Agricultural entrepreneurship and production risk management in serbian farms

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Miroslav Miskic
PhD, Faculty of Technical Sciences
University of Novi Sad, Trg Dositeja Obradovica 6, Novi Sad, Serbia

Vladimir Njegomir
PhD, Faculty for Legal and Business Studies "Dr Lazar Vrkatic" Novi Sad,
Bulevar Oslobodjenja 76 Novi Sad, Serbia

Dragan Stojic
PhD, Faculty of Economics, University of Novi Sad,
Dr Sime Milosevica 16, Novi Sad, Serbia
(corresponding author)
E-mail: **stojicd@ef.uns.ac.rs**

Abstract

Agricultural sector has an enormous economic significance for Serbia. However, majority of small farmers have been reluctant to conclude insurance contracts of any kind. Despite the great importance of insurance, various studies have shown conflicting results regarding the factors that have a positive impact on agricultural producers to engage with the insurance industry. We investigated the means of risk management available to farm owners in northern Serbian province of Vojvodina. The results indicate that among the possibilities to cover all risks with one insurance policy and a revenue insurance, securities and financial markets through partnerships with suppliers and customers, there is no difference in the impact on total revenue. Also, there is evidence of the inferiority of microinsurance and public-private partnerships.

Keywords: Effectiveness. Risk. Agricultural production. Insurance. Serbia.

1. Introduction

The research presented in this paper includes an analysis of agricultural production risks, complementary measures, apart from insurance, applied in the prevention and financing of consequences of natural disasters, as well as analysis of the possibility of using an alternative measures to improve the protection of agricultural production. The study aims to analyse exposure of agricultural producers in Serbia to the negative effects of climate change and its impact on the survival and long-term sustainability of production. Also, research has primarily included actual measures to be applied in agricultural production in

order to prevent the financing of achieving a result of natural disasters but also the possibilities of alternative, innovative measures.

Agricultural production has an enormous social and economic significance in Serbia. In 2017, it participated with 10.8% in total GDP (18% with food industry included), employs 23% of total labour and 17% of the active population, while agricultural exports accounted for 23,3%. Due to favorable climatic conditions, a relatively large arable land per capita, signing the free trade agreement CEFTA market proximity and prospective accession to EU membership, agro-industry has great potential for further development.

However, agricultural production is exposed to numerous risks, including natural disasters, variable weather conditions, uncertainty of yield and price. The importance of understanding the risks which pose a threat to agricultural production as well as the form of governance risks that farmers are available, is of crucial importance in terms of domicile, bearing in mind the aforementioned significance of agricultural production and the fact that a healthy agricultural sector can mitigate the adverse economic consequences of the crisis. Bearing in mind the number of risk management activities and form a basis of the fact that risk management is the basis of economic survival of agricultural production, the aim of this paper is to point out the potential danger that may threaten agricultural production, an overview of available forms of risk management and emphasize the importance and security features as a key form of governance insurable risks.

The importance of understanding the risks to which the agricultural production is exposed to, as well as the form of risk management available to the farmers is of crucial importance, bearing in mind the aforementioned significance of agricultural production and the fact that a healthy agricultural sector can mitigate the adverse economic consequences of the crisis. The aim of this paper is to point out the potential danger that may threaten agricultural production, an overview of available forms of risk management and emphasize the importance and security features as a key form of managing insurable risks.

2. Prior literature review

None of the classification of risks is exhaustive. The individual risks may be interconnected; hence the divisions may seem artificial. For example, the selling prices of agricultural products are sensitive to weather conditions such as floods or droughts and

changes in macroeconomic policy such as changes in interest rates or exchange rates. However, we consider that the classification of risk is necessary, bearing in mind the need to understand the causes, consequences and characteristics of the particular risks for the implementation of adequate forms of risk management.

Hardaker et al. (2004) classify risks in agriculture as 1) business (business) risks involving production, market, institutional and personal, and 2) the financial risks that depend on the mode of financing of agricultural production. Musser and Patrick (2001) as well as Baquet, Hambleton and Jose (1997), classified risks in agriculture in a similar way on production, marketing, financial, legal and the risks associated with human resources.

Meuwissen, van Asseldonk and Huirne (2006) distinguish between normal business risk and the crisis risk that is in the focus of their interest, which includes such risks as avian influenza, foot and mouth disease, climate change and issues of biological security in the event of a terrorist attack.

