WHOLE FARM REVENUE INSURANCE AS A NEW MODEL OF CROP INSURANCE

Željko Kokot[1], Todor Marković[1], Aleksandra Martinovska-Stojcheska[2], Ivana Janeska Stamenkovska[2]

[1]University of Novi Sad, Faculty of Agriculture, Republic of Serbia
[2]University Ss. Cyril and Methodius in Skopje, Faculty of Agricultural Sciences and Food-Skopje, Republic of Macedonia

Corresponding author: zeljko.kokot5@gmail.com

Abstract
Agricultural production is a specific area of business that is strongly influenced by natural, climatic, market, financial and institutional factors. These are all hazards not depending on the will of man and his activities, and it is necessary to foresee them and to insure against them. Crop and fruit insurance is the most effective risk management instrument in open field crop production. The aim of this paper is to present a new model of crop insurance which began to apply in 2015 in the United States. Every farm, by its implementation, provides farm's expected total revenue that may be affected by the operation of both natural and climate risks, and market risks too, which are manifested through fluctuations in market prices. In this way all farm crops are insured against any risks with just one policy. Analyzed farm has experienced revenue loss due to drought, therefore it has indemnity right in the amount of 2,500 €. Premium costs amount to 330 €.

Keywords: crop insurance, revenue, farm, one policy.

Introduction

Insurance is a financial arrangement that reallocates the costs of unexpected losses (Dorfman, 2007). Insurance of crops and fruits, as a contemporary form of protection of the production is the best risk management instrument in crop production (Kokot et al., 2017). The emergence of modern risk management in agriculture is increasingly becoming focused on ensuring total farm revenue (Turvey, 2012), considering that thus eliminating the disadvantages of traditional insurance systems, like adverse selection and moral hazard. The aim of the whole farm insurance is to unite all the risks that threaten farm under one insurance policy. Whole-farm revenue protection (hereinafter WFRP), as the latest model of the whole farm insurance, provides protection against loss of revenue that farmer expects to earn or will obtain from commodities (crops, fruits, livestock etc.) produced or purchased for resale during the insurance period. WFRP protects against revenue loss due to any unforeseen natural phenomena that cause a decrease in yield, or due to market fluctuations that cause the revenue loss during the insurance year (Stokes Nayda and English, 1997; Zhu et al., 2008; Johnson et al., 2008). The Risk Management Agency (RMA), which is located within the Ministry of Agriculture of the United States, begin to apply WFRP under the Farm Bill from 2014. WFRP is the successor of the Adjusted Gross Revenue (AGR-Lite), which also represents a model of the whole farm insurance (Shields, 2012). The benefits of applying WFRP as compared to AGR-Lite are: a wider range of coverage level, increased maximum amount of coverage (from 1 to 8,5 mil. $), replant coverage, higher government subsidies and coverage of the market readiness costs (Chalise et al., 2017; Shields, 2015). Whole farm insurance provides more efficient coverage then ensuring each commodity separately with particular insurance policy (Bielza Maria and Garrido, 2009). The ratio of this insurance model is based on a simple diversification and portfolio management. For example, if a farmer grows two crops, A and B, the insurance policy based on the total farm revenue will be cheaper than the sum of the premiums for two individual insurances for crops A and B, which provides the same expected revenue. Saving is inversely proportional to the correlation between revenue from the analyzed crops (Hennessy et al., 1997). On the other hand, WFRP has an important

positive side for insurance companies because the negative financial result, which the farmer realizes in one product can be offset with the positive financial result of another product. In this way there is no significant reduction in total farm revenue, therefore insurance companies will not have to compensate the damage. The aim of the research is to present the theoretical basis of WFRP, as the most modern insurance model in agriculture, and to analyze the possibility of applying this model in Serbia based on a practical example.

Material and methods

For the purposes of research, primary data is obtained from a private farm located in the northern part of Serbia, Province of Vojvodina. Additional sources of data are the Statistical Office of the Republic of Serbia, the Commodity Exchange in Novi Sad and the United States Department of Agriculture. The data was analyzed within the period of five years (2010-2014). A literature review was carried out to outline the theoretical framework for this paper. A practical implementation of WFRP is shown in the case of the aforementioned farm. When projecting the expected farm revenue in the insurance year, data on average realized revenue in the period from 2010 to 2014 are used. The expected revenue (R) is calculated as the product of the total area sown (a), the expected yield (y) and the commodity price (s).

