realized in relation to loss in income, livestock, land or other production factors caused by natural disasters.
- Payments can maximally fit the total damage. In case that farmer receives payments within the same year for a loss-of-income, or from government-backed payment scheme, or from similar government support programmes, the total income of farmers (sum received from all mentioned programmes) for observed year have not exceed the total damage they suffered.

Methodology and data sources

Main goal of the paper is to review the EU 2014-2020 CAP measures related to risk management provisions (instruments) oriented at the sector of agriculture. It also analyses the possibilities for future CAP development related to previously mentioned issue, trying to approach farms confrontation more effectively with agricultural production risks, income uncertainties and market volatility.

To this end, few methods are used, which primarily include desk research method, interview with relevant experts, literature study and methods of analysis and synthesis. Moreover, statistical methods of correlation and regression are applied.

Research was primarily based on secondary data obtained from FAOSTAT, Commodity Exchange Novi Sad, Chicago Mercantile Exchange (CME) and MATIF exchange Paris. All results and conclusions are complimentary to available scientific and professional literature oriented at risk management instruments in agriculture.

Results and discussion

Within the CAP 2007/2013, support to the risk management instruments was concentrated in Pillar 1. This kind of support firstly started in 2007 with fruit and vegetables regulations, followed by the wine sector, together with introduction of the mechanisms for crisis prevention and management (crop insurance support and mutual funds support). Health Check reform in 2008 introduced the possibility to support risk management instruments in all sectors of agriculture using up to 10% of their national ceilings devoted to the single payment scheme. State aid (individual Member State support to national agrarian sector) has a fundamental role in risk management within the CAP 2007/2013, because of which the EU is not covered with a harmonized EU-wide agricultural risk management scheme. Adopted type of risk management tools and the level to which they have been used widely differ among the Member States. The same refers to the level of coverage and subsidization, even at the regional level within a given country (Bardaji et al., 2016; Matthews et al., 2017).

According to the development of agricultural risk management instruments, important change was done within the CAP 2014/2020, when joint support to the risk management was shifted from direct payments to Pillar 2. The above-mentioned support starts to be a contribution to insurance premiums, mutual funds and income stabilization tool (Tangermann, 2011; Novickyte, 2018).

Unfortunately, the next table (Table 1) shows a notably low level of the EU support toward the risk management instruments.

Table 1. Number of holdings and per cent of farms supported by the EU risk management instruments under Pillar 2 (CAP 2014-2020)

Member State	Estimated number of participating holdings				Per cent of farms covered
	Insurance premium	Mutual funds	Income stabilization tool	Total	
Belgium – *Flanders*	1,300	0	0	1,300	5
Spain – *Castilla y Leon*	0	0	950	950	0.97
France	97,000	398,000	0	495,000	95.91
Croatia	8,300	0	0	8,300	3.54
Italy	80,000	5,000	5,000	90,000	5.55
Latvia	4,000	0	0	4,000	4.92
Lithuania	1,450	0	0	1,450	0.75
Hungary	10,500	0	4,500	15,000	3.10
Malta	1,500	0	0	1,500	11.97
Netherlands	1,300	0	0	1,300	1.8
Portugal – *Mainland* – *Azores* – *Madeira*	 785 150 350	 0 0 0	 0 0 0	 785 150 350	 0.28 1.11 2.57
Romania	0	15,000	0	15,000	0.39
Total	206,635	418,000	10,450	635,085	*

Source: Bardaji et al. (2016).

Note: only Member States with expected measures are included in the table.

Conducted analysis primarily focus on the possibilities for further development of risk management instruments in agriculture, under which the EU CAP could have a certain level of impact: agricultural insurances, mutual funds, savings accounts, hedging strategies, fiscal-tax measures and *ad-hoc* payments.

Some of them are defined in the current EU CAP legislation (the EU Regulation No. 1305/2013), primarily scheme for subsidizing the insurance instruments, mutual funds for compensating the losses gained at farms due to

catastrophic weather, sanitary and environmental events, and income stabilization tool for compensating income losses caused by production and price risks. According to them, farm can receive a maximum of 65% of public compensation for sustained losses (this contribution involves European Agricultural Guarantee Fund with 75% and Member States resources with 25% of reserved assets) (Cordier, Santeramo, 2018).

1. Agricultural insurances

Support to the agricultural insurance is subject to the Pillar 2 of the EU CAP as contributions to insurance premiums for crop and animal insurance.

The state aid within the CAP plays a fundamental role in supporting the agricultural insurance in the EU. Types of insurance and level of support widely differ across the Member States. In the EU is single peril insurance prevails, which usually covers hail damage, while in the USA and Canada the revenue insurance covering all risks (production and income) is dominant (Smith, Glauber, 2012; Janowicz Lomott et al., 2015). The EU policy should aim at improvement of the agriculture insurance structure along with extension of the revenue insurances. Support for reinsurance is another important factor for development of agriculture insurance. Reinsurance should be provided to insurers that pay premiums and receive indemnities if their portfolio is at-risk. It is highly important to consider common reinsurance policy as an essential part of the CAP.

As the authors of this paper recognize, the USA system for supporting agricultural insurance as one of the world's most successful, the model of agricultural insurance support in USA will be presented in order to find adequate path for the development of the EU support system for agricultural insurance.

Insurance subsidies are the most important form of support for agricultural producers in the USA. Insurance support is provided via the Federal Crop Insurance Corporation (FCIC), established in 1930s in order to provide covering for crop losses caused by natural disasters. Subsidies for insurance are managed throughout public-private partnerships (according to the Federal Crop Insurance Act of 1980). Insurance companies establish insurance policies defined by FCIC (Shields, 2015).