For crops and fruits the most commonly considered risks are the weather conditions and the prices of inputs and outputs, while for the livestock it is usually the risk of disease (e.g. Gramig et al. (2006) and Shaik et al. (2006)).

Starting from the premise that the risk in agriculture is a function of the variability of the price of inputs and outputs, actual yield and size of land and / or livestock numbers, we find the most acceptable division of risk in agriculture division to be: 1) regulatory or institutional, 2) market or price and 3) production risk.

The focus of our study is the effectiveness of agriculture production under production risks hence we pursue into more details the characteristics of production risks. The specificity of agricultural activities is the outdoor production and the management of living organisms, plants and livestocks, from which the production risks stem in terms of weather conditions, pests and diseases. It is a risk whose realization leads to variability in yields of agricultural production. Extreme temperatures, floods, droughts and pandemics realized in the last decade clearly emphasize the importance of the production risk.

Farmers face the risks associated with weather conditions for centuries and these risks still represent the key risks that threaten agricultural production. For example, the estimates are (Baquet, Hambleton, and Jose, 1997) that about 69% of the total damage to crops caused by drought in the United States and the excessive rainfall and even 95% caused by weather conditions. Also, Ekboir (1999) estimated that the potential harm caused by the hypothetical outbreak of foot-and-mouth disease in California would reach 13.5 billion

dollars. In addition to the existing risks the future will continuously create new challenges for farmers. High temperatures, drought and floods have always threatened agricultural production, but the probability of occurrence of extreme weather conditions has increased with the global warming. Due to the indoor production in livestock husbandry the impact of weather conditions or the exposure to diseases has been reduced. Risk of agricultural production in the future will be under the decisive influence of four potential factors: climate change, genetically modified crops, potential epidemics in cattle and unexpected policy changes (OECD, 2009).

Different ways of classifying the available forms of treatment the risk of agricultural production can be found in the literature. According to the European Commission (EC, 2001) all forms of risk management can be divided into 1) measures implemented on agricultural holdings (e.g. selection of products with low exposure risk, short production cycles, diversification of product lines and vertical integration) and 2) measures of risk sharing (e.g. agreements on agricultural production, contracts for the sale of agricultural products, futures, funds and joint insurance). Hirsch and Nell (2008) distinguish between 1) *ex ante* approaches, which involve the use of risk management activities by farmers before the realization of the damage and 2) *ex post* approaches, which include measures on the achievement of damage.

We believe that the division of different forms of dealing with risk in agriculture by type of risk is most important and this sense distinguish between 1) general measures applicable to the management of all risks (e.g. diversification, vertical integration, contracts on agricultural production, creation of individual savings accounts, forming cooperatives and association of farmers in funds of funds), 2) price risk management measures (for example, contracts for the sale of agricultural products, futures, options, swaps, forwards) and 3) manufacturing risk management measures (for example, measures of prevention and insurance). The application of some form of risk management is limited to their availability in a particular market. Farmers in the United States, for example, have the ability to use almost all forms of dealing with risk, however the research shows (Blank and McDonald, 1995) that the diversification is used the most (in over 47% of cases), followed by the insurance, forwards, government programs, futures and other forms.

Diversification as a risk management approach in agriculture has been used since the Middle Ages (McCloskey, 1976), while this form of risk management economists are beginning to attract attention from the fifties of the twentieth century, analyzing the

possibilities of its application precisely in agricultural production. Diversification of risk to which farmers are exposed to can be accomplished in several ways. It is possible to achieve spatial diversification (carrying out production in different locations), production diversification (cultivation of different crops and livestocks), diversified business (which provides a reduction of dependence on agriculture as the sole source of income from the agricultural holding and is based on addressing activities such as agro-tourism), diversification of income by hiring out of agricultural holdings and finally diversification can be achieved through building cooperatives that allow distribution of yield, price and risk.