$$R = a \cdot s \cdot y \quad (1)$$

The amount of insurance premium (P) that farmers have to pay to an insurance company, as compensation for the transfer of risk, is the product of the insured revenue (R_o) and premium rate (p), whereby the insured revenue is obtained as a product of the approved revenue and the selected level of coverage:

$$P = R_o \cdot p \quad (2)$$

The level of premium rate depends primarily on the diversification factor, which is determined based on the number of commodities on the farm and the Weighted Commodity Rate. The Risk Management Agency (RMA) allows all farmers to calculate themselves how much the insurance policy would cost them. Namely, the Cost Estimator, located on the RMA website, where each farmer will, by entering the appropriate parameters, receive the amount of the premium to be paid. In the event of failure to achieve guaranteed revenue, the farmer is entitled to indemnity (I_n) which is calculated as the difference between the insured revenue (R_o) and the realized revenue (R_p). On the other hand, if the farmer generates revenue at the end of the year equal to or greater than the guaranteed revenue, it can be concluded that the insured event did not occur, and consequently there is no need for an indemnity:

$$I_n = R_o - R_p \quad (3)$$

Results and discussion

Basic characteristics of WFRP

WFRP is the only insurance model in agriculture which is available at the national level respectively in all 50 USA states. This model represents a system that is based on revenue. In this way, protection of total farm revenue is provided with one insurance policy. In other words, this approach represents an "umbrella policy". A trigger level forms within the policy, and if realized revenue falls below that level, indemnity right will be acquired. WFRP protects the farm from the loss of revenue that is expected to be earned from: (i) commodities produced during the insurance period, regardless of whether they are sold or not; (ii) commodities purchased for resale during the insurance period; (iii) all commodities on the farm, except timber, forest and forest products, or animals for sport and show or pets. The farmer should choose the appropriate coverage level of the

insured revenue when applying for the WFRP insurance program. WFRP provides coverage levels ranging from 50 to 85% of the farm insured revenue. It is necessary to have an expressed diversification of production if certain farm wants to be qualified for the highest coverage levels. It practically means that at least 3 commodities must be on the farm (for example, wheat, corn and sunflower), which each individually contributes significantly to the total revenue in order to farm qualifies for coverage level of 80 and 85%. The diversification level is very important for WFRP and is measured by the number of commodities on the farm. Higher production diversification except allowing a higher percentage of coverage, it also allows a higher subsidy amount in order to pay lower premiums. This is because the higher diversification reduces the risk of total farm revenue decrease. In addition to product diversification, authors Pejanović and Njegomir (2011) mention spatial diversification, diversification of businesses, diversification by off-farm employment and diversification by association in cooperatives, as ways to diversify the risks that the farmers are exposed to. The insurance period is based on the fiscal year. If the farmer is a tax filer who pays taxes on the basis of the calendar year, the insurance period is from January1 to December 31. There are certain documents that must be submitted to the insurance agent when concluding policy, and which are related to farm operation in the last five years (the so-called historic period):

1) WFRP application
2) Whole-Farm History Report
a) Tax form Schedule F for all the previous 5 years of historic period
b) Allowable Revenue Worksheet for all the previous 5 years of historic period
c) Allowable Expenses Worksheet for all the previous 5 years of historic period
3) Farm Operation Report
4) Beginning Accounts Receivable and Accounts Payable Report

(if applicable)

5) Market Animal and Nursery Inventory Report.

Furthermore, these and all other documents that must be submitted when concluding the insurance contract and during the insurance year will be explained through a practical example of the implementation of WFRP insurance.

WFRP implementation in the analyzed farm case

A farm located in the northern part of Serbia, province of Vojvodina, will be analyzed in this particular case. The farm has a total of 28 ha of arable land that is deployed on four plots of 3, 5, 8 and 12 hectares and is engaged solely in crop production. In all years of the analyzed period, spring wheat, corn, soybean and sunflower are represented in the sowing structure. The first step will be the drafting of the Whole-Farm History Report (Table 1). The Whole-Farm History Report is a report that documents allowable revenue and allowable expenses for each tax year that is used in determining the whole farm historic average of revenue and expenses (WFRP Pilot Handbook, 2016). Historic period covers five consecutive tax years prior to the tax year immediately before the insurance year (lag year). Particularly, it is necessary to provide copies of tax forms for the period from 2010 to 2014 for the insurance year 2016.