Significant progress in coverage of agriculture insurance was achieved at the beginning of 1990s, when all types of state subsidies could only be realized by insured agricultural holdings. Such a policy has already showed a significant outcome, in the middle of the above-mentioned decade as the number of agricultural holdings that were secured doubled. Moreover, growth of insured holdings and land area was strongly linked to increase in the subsidy rate (from 30% to 50%) and introduction of revenue insurance (Smith, 2017). Development of insurance and importance of state subsidies related to observed risk management instrument in the USA can be seen in Figure 1.

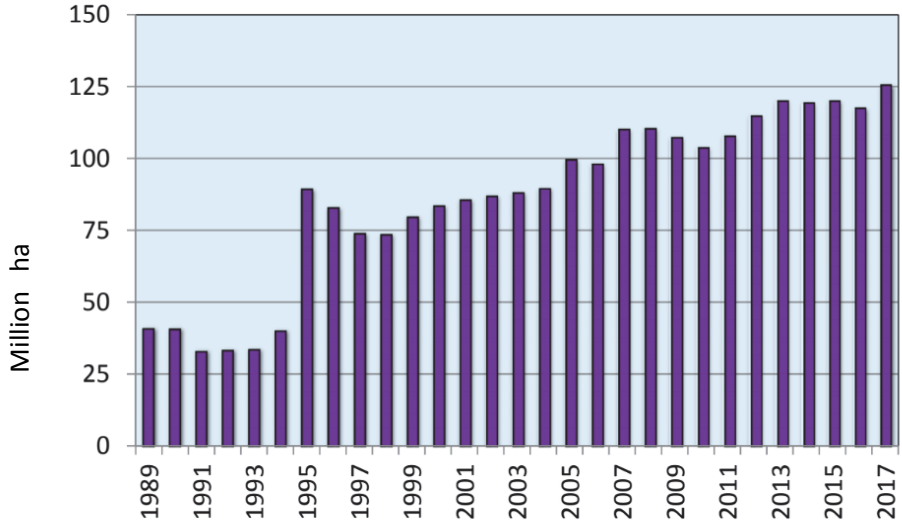

Figure 1. Insured land area in the USA agriculture in the 1989-2017 period
Source: adjusted according to Motamed et al. (2018).

In 1993, in the USA subsidies were linked to insurance, only insured producers were eligible for subsidies. Consequently, in the next year the insured area doubled. It is interesting that in the following years the linkage between insurance and subsidies increased, but the area under insurance remained constant. This is explained by the FCIC representatives by the fact that producers develop a habit to take out insurance which they follow even if it is no longer mandatory to do so.

State subsidies to agricultural insurance in the USA include a number of different policies, while types of insurance are constantly evolving, introducing new ones to the farmers.

Insurance companies are only providing the service to subsidized insurance (selling the insurance developed by the government). The principle of the subsidy is that a given insurance company receives up to 18.5% of the cost of the premium for the services it provides, so the farmer pays a subsidized premium without administrative costs of insurance. The premiums are defined by the FCIC and they depend on the degree of the insurance coverage, thus 50% of the costs and 55% of the expected product price is free in the insurance premium. If the farmers are willing to increase the percentage of secured yield and insured product price, the share of subsidy decreases.

The USA support is dominantly focused on yield and revenue insurance. A common justification given for the continued funding of the US crop insurance program subsidies is that it will eliminate the need for *ad-hoc* disaster programs (Paulson, Babcock, 2008).

A surely important issue related to insurance is the mechanism of the reinsurance system in the USA. The state provides insurance and reinsurance services that include (Francher, 2002; Shields, 2010):

- For compensations over 500% in relation to the premiums received, the stop loss reinsurance is starting, so the state takes over the repayment of damages over the specified percentage from the insurance company.
- As per the achieved business results, for favourable years and high profits, insurance companies are obliged to pay part of the gained profit to Risk Management Agency (RMA) that manages the FCIC under the USDA; while for bad years, the RMA pays funds to insurance companies (financial transfer is made up of the net book quota share that is set on 5% to 10% of the cumulative underwriting gains/losses of the company).

As the EU agricultural insurance support policy lags behind a similar American policy, development of the CAP policy oriented at insurance should be expanded with certain new insurance products, i.e. whole farm insurance, revenue insurance, etc. that should be supported. Thus, following the US experience, main reforms in the new CAP should be focused on harmonization of insurance support policy across Member States, together with increase in the level of support and introduction of mandatory insurance as a manner to open the door for other EU subsidies.

2. Mutual funds

Mutual funds are one of the legal risk management instruments used in agricultural sector. They are based on the idea of risk division among the group of agricultural producers that focuses on same type of peril. Basically, as preventive measures, it refers to transfer of certain risk and mitigation of its negative effects throughout the collecting savings or establishment safety net at regional or national level. Their establishment is defined by the EU legislation as of 2009 (regulation No. 73/2009), providing some general terms and approving the individual Member States to set the particular rules of their creation, implementation, functioning and later monitoring (Lipinska, 2016).

They may be established at the territorial or sectoral level covering certain production lines. Although, it represents relatively new tool for risk management in agriculture, their recognition within the EU could be seen throughout the successful functioning in France, Italy, Romania, the Netherlands, etc. The largest one is mutual fund that operates in France as mandatory for all farmers involved in FMSE (Fonds National Agricole de Mutualisation Sanitaire et Environnementale), (Kuliesis et al., 2017).

Their establishment may be supported through: start-up support in capitalization of a mutual fund; annual support to the mutual fund; compensation of part of the costs in case of damage or tax incentives for the mutual fund.

In case of periodic financial support to the mutual fund, large amount at the fund account could stay frozen, if there are no flexible rules defined for money withdrawing. Moreover, in case of newly established funds, it could be important to recognize the large-scale systemic damage that affects a number of mutual fund members. A possible solution to this end could be the use of state reinsurance funds.

Other possibility for risk transferring outside the mutual fund is its securitization and sale of over the counter (OTC) bonds in the form of CAT (catastrophe) bonds (Csiszar, 2007).

