Evaluation of the Income Stabilisation Tool in Polish Agriculture

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Abstract

We can observe the modernization of Common Agricultural Policy which is aimed at reduction of resources for direct subsidies and their transfer into development of rural areas, in particular management of farm household under risk conditions in the last years . Therefore, in 2013, a new risk management instrument was introduced - Income Stabilization Tool. The objective of IST is securing against income loss without specifying the causes of said loss (which would mean inclusion of factors that have not been subject to market insurance so far). Proposed by the Commission income stabilization tools is new and therefore there is a relatively small number of theoretical or empirical studies. It is worth highlighting that they concentrated mainly on evaluation of IST, specification of beneficiaries in farming populations as well as the need to create proper insurance policy.
Having that in mind, a research objective was formulated - to investigate the potential of IST in farm households in Poland. In the paper Author estimated claims from IST, evaluated of minimum level of net premium in Poland on the basis of data from FADN.
As highlighted in conclusions, a key element decisive for attractiveness of income stabilization tools is engagement of resources from Common Agricultural Policy. Without them they may become unattractive (mainly due to price factor) for farm households in Poland despite the fact that they play the role of a farmer's income stabilizer.

Keywords: Risk Management In Agriculture, Income Risk, Income Stabilisation, CAP,

Introduction

The Regulation on support for rural development (Regulation (EU) No 1305/2013 of the European Parliament, art. 35 and 39), as a part of Common Agricultural Policy 2014–2020, introduced a new tool, income stabilisation tool (IST) the aim of which is to compensate loss in incomes of the farmers. IST is aimed at creating a certain level of security for farmers by protecting them with one contract against the negative effects of unfavourable tendencies in total income of farms, irrespectively of their source. Additionally, in the situation when countries competing with Europe on agricultural markets (mainly Canada and USA) implement income stabilisation tools, application of this solution in the EU countries is a must.

Proposed by the Commission income stabilisation tools is new and therefore there is a relatively small number of theoretical or empirical studies. It is worth highlighting that they concentrated mainly on evaluation of IST, specification of beneficiaries in farming populations as well as the need to create proper insurance policy.

Having that in mind, a research objective was formulated - to investigate the potential of IST in farm households in Poland. The article is divided into three sections. Section 1 taken into consideration legal regulations, literary sources and the objective, conditions of functioning and rules of financing IST. Section two reviews previous studies on IST. The last point of the publication (section 3) is key due to its application value. It constitutes the proposal regarding rules and forms of using IST as well as simulation of this tool for 2007-2015 on the data from the Polish FADN system (Farm Accountancy Data Network).[1] Furthermore using the method of expected value, net insurance premium was calculated with division into classes of economic size and tariff rate.

[1] FADN (Farm Accountancy Data Network) is a European system collecting accountancy data from agricultural holdings. Currently the system functions in 28 member states and includes over 81 thousand households.

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The concept of income stabilisation tool in EU solutions

The Regulation No 1305/2013 specifies basic requirements for income stabilisation tools implemented in the EU member states so that they can be subsidized from the Rural Development Program (RDP) funds. Above all, they must be organized in the form of mutual fund, i.e. they are to be based on the concept of mutuality (Janowicz-Lomott, Łyskawa. 2014).
Allowance from mutual fund with regard to income stabilisation may be granted only when the income decrease of a farmer participating in the fund exceeds 30% of their mean annual income from the previous three years or the mean from three years calculated on the basis of five previous years, excluding the lowest and highest value. Such a method minimizes the effects of incidental income drop, but also has certain consequences when the income is subject to cycles (Pigeon, et al., 2012).

The income is determined as the sum of income gained by the farmer from the market, including all forms of public support, after deduction of production costs. Payouts from the mutual fund compensate less than 70% of lost income in the year when the producer starts to qualify for this form of support. 70% of the paid allowance may be financed from the II pillar of CAP (

). This shows that despite introduction of income stabilisation tools, farms will participate in loss compensation and will co-finance the difference between the historical mean and the actual income (on the level of 30%). Such a formula for calculating the sum of allowance also stresses the aim of using IST – to stabilise the functioning and possibly guarantee the survival of agricultural holding, yet not to fully compensate the incurred loss.