Table 1. Whole-Farm History Report (Insurance year 2016)

Tax year	Allowable revenue (€)	Allowable expenses (€)
2010	30,700	20,198
2011	28,587	18,807
2012	25,882	17,028
2013	28,778	18,933
2014	30,600	19,999
Total	144,547	94,965
Whole farm historic average	28,910	18,993

Source: Farm; Authors' calculation

The next step is compiling the Intended Operation Report, which represents a form on which the insured provides all necessary information in relation to all crops planned for production during the insurance year and the expected revenue from those crops during the insurance period. In particular, it is necessary to enter data regarding the specific area under each crop (number of hectares), the total expected production, the expected selling price per commodity unit, and the total value of each commodity. The approved revenue amount is determined on the basis of Farm Operation Report and represents a lower amount of: (1) Farm Expected Revenue in the insurance year, or (2) Whole-Farm Historic Average Revenue (Table 1). In this specific case, as stated above, the analyzed farm is engaged solely in crop production, and it is planned 12 ha of spring wheat, 3 ha of corn, 5 ha of soybeans and 8 ha of sunflower to be grown in the insurance year. Total expected revenue at the farm level is calculated on the basis of expression (1) and amounts 25,895 €, which in this case also represents the value of the approved revenue, while the value of approved expenses is 17,012 €. At the end of production year, it is necessary to complete Schedule F, which represents a tax form that is most commonly used for the application of the federal farm tax. This means that actual realized revenue and expenses during the production (insurance) year are determined on the basis of Schedule F (Table 3). Copies of the applicable tax forms of Internal Revenue Service (IRS), such as Schedule F, must be submitted to the insurance company for each tax year within the farm historic period (2010-2014).

Table 2. Farm Operation Report

Commodity	Measurement unit	Yield (t x ha^{-1})	Expected Value (€ x t^{-1})	Expected Revenue (€)	Intended area (ha)	Total Expected Revenue (€)
Spring wheat	Ha	4.74	161	763	12	9,156
Corn	Ha	8.62	142	1,224	3	3,672
Soybeans	Ha	3.42	353	1,207	5	6,035
Sunflower	Ha	2.98	295	879	8	7,032
Total at sales closing date						25,895
Total Expected Revenue at sales closing date (SCD)						25,895
Whole-Farm Historic Average Revenue (Item 5 from Table 1)						29,344
Approved Revenue (Lesser of item 9 and 10)						25,895
Approved Expenses (Approved Revenue/item 5 from Table 1 for revenue x item 5 from Table 1 for expenses)						17,012

Table 3. Allowable revenue and expenses' calculation

Serial no.	Description	Amount (€)
1.	Gross farm revenue in 2016 (Schedule F)	37,544
2.	Gross farm expenses in 2016 (Schedule F)	38,662
3.	Adjustment revenue amount	18,034
4.	Adjustment expenses amount	10,181
5.	Allowable revenue for tax (insurance) year (5=1-3)	19,510
6.	Allowable expenses for tax (insurance) year (6=2-4)	28,481

Source: Authors' calculation

Allowable revenue is the revenue derived from farm's commodities produced within the farm operation, or from commodities that are purchased in order to continue its growth and development on the farm. In short, the allowable revenue includes revenue from all insured commodities and all items that make up the allowable revenue are accurately listed in Schedule F

tax form. Calculating the allowable revenue is needed to show which revenue can be insured under WFRP policy, and which adjustments should be made to eliminate the revenue that cannot be insured. Allowable revenue excludes: (1) Revenue from any post-production operations, (2) Net gain from commodity hedging or speculation, (3) Revenue from custom hire and rental activities, (4) Revenue earned as an animal contract grower, (5) Revenue from wages, salaries, tips and cash rent, (6) Revenue from government agricultural programs, etc. Adjustment amount used in Table 3 includes amounts of revenue i.e. expenses that are not considered allowable revenue and allowable expenses for the WFRP purposes. Allowable expenses specifically exclude any expenses related to post-production operations or commodities in which farmer has no insured interest. Adjustment amount is also calculated on the basis of information from Schedule F. Allowable revenue and allowable expenses' amounts represent the basis for composition of Whole Farm History Report (Table 1). When considering expenses, it is important to state that their only role in WFRP insurance model is to correct (reduce) the value of the insured revenue if expenses during the insurance year are not at the level of at least 70% of the approved expenses (Table 2). This basically means that if farm production has no expenses during the insurance year in the amount of at least 70% of approved expenses, the insured amount of revenue will be reduced by 1% for each percentage point of approved expenses which fall below 70% of the approved expenses. In this way, the possibility of moral hazard is also neutralized. In the analyzed case, the allowable expenses are higher than the approved expenses, so it is not necessary to make adjustment (reduction) of the insured revenue amount. By insurance, the farmer transfers the risk of loss to the insurer and undertakes to pay an insurance premium for that (Berg, 2005). In other words, insurance premium is the amount of money which in this case farmer pays to the insurance company as a service for risk transfer. It can be represented as a price risk and cost of insurance (Marković, 2013). The premium is directly proportional to the size of the risk, the value of the insured sum and duration of insurance (Petrevska et al., 2010). Expression (2) is used to calculate the premium to be paid by farmers to the insurance company. The total amount of the premium consists of functional (net) premium and administrative fees, which in this model of insurance amounts 20 €. Administrative fees include the costs of concluding the insurance contract, the costs of collection of premiums, salaries and other administrative fees. Also, it should be noted that depending on the number of crops produced on the farm, U.S. Department of Agriculture subsidizes certain percentage of WFRP insurance premium (www, USDA). In Serbia, the Ministry of Agriculture, Forestry and Water Management subsidizes insurance premiums in 40% of the total amount, but the maximum area on which the right to return can be realized is limited to 20 ha.