3. Savings accounts

Savings accounts are made to increase certain funds through farmer's deposits on a special account, providing interest payment. Accumulated deposits could be primarily used in case of catastrophic events, but also at times of income decline or as support to investment in implementation of measures against the risks (Hohl, 2019).

In the experience of developed countries, government support to the savings accounts can be realised by tax reliefs upon withdrawal, subsidy of savings account interest rate, direct money contribution to savings account or contribution in payments to catastrophic events.

Given that the maintenance of farm financial reserves can replace the classical agricultural insurance, a comparative overview of their main benefits has been prepared (Table 2).

Table 2. Comparative analysis of benefits of savings accounts and agricultural insurance

Financial reserves	Insurance
• There are no insurance policy costs • There is no risk of non-payment of insurance after the occurrence of harmful events • IT innovations as mobile banking and defined direct deposit options make their use administratively much easier • Usually low minimum opening deposits are required • Deposited assets are always farm property • Constant growth of demand for savings • Greater usability in farm risk management, since financial reserves can be also used for unplanned events that are not subject to insurance • Assets on savings accounts can be used permanently, while insurance premium is for one year	• Lower engagement of own funds (the amount for the insurance policy is lower than the amount for financial reserves) • Potentially much larger damages can be covered with lower amount of annually invested farm assets in risk management • There are no bank account maintaining costs

Source: authors' study.

The main advantage of savings accounts is that they can replace the insurance, but the assets remain at the farmers' account, representing a multi-annual risk management instrument, unlike insurance, which is a one-year instrument. Besides it is characterized by better risk avoidance, as the assets used for coverage of damages are from farmers' personal savings account, urging him to be more proactive and considerate in the process of potential risk avoidance than in case of classical insurance.

Mandatory possession of farm savings account that will be defined in detail by the EU CAP could be one of the solutions for the problem related to risk mitigation in the EU agriculture. According to the above, there are a couple of issues that have to be widely discussed, such as: when can the farmer withdraw the assets (one option is to set the same conditions as those required by the insurance company for the indemnity payment), what would be the minimum or sufficient deposits that will be paid towards the savings account, what would be the adequate moment and time interval for assets transferring to the account, what will be the maximum amount of assets accumulated at the savings account (in order to avoid accumulation of excessive sums of money that could be more effectively used for investments and business development at the farm).

Successful model of specialized savings account exists in North America. For example, in Canada for many years savings accounts incentive costs are shared between federal, provincial and territorial governments. They are concentrated and lead by the agri-invest program that helps farmer to manage certain income drops, supporting the investments for risks alleviation or income improvement. The program creates individual savings account that allows farmers' participation with a limited annual deposit of 1.5% of allowable net sales (realized sales) and covering all administrative costs. In addition, the same level of deposit as a subsidy (matching contribution) is provided by certain level of governmental support, as well as supplemental 3% interest rate. Program ensures coverage of minor loss of reference revenues at a percentage of 85-100%. Limitation of amount of assets deposited at the account prevents unnecessary freezing of large sums of farm assets that could be used more purposefully from economic perspective. Assets deposited at the account are exempt from tax base. Thus, increasing the flexibility in using these funds, farmer can withdraw accumulated assets whenever he needs them (Anton et al., 2011; Agriculture & Agri-food Canada, 2018).

4. Hedging strategies

Pronounced oscillations of agri-food prices during the second half of the last century initiated the development of commodity and financial derivatives that allow price risk management. Throughout their trade at the derivative markets, farmers could ensure certain level of product price prior to harvest, together with the increase in total production (Zakić, Vasiljević, 2013). Price oscillations are primarily caused by the incompatibility of current food availability and level of demand pressure (Jankovic et al., 2018).

Hedging strategies for farmers are based on the purchase and sale of agricultural products in the forward market. Futures and option contracts traded at commodity exchanges are recognized as the most important instruments of hedging strategies. Futures contracts are highly standardized contracts for the purchase or sale of certain assets within the futures. They have many similarities, but also differences, compared to forward contracts. Their high standardization allows for secondary trading with futures and option contracts (Kang, Mahajan, 2006; Kolb, Overdahl, 2007).

Option contracts can be defined as derivative securities that carry a certain right. Relations between the parties are regulated by an optional contract that is in legal terms an incomplete agreement, as it grants one signatory the right to buy or sell certain types of agricultural products at a pre-agreed price, but does not oblige it to do so. The seller is willing to choose the option of the buyer primarily because the signatory of the option agreement gets a premium, which represents the option price when concluding an optional agreement (Stošić Mihajlović, Zdravković, 2016).

In the US, as in the EU, in order to enable income stability, the farmers rely heavily on the maintenance of farm financial reserves or on participation in state production programs with guaranteed prices, as well as on diversification and insurance of organized production, forward contracts and hedging strategies. But the most significant difference between the US and the EU producers in the use of risk control instruments is that the first former much more often use the hedging risk management strategies (around 60% of the large farms in the Corn Belt, only 5% of farms in the EU, mostly located in Germany) (Schaffnit-Chatterjee, 2010).

Possible benefits of farmers using hedging strategies could be seen in the next example explaining the futures contracts. It is assumed that the corn price at the futures market in November will be set at 125 EUR/t, which fully fits the expectations of the producers. But in November, the forward contract is closed at the price of 120 EUR/t, and the farmer really sells corn in November on the local spot market for the 120 EUR/t. Farm result obtained after the use of hedging strategy can be observed in the next table.

Table 3. Hedging strategy with the futures contracts

Spot corn price	Futures corn price	End result
Planned corn price in April for November is 125 EUR/t	Corn sold under November futures for 125 EUR/t	– Planned price for November 125 EUR/t – Spot price in November 120 EUR/t – Profit on futures market 5 EUR/t – Final corn price in November 125 EUR/t
Spot price of corn in November is 120 EUR/t	Futures contract closed by farmer in November at 120 EUR/t	
Spot market result is 125 EUR/t – 120 EUR/t or 5 EUR/t less than planned price	Operation at futures market results the profit of 5 EUR/t	

Source: authors' study.