In most countries in the case of the significant damage caused by floods, fires, and other disasters that threaten the incomes of agricultural country of the manufacturer ultimately intervene directly to finance the budget. It should be noted that state intervention in the management of risk in agriculture is justified only when the risk management measures based on market principles, such as insurance or futures, are not applicable or do not exist. For example, in order to repair by Hurricane Xynthia that in February of 2010 caused significant damage to agricultural producers in France, promised the direct support from the state fund for natural disasters. Due to flooding and in Serbia in 2010 intervened in the country or from the budget. In the case of direct intervention of the state on the occurrence of catastrophic events, which is not always desirable because it stifles the development of private insurance, the advantage trebadati existence of public funds in case of realization of catastrophic events rather than ad-hoc type of assistance that leads to a negative impact on the budget. In some states from the budget to subsidize farmers' expenditure on premium insurance coverage. For example, in Serbia the state subsidizes 40% of the insurance premium. Research shows that the existence of state programs and crop insurance in developed and in developing countries can not survive without government subsidies in most cases social benefits were not clear enough to justify the cost of budgetary funds (Skees, Hazell and Miranda, 1999). The state can also occur in the role of a quasi reinsurers as is the case in China, which is indirectly subsidize and support the development of agriculture insurance. In OECD countries, the most common form of state intervention is to support market prices that provides stabilization of prices and reducing price risk on the domestic market of agricultural products, and established the correlation between the degree of support market prices and the development of a form of risk management (OECD, 2009). For example, higher levels of support corresponds to a lower

level of development of risk management measures, and vice versa. In addition to participation in the ex-post risk management strategies in agriculture state can provide risk management support to the efforts of farmers through investments in the construction of irrigation systems, flood protection, scientific research and the promotion of market mechanisms such as futures, forwards and insurance.

In most countries in the case of the significant damage caused by floods, fires, and other disasters that threaten the income of agricultural producers, the country ultimately intervenes directly from the budget. It should be noted that the state intervention in the agriculture risk management is justified only when the risk management measures based on market principles, such as insurance or futures, are not applicable or do not exist. For example, in order to repair the damage caused by Hurricane Xynthia in February of 2010 to agricultural producers in France, the direct support from the state fund for natural disasters was promised. Due to flooding in Serbia in 2010 the state intervened, but from the budget. In the case of direct intervention of the state on the occurrence of catastrophic events, the advantage should be given to the public funds in case of realization of catastrophic events rather than ad-hoc type of assistance that leads to a negative impact on the budget.

Insurance is one of the key forms of risk management, but in order for agricultural production risks to be transferred to the insurance companies, certain conditions must be met. Insurability conditions that must be met are: 1) the risk must be random, and its realization must be beyond the control of the insured, 2) risk must be definable and measurable in the sense that there must be an ability to determine the probability of occurrence and intensity of harmful effects as well as the ability to determine and measurement of actual losses, 3) there must be a large number of insured objects or persons exposed to the same type of hazard that could apply the law of large numbers, 4) their realization risks must generate economic damage. Economic availability of insurance premiums in the literature (for example, Skees and Barnett, 1999; Rejda, 2005) cited as an additional requirement.

Despite the great importance of insurance, various studies have shown conflicting results regarding the factors that have a positive impact on agricultural producers to conclude insurance contracts. For example, Velandia et al. (2009) found that on the conclusion of crop insurance contracts the level of business risk has a positive effect, while the land ownership, off-farm income and education have negative effects. However, Sherrick et al.

(2004) found that farmers would prefer concluding insurance contract if their perceived yield risk had been increased, and if they are engaged in production on farms that are larger, older and not leased. Also, Enjolras and Sentis (2008) were analyzing the agricultural insurance in France and found that the size and financial strength of holdings, diversified production and catastrophic climatic events have a positive impact on farmers' decision to insure.

The basic classification of agriculture insurance is on crop insurance and livestock insurance. The crop insurance provides coverage for all types of crops, fruits, flowers and vegetables, while the livestock insurance covers damages that occur due to the death or unplanned destruction due to illness or accidental injury of horses, pigs, sheep, bulls, cows, calves and goats and other domestic livestocks, and in some cases wild livestocks. The crop insurance accounted for about 90% of the total agriculture insurance premiums (Iturrioz, 2009) in 2008. In developing countries, the focus is almost primarily on the crop insurance, given its dominant role in total agricultural production, while the livestock insurance is limited to insurance of sudden deaths. In addition to the insurance of crop and livestocks, which are exclusively present in Serbia, agricultural insurance includes yield insurance and insurance based on the use of indices (Insurance for the Poor Program, Public Intervention for Agricultural Insurance, World Bank, 2009).

3. Data and Methodology

The survey conveyed in this research included 165 owners of agricultural holdings from the Republic of Serbia, drawn from the random sample. The aim was to gain access on owners' attitudes towards risks in agricultural production and the ways of mitigation and risk prevention. The data collected from the questionnaire represent an invaluable insight into the 'field figures' and are further investigated using proper mathematical models.