Table 4. The calculation of premium borne by the insured

Approved Revenue (€)	Coverage level (%)	Premium Rate (%)	Subsidy amount (%)	Premium amount (€)
1	*2*	*3*	*4*	*5=(1x2x3)-(1x2x3x4)*
25,895	85	3.2	56	310

Source: Authors' calculation; www.ewebapp.rma.usda.gov

Irrespective of the realized revenue at the end of the year, the farmer has an obligation towards the insurance company in the amount of 330 €, which is the amount of insurance premium when value of administrative costs is added. In this model of insurance, losses occur in a situation where allowable revenue (Table 3), obtained from commodities produced during the insurance year, fall below the insured revenue which is calculated as the product of the approved revenue and selected coverage level (Table 5). Due to unfavorable weather conditions (drought) in the production year 2016, analyzed farm has achieved below-average revenue in the amount of 19,510 €. Considering

that value of realized revenue is less then value of insured revenue, it can be concluded that there was an occurrence of the insured event in the current year. Insurance company is obliged to pay to the farmer, i.e. farm owner, indemnity in the amount of 2,500 €, based on expression (3).

Table 5. Claim for Indemnity Form

<table>
<tr><td colspan="9">CLAIM FOR INDEMNITY FORM</td></tr>
<tr><td>1. Insurance Year: 2016</td><td>2. State/County: Serbia/Vojvodina</td><td colspan="2">3. Insured information:
N.N. Insured
Vojvodina, Serbia
Phone: xxx xxx
SSN: xxxxxxxx</td><td colspan="2">4. Agency information:
N.N Agent
Vojvodina, Serbia
Phone: xxxxxx
Agent Code: XX
Policy: xxx</td><td colspan="3">5. Companion Policy(s): NONE</td></tr>
<tr><td colspan="2">6. Date of Damage: July 2016</td><td colspan="2">7. Cause of Damage: Drought</td><td colspan="2">8. Primary Cause (100%): 100</td><td colspan="3">9. Date(s) of Notice: 01.08.2016.</td></tr>
<tr><td colspan="9">CALCULATION OF CLAIM</td></tr>
<tr><td>10. Allowable Expenses for Insurance Year (Table 5) (€)</td><td>11. Approved expenses (Table 2) (€)</td><td>12. Expense Percentage (10/11)</td><td>13. Expense Reduction Factor</td><td>14. Approved Revenue (Table 2) (€)</td><td>15. Expense Reduction Amount (13x14) (€)</td><td>16. Approved Revenue Adjusted for Expenses (14 – 15) (€)</td><td>17. Coverage Level (%)</td><td>18. Insured Revenue (16x17) (€)</td></tr>
<tr><td>28,481</td><td>17,012</td><td>1.67</td><td>0</td><td>25,895</td><td>0</td><td>25,895</td><td>85</td><td>22,010</td></tr>
<tr><td>19. Allowable Revenue for Insurance Year (Table 4) (€)</td><td>20. Inventory Adjustment (€)</td><td>21. Accounts Receivable Adjustment (€)</td><td>22. Market Animal and Nursery Adjustment (€)</td><td>23. All Other Adjustments (€)</td><td colspan="2">24. Revenue-to-count (19+20+21+22+23) (€)</td><td colspan="2">27. Revenue Loss (18-24) (€)</td></tr>
<tr><td>19,510</td><td>0</td><td>0</td><td>0</td><td>0</td><td colspan="2">19,510</td><td colspan="2">2,500</td></tr>
</table>

28. Narrative: Items 20, 21, 22 and 23 are not filled because analyzed farm has no stored commodities, nor due Accounts receivable and due Accounts payable, nor livestock.
Source: Authors' calculation