The idea behind opening a short hedging position (selling agricultural products on futures contract) consists in the fact that even if there is a fall in the price on the spot market at a certain moment, as it is shown in the example, the planned price (125 EUR/t) is secured by a gain on futures contract. In simple words, no matter how much the farmer loses from the corn price drop from April to November on the spot market, he will approach the planed price through the futures market. Likewise, in case of corn price growth farmers' gain on spot market will be reduced to the same loss at futures market.

Another example that shows the possible benefit of farmers while practicing the hedging strategies is operation with option contracts: corn producer in May is purchasing the November put option with a strike price of 125 EUR/t, with an option premium of 10 EUR/t. The next table shows the possible development of result that could be gained at the farm.

Table 4. Hedging strategy with the option contracts

Corn price at spot market in November (EUR/t)	Option value (EUR/t)	Profit/loss (EUR/t)
150	0	-10
140	0	-10
125	0	-10
115	10	0
105	20	10
100	25	15

Source: authors' calculations.

According to the previous Table, the breaking point is at the corn price of 115 EUR/t (gain on option contract is offset by paid option premium). Furthermore, profit generated by farmer will increase in line with the rate of corn price drop at the spot market (the farmer will activate the option right when the price drops below 125 EUR/t). When the price of corn grows, the farmer will not have the interest to exercise the option right (at price above 125 EUR/t).

As in the US, the EU soft commodity derivative market is important because it plays a role in hedging strategies realization and further advancement of the whole farm insurance and revenue insurance transfer to the futures market (insurance agencies are in position to hedge their risks at futures market) (Tiwari et al., 2017). Compared to the US, soft commodity derivative market in the EU handles much lower volume.

Further development of the EU derivative market requires certain preconditions, for instance, sufficient trade volume that guarantee its sustainability. There are few commodity exchanges in the EU with futures market in agricultural products (mostly in Central and Western EU).

In Eastern Europe, there were unsuccessful attempts of individual Member States to establish futures market (Hungary, Romania or Bulgaria). According to the FAOSTAT, the average annual grain production in the last decade in Eastern Europe was around 2.44 million tons. This could be considered as sufficient to support joint commodity market in this region. Besides, as these are mostly agrarian countries, there is a need for establishing a joint futures exchange that will operate under a single clearinghouse, thus advancing management of agricultural risks in this part of the EU. In practice, location for the newly established soft commodity derivative (futures) market is usually chosen by the infrastructural and economic strength of the delivery point, i.e. market with the highest spot trading. For joint Eastern Europe futures market, the Black Sea region could be the possible delivery point (Kovačević, 2013; FAOSTAT, 2018).

Starting from 2018, the new common EU regulative framework (MiFID II), jointly with previously established EU rules on derivatives contracts (Regulation No. 648/2012), have advanced investor protection, as well as improved the functioning of financial markets, making them more efficient, resilient and transparent. In case of joint commodity exchange, certain provisions could facilitate its activities, as for e.g. clearinghouse registered in one of the Member States may operates in the whole EU, or trade can become easier as its done in single EU currency – EUR (EC, 2012; ESMA, 2018).

The figure below demonstrates the specific importance of the commodity exchanges for farmers from particular region. It shows corn price correlation between Novi Sad commodity exchange, MATIF exchange in Paris and Chicago Mercantile Exchange (CME).

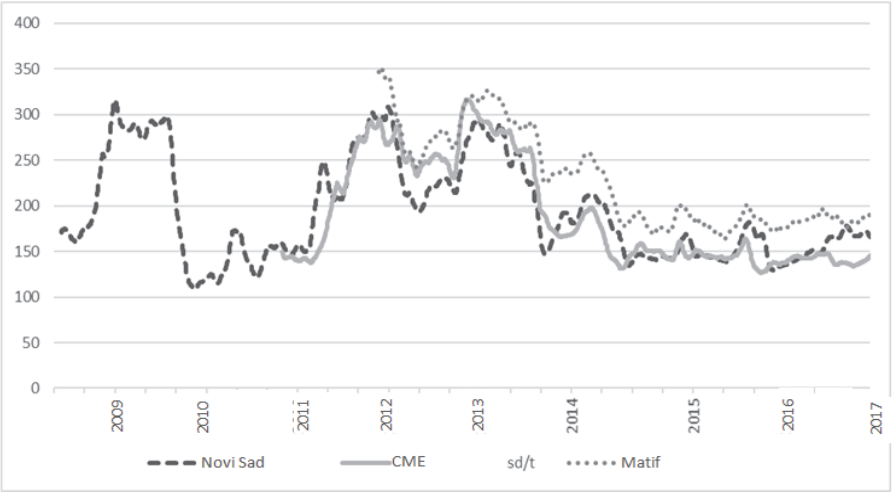

Figure 2. Trend of corn prices on Novi Sad commodity exchange, CME and MATIF during the 2008-2017 period (in USD/t)

Source: commodity exchange Novi Sad, 2018; CME, 2018; MATIF, 2018.

Considering the Figure above it can be concluded that:

- Regardless of the territorial impact, present high price volatility is a driving force for trading with futures (in volatile markets, in order to control certain risks, farmers and traders have a need for the commodity exchange trading).
- Trend of interregional price correlation is significant (Table 5) which is in turn essential for establishment of international trade and joint futures markets.

The next table shows the correlation of corn prices between the Commodity exchanges in Novi Sad, CME and MATIF.