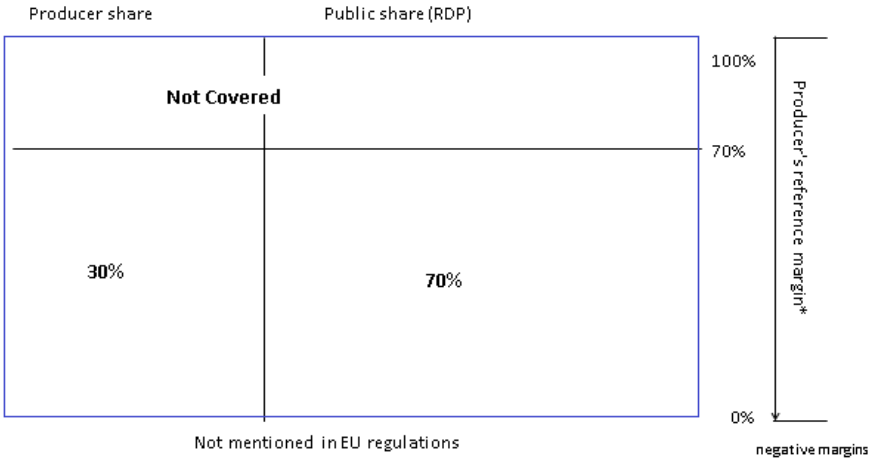

Figure 1: The scheme of IST functioning as per Regulation No 1305/2013.

** Producer's reference margin = current income/ historical average income, (the five-years average of the income without the highest and lowest values).*
Source: (Liesivaara, Myyra, Jaakkola, 2012)

One of key issues concerning application of income stabilisation tools is quantification of the income itself. In works on agricultural economics the multitude of economic categories depicting income in agriculture is stressed. In the Regulation No 1305/2013 it was stated that income is perceived as a sum of revenues obtained by the farmer from the market, including all forms of public support after deducting production costs. This methodology does not suggest which income categories are to be considered, it suggests only the following statements:

- IST ought to be a system which allows to estimate annual income of households participating in the fund; this estimation should be based on sound, clearly stated rules and with the use of available documentary sources,
- estimation of income from business activity should include only revenues and costs which are reflected in the documentation which is to support and confirm data and methodology of income estimation.

Within these rules, the regulator should stipulate acts and regulations which settle the rules of income estimation, procedures of loss qualification, method of fund premium calculation as well as the rules of loss quantification, supervision and documentation requirements. Analogically to mutual fund, EU documents did not lay down the rules of IST functioning, i.e. its governing bodies, representatives, the rules of fund entering and leaving as well as a number of

financial requirements (estimation of administrative costs, liability for obligations etc.). This gives a lot of freedom to decision-makers, yet causes a lot of doubts.

Literature Review

IST is a new solution in the EU and therefore there is a relatively small number of empirical studies on this subject.

Analyses regarding possible implementation of IST on the domestic level have been conducted so far for Italy (dell'Aquila & Cimino, 2012) (Capitanio et al. 2016) (Severini et.al., 2019), Switzerland (Benni et al, 2012), (Finger& El Benni, 2014), (Benni, et al, 2016) Slovakia (Boháčiková et al., 2020) and Croatia (Cop at al,., 2020). These studies were conducted on the data available in FADN database for various, yet relatively short periods of time. As for Italy, they were focused on the possibility of implementing one IST fund and a unified method of income stabilisation for Italian households (dell'Aquila & Cimino, 2012) (Severini et. al., 2019), IST implementation costs and fund profitability in Italy (Capitanio, et al., 2016). Apart from a number of observations specific for the country, one also comes across a postulate to create one central fund while indicating lack of the need for diversification in the case of implementing local solutions. Moreover, a concept changing the functioning of the fund was proposed: a guaranteed public contribution ex-ante which depends directly on the contributions paid by fund members so as to cover certain part of compensations paid out to fund members (Capitanio, et al., 2016). Other studies (Severini et al., 2017) concerned the level of IST aggregation and the means of contribution payment by farmers. It was concluded that lowering the level of aggregation, i.e. shifting from domestic to regional or sectoral IST, increases the variability in time of total compensations paid by the fund. As a result, the validity of the idea of creating IST on the domestic level was confirmed as IST by concentrating on specific regions or sectors may require substantial financial resources and/or their reasecuration. In the authors' view, IST on the domestic level seems to face a limited variability of the total sum of compensations in the future. Important results were obtained on the basis of the analysis regarding IST premium payment among farmers. The authors claim that if farmers will pay flat rates, a regional or sectoral fund seems to be a more effective solution. The situation is totally different in the case of non-flat rates. Interestingly, the use of flat-rate premiums may be less effective than the use of share pro-rata to average household income level.