Conclusions

Agricultural production, as one of the most important industries, is faced with many production risks. This is reflected in direct dependence on the achieved results and the weather (non)conditions. Different insurance systems are the most efficient in managing weather risks. Whole-Farm Revenue Insurance is one of the newer models, which is still only available in the United States. The emergence of modern risk management in agriculture is increasingly becoming focused on farm revenue insurance. The aim of this insurance system is to combine all farm risks under one policy, while achieving numerous advantages over traditional insurance. Unlike traditional insurance, there are no problems of moral-hazard and adverse selection with whole farm revenue insurance, which can be seen in the case of the analyzed farm. Whole farm revenue is determined at the end of the production year and, if the revenue is below a threshold level (insured revenue), the insurer is obliged to pay indemnity to a farmer. In the analyzed case, due to the fact that value of realized revenue is lesser then insured revenue, the insurer is obliged to pay indemnity to the farmer in the amount of 2,500 €. On the other side, a farmer who cultivates 28 hectares of land, has monetary obligation towards insurance company in the amount of 330 €, which amount includes premium and administrative fees. That is certainly not the large amount, if taken in account that whole farm is completely insured from all natural and price risks. A clear strategy on the state level, by establishing a legal framework and financial incentives, analyzed insurance model could be successfully implemented in other parts of the world, and thus insure a large number of farmers, especially those who perform their activity in countries where climatic conditions are unstable.

References

1. Berg, E. (2005). Integriertes Risikomanagemenet: Notwendigkeit und Konzepte für die Landwritschaft: 4.
2. Bielza Maria and Garido A. (2009): Evaluating the potential of whole-farm insurance over crop-specific insurance policies, Spanish Journal of Agricultural Research, Vol. 7, No.1: 3-11Chalise, L., Coble, K. H.,
3. Barnett, B. J., & Miller, J. C. (2017). Developing Area-Triggered Whole Farm Revenue Insurance. Journal of Agricultural and Resource Economics, 42 (1): 27-44.
4. Dorfman M.S. (2007). Introduction to Risk Management and Insurance,ISBN13: 9780132242271, Prentice Hall, New Jersey: 2.
5. Hennessy, D. A., Babcock, B. A., & Hayes, D. J. (1997). Budgetary and producer welfare effects of revenue insurance. American Journal of Agricultural Economics, 79(3): 1024-1034.
6. Johnson, J. B., Hewlett, J., & Griffith, D. (2008). Adjusted Gross Revenue-Lite: A Whole Farm Revenue Insurance Available in Wyoming. Agricultural Marketing Policy Paper: 24
7. Kokot, Ž., Marković, T., & Pajić, N. (2017). Risk management in crop production based on the regional index. Ratarstvo i povrtarstvo, 54(1): 13-18.
8. Marković T. (2013): Vremenski derivati i upravljanje rizikom u poljoprivredi, Poljoprivredni fakultet, Novi Sad.
9. Petrevska M., Toscano B. and Milošev D. (2010): Osiguranje biljne proizvodnje, Bruno Toscano, Beograd.
10. Pejanović, R., & Njegomir, V. (2011). Problemi upravljanja rizicima u poljoprivredi. Ekonomika poljoprivrede, 58(1): 91-103.
11. Shields, D. A. (2012). “Federal Crop Insurance for Specialty Crops: Background and Legislative Proposals.” CRS Report for Congress R42813, Congressional Research Service, Washington, DC. Available online at http://nationalaglawcenter.org/wp-content/uploads/assets/crs/R42813.pdf.
12. Shields, D. A. (2015). “Federal Crop Insurance: Background.” CRS Report for Congress R40532, CongressionalResearch Service, Washington, DC, 2015. Available online at http://www.fas.org/sgp/crs/misc/R40532.pdf.
13. Stokes, J. R., Nayda, W. I., & English, B. C. (1997). The pricing of revenue assurance. American Journal of Agricultural Economics, 79(2): 439-451.
14. Turvey, C. G. (2012). Whole farm income insurance. Journal of Risk and Insurance, 79(2): 515-540.
15. United States Department of Agriculture and Federal Crop Insurance Corporation (2016): Whole-Farm Revenue Protection Pilot Handbook, USDA, SAD.
16. United States Department of Agriculture and Federal Crop Insurance Corporation (2016): Whole-Farm Revenue Protection Pilot Policy, USDA, SAD.
17. Zhu, Y., Ghosh, S. K., & Goodwin, B. K. (2008, July). Modeling Dependence in the Design of Whole Farm Insurance Contract, A Copula-Based Model Approach. In annual meetings of the American Agricultural Economics Association, Orlando, FL: 27-29.
18. www.irs.gov
19. www.rma.usda.gov
20. www.ewebapp.rma.usda.gov
21. www.stat.gov.rs
22. www.proberza.co.rs