Table 5. R square correlations between the corn prices achieved at Commodity exchange in Novi Sad, CME and MATIF

Commodity exchange	CE Novi Sad	CME	MATIF
CE Novi Sad	1	0.905478016	0.94607507
CME	0.905478016	1	0.945824542
MATIF	0.94607507	0.945824542	1

Source: authors' calculations based on data from Commodity exchange Novi Sad, 2018; CME, 2018; MATIF, 2018.

5. Fiscal-tax measures

Fiscal and tax policy can be an effective tool in farm income stabilization (McDowell et al., 1989). They allow farmers to average their income during various years (agriculture could be characterized by notable profit oscillations from year to year, caused by unstable weather conditions, or product price fluctuation, etc.). Fiscal and tax measures may also reduce the tax requirements in bad years, transferring a certain part of taxation from years with lower to years with regular and above-average income. They also provide the opportunity to impose tax reliefs or exemptions for farms affected by climate hazards (Benson, Clay, 2004).

In relation to future the EU CAP policy, France can be a general example of well-designed agricultural tax instruments (Deduction pour Aléas). It offers a good alternative to farmers to overcome the consequences of income and yield oscillations. This instrument allows farmers to manage a precautionary savings account oriented at certain types of risk, where in practice farmers set aside a tax-deductible part of their incomes which can be used in cases of weather (hail, frost, etc.), economic (e.g., contract termination), sanitary (disease) and family (divorce, incident that affects invalidity, etc.) events (OECD, 2009).

6. Ad-hoc payments

Ad-hoc payments provide an opportunity for the government to provide support to the farmers who suffered damages in case of catastrophic events.

Ad-hoc payments can appear in the form of financial support for repair of damaged facilities and elements of physical infrastructure, as well as for rebuilt of machinery, or tree plantation, herds, etc. Moreover, in some situations *ad-hoc* payments can be substituted with subsidized loans, tax reliefs or other forms of government support.

Several *ad-hoc* measures for catastrophic events are used by the EU Member States. Main issues related to their realization focus usually on their overlapping with agricultural insurance (avoiding double compensation). Most often the national law does not allow certain damage to be compensated from public funds if they were previously insured, or if insurance is available for this type of risk, or compensations include just those damages for which insurance is still not developed or implemented (Bielza et al., 2008).

The main disadvantages of *ad-hoc* measures includes: difficulties in correct assessment of farmers' damages, lack of knowledge on the part of farmers if *ad-hoc* support is triggered by catastrophic event and refusal to use other risk management instruments by farmers because of strong reliance on *ad-hoc* support, etc.

Conclusion

Importance of the further EU support for implementation and development of risk management instruments is primarily in line with the expected continuation of climate change pressure affecting the growth of production risks and price volatility that increase instability of farmers' income.

There are no detailed common regulations to define the functioning mechanism of newly developed and introduced IST. Currently, all these instruments and initiatives are mostly regulated by the national legislation. As the new EU CAP should be directed at greater market orientation, it requires further harmonization of risk management policy on the EU level.

The present insurance policy in the EU agriculture is usually predominated by single peril insurance, while in the US and Canada the dominant form is revenue insurance that covers all farm risks (production and income). Surely, one of the CAP task should be advancement of the insurance structure with the increase of revenue insurance share, as well as development of the coherent and common EU policy focused on insurance (current policy is greatly left to the discretion of Member States).

Although they are operational within the EU Member States (with several positive experiences), the EU support directed at mutual funds should be increased and common policy in this regard should be implemented.

Because of certain advantages over insurance, savings accounts as farm risk management funds could be their good alternative. It could be useful to base on positive experience and results achieved in Canada, as well as recent efforts in France showing a good path to follow for the CAP 2020+ reform related to this instrument.

Further development of futures market is one of the keystones of the EU policy reform regarding risk management. Its importance relies on the fact that farmers use futures market for hedging strategies, as well as for development of whole-farm insurance and revenue insurance (well-developed futures market is a place where insurance agencies hedge their revenue-based insurance policies). Futures market in the EU are week, because well-developed futures market cannot operate without a certain volume of trade. Because of a major direct and indirect importance it has on risk management for the EU agriculture, certain possibilities are suggested, such as the use of advantages of MiFID II policy in establishing a common grain futures market for the Eastern EU countries (this territory has at its disposal a sufficient volume of grains, thus together with the results gained for grain price correlation it leads to development of sustainable joint futures market with one clearinghouse operating for the whole market that will achieve good liquidity). Furthermore, all preconditions for development of the joint EU futures (derivative) market exist, such as significant volatility of agricultural-food products and significant price correlation in individual EU Member States.

Income stabilization tool is beyond the conceptual base in the EU due to its complex implementation procedure, so it is suggested to be replace it with other risk management instruments, such as whole farm insurance, revenue insurance, savings accounts, etc.

Fiscal and tax policy measures can be used as an effective tool in farmers' income stabilization. They allow farmers to average their income gained within a certain period of time. Because of the way how agricultural production characterizes profit variation between the several years (due to oscillation in climatic conditions or volatility of product prices, etc.), the abovementioned policies would allow to transfer tax requirements from bad to profitable years. Positive experience for development of the current EU CAP policy in this regard can be found in France.

Up till today, *ad-hoc* measures are mostly implemented in the EU. Given some of their disadvantages, it is suggested to reduce them in favour of support to other risk management instruments.

In line with efforts to support international trade, the upcoming CAP reform must be, above all, fully matched (in part related to risk management instruments too) to the WTO requirements.

References

Agriculture & Agri-food Canada (2018). AgriInvest. Web portal of the Federal Ministry of the Agriculture, Ottawa, Canada. Retrieved from: www.agr.gc.ca/eng/?id=1291828779399 (access date: 12.01.2019).

Anton, J. (2015). Risk management in agriculture: What role for policy in the new Common Agricultural Policy? In: J.A. McMahon, M.N. Cardwell (Eds.), *Research Handbook on EU Agriculture Law* (pp. 86-112). Cheltenham, UK: Edward Elgar Publishing Ltd.