The methods included in this study are particularly relevant for a holistic approach, for example, when the goal is to discover the reason for using a particular protection technology, or crop insurance, or how farms manage funds to meet supply and demand problems and the like. The emphasis is on the practical use of appropriate modeling techniques.

The set of explanatory variables used in the model is limited by the availability of data from the survey. In addition to numerical explanatory variables, such as the years of formal

education, percentage assessment of damage caused by natural influences, etc., categorical (qualitative) variables also occur. Categorical variables are variables that take values from the set of names and designations, for example gender, seasons etc. The main problem with the qualitative variables is that they can not be directly included in the regression equation. In general, categorical variable with k levels must be transformed into a k-1 binary variable to avoid linear dependence between the variables. Binary variables can be directly entered into the model. Level of the category that is omitted becomes 'the reference variable' and all the others in the same category 'compare' with it. In this case, the estimated coefficients of the regression associated with binary variables are interpreted as the differential (positive or negative) impact on the dependent variable, in relation to the impact of the reference variable on the dependent one.

Linear regression model that includes m continuous explanatory variables and n categorical variables is given by:

$$y_h = \alpha x_0 + \sum_{k=1}^{m} \beta_k x_{kh} + \sum_{k=1}^{n} \sum_{d=1}^{D_k} \gamma_{dk} x_{kdh} + \varepsilon_h \text{ , h = 1, 2,...,N.} \quad (1)$$

Where the y_j is a dependent variable, the y axis intersecion variable x_0 is identically equal to 1, continuous explanatory variables x_{kh}, k = 1,...,m, while the set indicator variables x_{kd}, d = 1,...,D_k defines the categorical variable x_k with D_k levels, where k = 1,...,n.

The model parameters $\alpha, \beta_k, \gamma_{dk}$ are the regression coefficients evaluated in the analysis. The applied model is the so called main effects model that does not contain the effects of interactions between variables. Correlation analysis showed that only 10% of all correlations lies outside the interval (-0.3, 0.3), and the two most correlated variables are the total income and the size of land. To determine the significance of other variables on income we decided to observe the income per hectare as a dependent variable (in the log form). Numerical variables covered in the model include the number of years of formal education (Q_4), the assessment of the negative impact of natural disasters as a percentage of total yield (Q_9), in how many consecutive years of did natural disasters have a negative impact on production (Q_{10}). Categorical variables include the basis on which the respondent is engaged in agricultural production (Q_2, reference variable - engagement on a commercial basis), types of agricultural production (Q_3, the reference variable - crop production) income outside agriculture (Q_6, the reference variable - no income), the most common cause of loss (Q_7, the reference variable - a natural disaster), the use of primary

measures of protection (Q_{11}, the reference variable - without protective measures), funding of damages caused by natural disasters (Q_{13}, the reference variable - insurance), entry in the register of agricultural holdings (Q_{14}, reference variable - respondent is not aware that entering the Register he/she would be entitled to a refund of 40% of the premium), purchase protection insurance (Q_{15}, the reference variable - without state subsidies), the main reason for the non-closure of the contract (Q_{16}, the reference variable - insurance is expensive), what do most farmers lack, i.e. what would one like to realize the most (Q_{18}, the reference variable - coverage for all risks once the insurance policy).

4. Results and discussion

The survey results show that the statistical sample is dominated by respondents who cultivate less than one hectare (27%), and approximately equal participation of subjects covering from 5 to 10 ha of agricultural land (22%). The 39% of surveyed participants said that they were engaged in agricultural production in order to meet their own needs, while 32% of respondents in the sample engaged in agriculture on a commercial basis, and in order to make a profit. More than half of the respondents surveyed (58%) said they are primarily engaged in farming. The questionnaire was largely completed by respondents who have completed secondary education (79%). About two thirds of respondents (67%) surveyed stated that they have income outside the agricultural sector. Approximately half (47%) of respondents believe that their agricultural production in the preceding five-year period was mostly exposed to the risks of drought, flood, frost, hail and other natural disasters, which are becoming increasingly common due to climate change and the phenomenon of global warming. Approximately half (47%) of respondents surveyed considered that the yields achieved in agricultural production over the preceding five years decreased by 20 - 40% due to the effects of drought, floods and other natural disasters previously mentioned. The largest number of respondents (40%) believe that they have been continuously exposed to the negative impact of natural disasters in the last five years. The largest percentage (37%) of respondents stated that as the primary protection against damage to agricultural production apply crop rotation. Results of the survey also point to an alarming fact that almost equal number of respondents (35%) do not apply any measures of risk management in the agricultural production. The highest number of respondents who do not apply any form of risk management measures in agricultural