Anton, J., Kimura, S., Martini, R. (2011). *Risk management in agriculture in Canada*. OECD Food, Agriculture and Fisheries Papers, paper no. 40, p. 87. Paris, France: OECD Publishing. Retrieved from: https://doi.org/10.1787/5kgj0d6189wg-en (access date: 14.11.2018).

Baltussen W.H.M., van Asseldonk, M.A.P.M., van der Meulen, H.A.B., Meuwissen, M.P.M., Valeeva, N.I., Vrolijk, H.C.J., Berndsen, R.C.D., Kort, M.B., van Lanen, R.J.M., Poppe, K.J. (2008). *Risk management instruments in agriculture: An assessment of efficacy and distortions*. Report no. 2008.054, p. 92, Hague, the Netherland: LEI Wageningen UR.

Bardaji, I., Garrido, A., Blanco, I., Felis, A., Maria Sumpsi, J., Garcia Azcarte, T., Enjolras, G., Capitanio, F. (2016). *Research for Agri Committee – State of play of risk management tools implemented by Member States during the period 2014-2020: National and European frameworks*. Study, p. 142, Brussels, Belgium: Directorate General for Internal Policies, Policy Department B: Structural and Cohesion Policies, European Parliament. Retrieved from: www.europarl.europa.eu/RegData/etudes/STUD/2016/573415/IPOL_STU(2016)573415_EN.pdf (access date: 16.01.2019).

Bazerkoska, J.B. (2011). The European Union and the World Trade Organization: Problems and Challenges. *Croatian Yearbook of European Law and Policy*, vol. 7, pp. 277-290.

Benson, C., Clay, E.J. (2004). *Understanding the economic and financial impacts of natural disasters*. Disaster Risk Management Series, no. 4, p. 119, Washington, USA: World Bank. Retrieved from: www.preventionweb.net/files/1848_VL102115.pdf (access date: 14.01.2019).

Bielza Diaz Caneja, M., Conte, C.G., Dittmann, C., Gallego Pinilla, F.J., Stroblmair, J. (2008). *Agricultural Insurance Schemes.* JRC Scientific and Technical Reports, p. 302, Ispra, Italy: European Commission, Joint Research Centre, Institute for the protection and security of the citizen.

Castaneda Vera, A., Garrido, A. (2017). Evaluation of risk management tools for stabilising farm income under CAP 2014+2020. *Economía Agraria y Recursos Naturales, vol. 17*(1), pp. 3-23.

CME (2018). *Trend of corn price in 2011-2017*. Web portal of Chicago Mercantile Exchange (CME), Chicago, USA: CME Group. Retrieved from: www.cmegroup.com (access date: 09.09.2018).

Commodity Exchange Novi Sad (2018). *Trend of corn price in 2008-2017*. Web portal of Commodity Exchange Novi Sad, Serbia. Retrieved from: https://www.proberza.co.rs/ (access date: 09.09.2018).

Cordier, J. (2015). *Comparative analysis of risk management tools supported by the 2014 farm bill and the CAP 2014-2020*. Study, p. 89, Rennes, France: UMR Smart-Lereco, Agrocampus Ouest INRA.

Cordier, J., Santeramo, F. G. (2018). *Mutual Funds and the Income Stabilization Tool in the EU: Retrospect and prospects*. MPRA Paper no. 90542, pp. 1-9, Munich, Germany: University Library of Munich, Retrieved from: https://mpra.ub.uni-muenchen.de/90542/1/MPRA_paper_90542.pdf (access date: 13.01.2019).

Cottier, T. (2001). Risk Management Experience in WTO Dispute Settlement. In: D. Robertson, A.J. Kellow (Eds.), *Globalization and the Environment: Risk Assessment and the WTO* (pp. 41-62). Cheltenham, UK: Edward Elgar.

Crane, L., Gantz, G., Isaacs, S., Jose, D., Sharp, R. (2013). *Introduction to risk management*. 2nd edition, p. 40, Washington, USA: Extension Risk management education and risk management agency, USDA. Retrieved from: http://extensionrme.org/pubs/introductiontoriskmanagement.pdf (access date: 04.02.2019).

Csiszar, E.N. (2007). An update on the use of modern financial instruments in the insurance sector. *Geneva Papers on Risk and Insurance – Issues and Practice*, vol. 32(3), pp. 319-331.

Dismukes, R., Durst, R. (2006). Whole-farm approaches to a safety net. *Economic Information Bulletin*, no. 15, pp. 1-19, Washington, USA: U.S. Department of Agriculture, Economic Research Service. Retrieved from: https://ageconsearch.umn.edu/record/33893/files/ei060015.pdf (access date: 06.02.2019).

Đurić, K. (2015). *Ekonomika poljoprivrede: Praktikum* [*Economics of Agriculture*]. p. 119, Novi Sad, Serbia: Faculty of Agriculture, University in Novi Sad.

EC (2012). *Regulation (EU) no. 648/2012 of the European Parliament and of the Council of 4th July 2012 on OTC derivatives, central counterparties and trade repositories*. Retrieved from: https://eur-lex.europa.eu/legal-content/EN/LSU/?uri=celex:32012R0648 (access date: 06.02.2019).

El Benni, N., Finger, R., Meuwissen, M.P. (2015). Potential effects of the Income Stabilization Tool (IST) in Swiss agriculture. *European Review of Agricultural Economics, vol. 43*(3), pp. 475-502.

ESMA (2018). *MiFID II*. Web portal of European Securities and Markets Authority (ESMA), Paris, France. Retrieved from: www.esma.europa.eu/policy-rules/mifid-ii-and-mifir (access date: 16.12.2018).

Fancher, S. (2002). FCIC's *Standard Reinsurance Agreement*. Agricultural Law Research Article, pp. 1-13. Fayetteville, USA: National Center for Agricultural Law Research and Information, University of Arkansas. Retrieved from: http://nationalaglawcenter.org/wp-content/uploads/assets/articles/fancher_reinsurance.pdf (access date: 7.02.2019).

FAOSTAT (2018). *Total volume of cereal production in Eastern Europe in period 2008-2017*. Database of FAOSTAT, Rome, Italy: Food and Agriculture Organization of the UN (FAO). Retrieved from: www.fao.org/faostat/en/#data/QC (access date: 06.10.2018).

Girdziute, L. (2012). Risks in agriculture and opportunities of their integrated evaluation. *Procedia – Social and Behavioral Sciences*, vol. 62, pp. 783-790.

Haberli, C. (2014). *After Bali: WTO rules applying to public food reserves*. FAO Commodity and Trade Policy Research Working Paper no. 46, p. 27. Rome, Italy: Food and Agriculture Organization of the UN (FAO).

Harwood, J., Heifner, R.G., Coble, K., Perry, J., Somwaru, A. (1999). *Managing risk in farming: Concepts, research, and analysis*. Agricultural Economics Report no. 774, p. 125. Washington, USA: U.S. Department of Agriculture, Economic Research Service. Retrieved from: https://ageconsearch.umn.edu/bitstream/34081/1/ae990774.pdf (access date: 14.12.2018.).

Hohl, R. M. (2019). *Agricultural risk transfer: From insurance to reinsurance to capital markets*. Chichester, UK: John Wiley and Sons ltd.

Jankovic, I., Jelocnik, M., Zubovic, J. (2018). Possibilities for development of commodity exchange in Serbia. *Economics of Agriculture, vol. 65*(4), pp. 1557-1571.

Janowicz Lomott, M., Lyskawa, K. (2014). The new instruments of risk management in agriculture in the European Union. *Procedia Economics and Finance*, vol. 9, pp. 321-330.

Janowicz Lomott, M., Lyskawa, K., Rozumek, P. (2015). Farm income insurance as an alternative for traditional crop insurance. *Procedia Economics and Finance*, vol. 33, pp. 439-449.

Kahan, D. (2008). *Managing risk in farming*. Rome, Italy: Food and Agriculture Organization of the UN (FAO).

Kang, M.G., Mahajan, N. (2006). *An introduction to market-based instruments for agricultural price risk management*. Agricultural management, marketing and finance working document no. 12. Rome, Italy: Food and Agriculture Organization of the UN (FAO). Retrieved from: www.fao.org/docrep/016/ap308e/ap308e.pdf (access date: 04.01.2019).

Kolb, R., Overdahl, J. (2007). *Futures, Options, and Swaps*. 5th edition. Hoboken, USA: Wiley-Blackwell Publishing.

Kovačević, V. (2013). Introduction of the grain futures market in the Black Sea region. *Economics of Agriculture, vol. 60*(4), pp. 695-712.

Kuliesis, G., Pareigiene, L., Ribasauskiene, E., Sablou, C. (2017). The readiness of farmers to create mutual funds for agricultural risk management in Lithuania. *Management theory and studies for rural business and infrastructure development*, vol. 39(4), pp. 442-452.

Lipinska, I. (2016). Managing the risk in agriculture production: The role of government. *European Countryside, vol. 8*(2), pp. 86-97.

MATIF (2018). *Trend of corn price in 2012-2017.* Web portal of MATIF (Euronext), Paris, France. Retrieved from: www.euronext.com/en (access date: 09.09.2018).

Matthews, A. (2017). Why further reform? (Appendix 1). In: A. Buckwell, (Ed.), CAP: *Thinking out of the Box (Further modernization of the CAP – why, what and how?)*, (pp. 1-24). Brussels, Belgium: the RISE Foundation.

Matthews, A. (2018). *Recent trends in EU WTO domestic support notifications.* Web portal CAPreform.eu. Retrieved from: http://capreform.eu/recent-trends-in-eu-wto-domestic-support-notifications/ (access date: 16.01.2019).

Matthews, A., Salvatici, L., Scoppola, M. (2017). *Trade Impacts of Agricultural Support in the EU*. IATRC Commissioned Paper no. 19, p. 116. St. Paul, USA: International Agricultural Trade Research Consortium (IATRC).

McDowell, H., Kramer, R.A., Price, J.M. (1989). An analysis of U.S. farm income policies: Historical, market-determined, and sector-wide stabilization. *Southern Journal of Agricultural Economics, vol. 21*(2), pp. 1-11.

Meuwissen, M.P.M., Hardaker, B., Huirne, R.B.M., Dijkhuizen, A.A. (2001). Sharing risks in agriculture: Principles and empirical results. *Netherlands Journal of Agricultural Science, vol. 49*(4), pp. 343-356.

Milić, D., Tica, N., Zekić, V., Radeka, M., Ranogajac, J., Bačkalić, Z. (2011). Utvrđivanje vrednosti nepoljoprivrednih zemljišta [Determining the value of non-agricultural land]. *Agroekonomika, vol. 40*(51-52), pp. 104-114.

Miller, A., Dobbins, C., Pritchett, J., Boehlje, M., Ehmke, C. (2004). *Risk management for farmers*. Staff paper no. 04-11, pp. 1-27. West Lafayette, USA: Department of Agricultural Economics, Purdue University. Retrieved from: http://ageconsearch.umn.edu/bitstream/28640/1/sp040011.pdf (access date: 05.01.2019.).

Motamed, M., Hungerford, A., Rosch, S., O'Donoghue, E., MacLachlan, M., Astill, G., Cessna, J., Cooper, J. (2018). *Federal risk management tools for agricultural producers: An overview*. Economic Research Report (ERR) no. 250. Washington, USA: U.S. Department of Agriculture, Economic Research Service. Retrieved from: https://infoagro.net/sites/default/files/2018-08/err-250.pdf (access date: 23.01.2019).