production claim that the measures are costly. More than two thirds of respondents (70%) financed damage to agricultural production caused by natural disasters from its own resources and acumulation. Majority of farmers (77%) surveyed are familiar with the fact that by registring in the Register of agricultural holdings become entitled to a refund of 40% of insurance premiums agriculture. There is approximately the same share of respondents to the survey who have used government subsidies in contracting agricultural insurance (31%) and the share of respondents who did not use the possibility of subsidizing insurance premiums (30%). More than half of respondents (53%) believe that insurance is expensive and that is why they decided not to insure against the risk in agricultural production. The analysis of respondents' answers regarding their future needs for obtaining insurance coverage of agricultural production can be stated to the largest group of respondents (47%) correspond to all the risks its production is exposed to be covered by a single insurance policy.

The preliminary research shows that the years engaged in formal education do not affect the income per hectare. The same holds for the assessment of negative impact of natural disasters.

Descriptive statistics for the numerical variables and the multiple regression results are presented in Table 1 and Table 2 respectively.

Table 1: Descriptive statistics

	Q_1	Q_4	Q_5	Q_9	Q_{10}
MEAN	8,02	11,89	510.778,40	0,33	3,61
MEDIAN	4,00	12,00	500.000,00	0,30	3,00
MAXIMUM	30,00	18,00	1.500.000,00	0,90	5,00
MINIMUM	0,75	6,00	100.000,00	0,00	1,00
STD. DEV.	9,64	2,09	445.598,30	0,17	1,26
SKEWNESS	1,50	-0,27	1,16	0,28	-0,15
KURTOSIS	3,89	5,10	3,36	3,03	1,66

Table 2: Coefficients estimation. Dependent variable – income per hectare

Dependent Variable: LOG(P5/P1)									
Method: Least Squares									
Included observations: 167									
Variable	Coef	S.E.	t-Stat	Prob.	Variable	Coef	S.E.	t-Stat	Prob.
C	11,641	0,401	29,035	0	D_{11}	-0,001	0,222	-0,004	0,997
Q_{10} ***	-0,150	0,063	-2,398	0,018	B_{13}	0,013	0,267	0,048	0,962

Q_{14}	0,04	0,162	0,248	0,804	C_{13}	0,031	0,273	0,115	0,909
Q_{15}***	0,457	0,157	2,915	0,004	D_{13}	0,264	0,368	0,717	0,475
Q_6*	0,265	0,15	1,766	0,08	B_{16}	-0,594	0,365	-1,628	0,106
B_2***	-0,578	0,183	-3,164	0,002	C_{16}	0,022	0,301	0,073	0,942
C_2***	-0,558	0,168	-3,33	0,001	D_{16}	0,192	0,276	0,695	0,488
D_2**	-0,922	0,359	-2,57	0,011	E_{16}	-0,044	0,285	-0,156	0,877
B_3	0,066	0,268	0,244	0,807	F_{16}***	0,138	0,052	2,635	0,009
C_3	0,293	0,269	1,088	0,279	A_{16}	-0,068	0,231	-0,293	0,77
D_3	0,101	0,196	0,516	0,607	B_{18}	-0,137	0,219	-0,625	0,533
E_3	0,252	0,181	1,393	0,166	C_{18}*	-0,286	0,16	-1,794	0,075
F_3***	0,264	0,091	2,896	0,004	D_{18}	-0,3	0,245	-1,225	0,223
B_7	-0,155	0,214	-0,721	0,472	E_{18}	-0,205	0,226	-0,907	0,366
C_7	-0,203	0,202	-1,007	0,316	F_{18}*	-0,480	0,248	-1,934	0,055
D_7	-0,009	0,302	-0,031	0,976	R-squared	0,491	Mean dependent		11,387
E_7	-0,325	0,322	-1,009	0,315	S.E. regression	0,622	Akaike info		2,072
A_{11}	-0,113	0,472	-0,238	0,812	SSR	51,047	Schwarz criterion		2,725
B_{11}	0,304	0,296	1,025	0,307	Log likelihood	-137,99	Hannan-Quinn criter.		2,337
C_{11}	0,092	0,301	0,304	0,762	F-statistic	3,74	Durbin-Watson stat		1,786

With the increased number of successive years during which the damage caused by natural disasters occured, the average revenue per hectare declines. For each additional year in which natural disasters were recorded, the average revenue declined for 14% ($Re^{-0,15}$), *ceteris paribus*.