Novickyte, L. (2018). Income Risk Management in Agriculture using Financial Support. *European Journal of Sustainable Development, vol. 7*(4), pp. 191-202.

OECD (2009). *Managing risk in agriculture: A holistic approach*. Paris, France: Organization for economic co-operation and development (OECD). Retrieved from: www.oecd.org/agriculture/agricultural-policies/45558582.pdf (access date: 25.12.2018).

Paulson, N.D., Babcock, B.A. (2008). Get a GRIP: Should area revenue coverage be offered through the farm bill or as a crop insurance program. *Journal of Agricultural and Resource Economics, vol. 33*(1), pp. 137-154.

Schaffnit Chatterjee, C. (2010). *Risk management in agriculture: Towards market solution in EU*. Deutsche Bank Research, p. 30. Frankfurt am Main, Germany: Deutsche Bank AG. Retrieved from: www.dbresearch.com/PROD/RPS_EN-PROD/PROD0000000000466866/Risk_management_in_agriculture%3A_Towards_market_sol.PDF (access date: 09.02.2019.).

Shields, D.A. (2010). *Renegotiation of the Standard Reinsurance Agreement (SRA) for Federal Crop Insurance*. CRS Report for Congress R40966, p. 17. Washington, USA: Congressional Research Service (CRS). Retrieved from: http://nationalaglawcenter.org/wp-content/uploads/assets/crs/R40966.pdf (access date: 06.02.2019).

Shields, D.A. (2015). *Federal crop insurance: Background*. CRS Report for Congress R40532, p. 23. Washington, USA: Congressional Research Service (CRS). Retrieved from: www.fas.org/sgp/crs/misc/R40532.pdf (access date: 07.02.2019).

Smith, V.H. (2017). *The US Federal Crop Insurance Program: A Case Study in Rent Seeking.* Mercatus Working Paper, p. 52. Arlington, USA: Mercatus Center, George Mason University. Retrieved from: www.mercatus.org/system/files/smith-farm-bill-wp-mercatus-v1.pdf (access date: 05.01.2019).

Smith, V.H., Glauber, J.W. (2012). Agricultural insurance in developed countries: where have we been and where are we going? *Applied Economic Perspectives and Policy, vol. 34*(3), pp. 363-390.

Stošić Mihajlović, Lj., Zdravković, I. (2016). Forward, future and options on stock exchange market. *Journal of Process Management − New Technologies, International, vol. 4*(3), pp. 50-56.

Tangermann, S. (2011). *Risk management in agriculture and the future of the EU's Common Agricultural Policy*. ICTSD Programme on Agricultural Trade and Sustainable Development, paper no. 34, p. 39. Geneva, Switzerland: International Centre for Trade and Sustainable Development (ICTSD). Retrieved from: www.ictsd.org/sites/default/files/downloads/2011/12/risk-management-in-agriculture-and-the-future-of-the-eus-common-agricultural-policy.pdf (access date: 28.11.2018).

Theuvsen, L. (2013). Risks and risk management in agriculture. *Problems of world agriculture, vol. 46*(4), pp. 162-174.

Tiwari, S., Coble, K.H., Harri, A., Barnett, B.J. (2017). *Hedging the price risk of crop revenue insurance through the options market.* Southern Agricultural Economics Association (SAEA) annual meeting, Mobile, USA, pp. 1-29. Retrieved from: https://ageconsearch.umn.edu/bitstream/253081/2/SAEA2017_Sweta.pdf (access date: 16.12.2018.).

Ullah, R., Shivakoti, G.P., Zulfiqar, F., Kamran, M.A. (2016). Farm risks and uncertainties: Sources, impacts and management. *Outlook on Agriculture, vol. 45*(3), pp. 199-205.

Vasiljević, Z. (1998). *Ekonomska efektivnost investicija u poljoprivredi* [*Economic effectiveness of the investments in agriculture*]. Belgrade, Serbia: Foundation Andrejević.

Vasiljević, Z., Kovačević, V., Zakić, V. (2014). Razvoj instrumenata za upravljanje rizikom poslovanja u poljoprivredi u funkciji privrednog razvoja Srbije, [Development of instruments for management of business risk in agriculture in the function of economic development of Serbia]. *Ekonomski vidici, vol. 19*(2-3), pp. 333-346.

Vujatović Zakić, Z. (2001). *Agrarna ekonomija* [*Agrarian economy*]. Belgrade, Serbia: Faculty of Economics, University in Belgrade.

Vukoje, V., Tomaš Simin, M., Trkulja, U., Klještanović, S., Krompić, J. (2015). *Inovativni programi unapređenja organske proizvodnje* [*Innovative programs for organic production advancement*]. Study, p. 123. Novi Sad, Serbia: Faculty of Agriculture, University in Novi Sad.

WTO (2018a). *WTO in brief*. Geneva, Switzerland: The World Trade Organization (WTO). Retrieved from: www.wto.org/english/thewto_e/whatis_e/inbrief_e/inbr_e.pdf (access date: 18.12.2018).

WTO (2018b). *Agreement on Agriculture: Uruguay round agreement*. Geneva, Switzerland: The World Trade Organization (WTO). Retrieved from: www.wto.org/english/docs_e/legal_e/14-ag.pdf (access date: 18.12.2018).

Zakić, V., Vasiljević, Z. (2013). Uspostavljanje tržišta robnih derivata u funkciji unapređenja agrosektora u Srbiji [Establishment of the commodity derivatives market in the function of agribusiness sector improvement in Serbia]. *Ekonomski vidici, vol. 18*(1), pp. 49-61.

Zakić, Z., Stojanović, Ž. (2008). *Ekonomika agrara* [*Economics of Agriculture*]. 1st edition, Belgrade, Serbia: Center for publishing, Faculty of Economics, University of Belgrade.

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