The coefficient of the variable Q_{14} is not significantly different from zero. Being informed on entitlement to a refund of 40% of the premiums if registeres does not generate a positive effect on revenues compared to farmers who have not been informed.

The coefficient of the variable Q_{15} is different from zero at the 1% level and points to the advantage that farmers who use government subsidies have, when compared to those who do not use the subsidy. Using subsidies it is possible to achieve revenue per hectare over 57% higher than the revenue without subsidies, *ceteris paribus*.

The regression coefficient of the variable Q_6 is positive and different from zero with a confidence level of 10%. The coefficient indicates the benefits achieved if farmers earn income outside agriculture, compared to those who are engaged solely in agricultural

production. Revenue per hectare by the entrepreneurs is on average 30% higher when compared to farmers who deal exclusively in agriculture.

The coefficients B_2, C_2 and D_2 are all different from zero and negative, which indicates significant differences in the average income per hectare compared to producers who are engaged in agriculture on a commercial basis. In the case of production for their own use, or production as an additional source of income, it is recorded that income per hectare is 40% and 42% respectively lower than that of respondents who work in agricultural production for commercial purposes. Compared to subjects who are engaged in agriculture for some other reason, this decrease is even more striking, amounting to an average of 60%, *ceteris paribus.*

The categorical variable Q_3 indicates that there are significant differences in the average income per hectare for farmers engaged in farming, fruit growing, viticulture, vegetable growing and livestock. Regression coefficients B_3, C_3, D_3 and E_3 are not statistically different from zero. However, the coefficient F_3 is positive and significantly different from zero, indicating increased revenue per hectare for farmers who are engaged in other activities, on average by 30%. This difference could be achieved through the production and processing of raw materials obtaining products with a high share of value added.

The categorical variable Q_7 indicates that differences in the expected average revenue per hectare due to the most common causes of loss in agricultural production are not statistically significant. Coefficients B_7, C_7, D_7 and E_7 are not different from zero. A similar worrisome conclusion applies to the variable Q_{11}. There are no significant differences in income per hectare to farmers who use improved measures of protection, irrigation and drainage, diversification and crop rotation in relation to farmers who do not apply protective measures.

Various fundings and covers of damage done to agricultural production have the same effect on the expected revenue per hectare. Regression coefficients B_{13}, C_{13}, D_{13} and E_{13} are not statistically different from zero, which implies that there are no differences in the average income per hectare if the damage was compensated through the payment of insurance premiums, personal savings, credit or with the help of the state, *ceteris paribus*.

The categorical variable Q_{16} measures the risk level in average income per hectare caused by different causes for not obtaining the insurance cover. The values of coefficients that are not statistically different from zero indicate that the same effect on income are due to failure to obtain insurance are the price of insurance, belief that it is not possible to protect

themselves against natural disasters and ignorance in relation to the importance of insurance payments. Farmers who do not buy insurance because they can not obtain the policy in the town they live in have on average a 14,5% higher income per hectare when compared to farmers who do not buy insurance from the above mentioned reasons.

Finally, the variable Q_{18} compared the differences in expected income per hectare in respect to the possibility of all risks being covered by one policy. Regression coefficients B_{18}, D_{18} and E_{18} indicate that there is no difference between one policy and insurance income, security through the financial markets and partnerships with suppliers and customers on the impact on total income, *ceteris paribus*. On the other hand, the coefficients C_{18} and $_{F18}$ indicate the inferiority of microinsurance and public-private partnerships because these options are expected to reduce the revenues per hectare compared to one policy insurance by 25% and 38% respectively.

5. Conclusion

There are no significant differences in income per hectare for farmers who use improved measures of protection, irrigation and drainage, diversification and crop rotation in relation to farmers who do not apply protective measures. The results indicate that among the possibilities to cover all risks with one insurance policy and a revenue insurance, securities and financial markets through partnerships with suppliers and customers, there is no difference in the impact on total revenue. Also, there is evidence of the inferiority of microinsurance and public-private partnerships. The results are interpreted by the absence of these forms of financing of agricultural production risks caused by climate change.

We believe in the full applicability of the results of this study at the micro level, i.e. the level of individual farmers (in terms of understanding and implementation of comprehensive risk management, and the preventive measures as well as the funding of harmful events) as well as at the macro level, i.e. the level of the relevant provincial and / or republican institutions in order to reduce the burden of budget resources while providing long-term sustainable development of agricultural production.

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