In IST simulations in Switzerland, Finger and Benni (2014) applied three scenarios of covering compensation costs form IST: (1) full (100%) where costs are fully subsidized from public funds, (2) partial where 65% of costs is covered from public funds and the remaining 35% by agricultural holdings, (3) all costs are covered by farmers only. They proved that income stabilisation tool may lessen income inequalities, but also this inequality drop is affected by the degree of farmer's share in the costs: the lower the farmer share in IST compensation costs, the greater is income inequality drop. The authors also point that income inequality drop concerns to a great extent the group of farmers with low income. In further research (Benni, et al., 2016) parameters of agricultural holdings that may have effect on IST payments were identified. Unexpectedly for the authors, IST payouts in Switzerland do not correlate significantly with the age and education of the farmers who run agricultural holdings as well as with the farm location or the degree of production diversification. Different conclusions were reached by Trestini et al. (2018) with an IST application to the dairy sector. Results show that farms' structural changes and farm characteristics significantly affect IST indemnities. Benni et al (2016) studies also confirmed that IST may be regarded as an instrument of income redistribution (from bigger farms to farms with lower income). This element should also be taken into consideration while projecting IST since such functioning of the fund may affect the market competition and structure of the households – smaller farms without IST, as ineffective, could withdraw from the market, which will not take place in case of support received from the fund.
In literature on the subject a few sectoral IST analyses also were performed.

The study aimed at evaluating IST implementation for French crop producers (Mary, Mishra, Gomez y Paloma, 2013), (Mary, Santini, Boulanger, 2013a). ISP (*Income Stabilisation Payment*) evaluated by them turned to be an effective tool of agricultural income stabilisation. However, it may cause disruptions in the production process, and in the case of low tier of instrument trigger or compensation amount it may have negative effects and, finally, result in greater income variability.

Sectoral analyses were also performed on the example of pig farming in Finland (Liesivaara, et al., 2012). While indicating the benefits of this solution the authors also stressed its big transaction costs and possibility of manipulation. Moreover, they signal the need for study on moral hazard associated with this instrument.

Different analyses were conducted in Wallonia in Belgium on three different groups of households (crop, dairy and cattle) (Pigeon, et al., 2012). According to the authors, this instrument is burdened with big information asymmetry (and moral hazard). The authors suggest implementation of additional limitations triggering payments (for instance additional tier value of loss exceeded by a referential number of farmers). This condition would limit IST exclusively to the events which affect a majority of farms and additionally would stimulate the development of voluntary insurance.

Analyses of IST functioning were also conducted on a representative group of agricultural holdings in the region Castilla y León (northern central Spain) (Castaneda-Veraa, Garridoa, 2017). While evaluating various instruments of risk

management it was concluded that direct payments are the most effective tool impacting the income. IST is also effective in reducing the coefficient of income variability while being less costly than direct payments[2], it is also more effective in income stabilisation than crop insurances.

The results of empirical studies indicate the usability of IST, but also signal a number of risks associated with the instrument, starting from significant budget requirements through risks of information asymmetry (including significant moral and motivational hazard), ending with indirect effects of the instrument functioning (its impact on the structure of households or substitutability with traditional insurances).

IST simulation for Poland

Methodology of research

Construction of the instrument in accordance with EU regulations is based on comparison of income obtained with reference income. IST formula used in further analyses as the first step assumes estimation of average (reference) income $\bar{D}_i$ of agricultural holding in a calendar year *and* in the following way:

$$\bar{D}_i = \frac{D_{i-1}+D_{i-2}+D_{i-3}}{3}, \qquad (1)$$

where D_i denotes income obtained in year *i*.

The Regulation No 1305/2013 allows for a two-fold method of average income estimation: as a three-year average calculated on the basis of three preceding years or the average from five years, excluding the highest and lowest values. In further analyses, the first method was chosen to be used.

Another step requires estimation of reference income which constitutes 70% of average income:

$$D_i^{ref} = 0{,}7 * \bar{D}_i \qquad (2)$$

In the final, third step pay-outs from IST are estimated for the analysed agricultural holding:

$$I_i = \begin{cases} 0 & D_i \geq D_i^{ref} \\ \max\left(0{,}7 * (\bar{D}_i - D_i), 0\right) & D_i < D_i^{ref} \end{cases} \qquad (3)$$

In the considerations it was assumed that the instrument will compensate 70% of the farmer's loss (as compared to the average). It is the upper limit of the compensation as provided for in the Regulation No 1305/2013.

Income data used in the calculation regarding IST functioning come from Polsh FADN database. Poland has participated in the network since accession to the EU in 2004, and the annual sample covers about 12,000 farms.

IST simulation was conducted for years 2007–2015[3]. A varied number of agricultural holdings (different in each year) participates in the study. This results from IST construction: in order to analyse agricultural holding as the one covered by IST, it must be present in FADN database for at least four continuous years[4] - around 70% of holdings in each of the analysed years (in 2012 even nearly 80%) were qualified into the observation.

For the purpose of further analyses, the researched holdings were classified with regard to economic size[5].

The analysis focuses on the costs of IST functioning associated only with the round of subsidies for farmers, but does not specify other costs resulting from IST implementation, which may be reflected in the premium cost (mark-ups on net premium). Also, the research does not indicate potential costs for agricultural holdings which may be incurred as a result of necessity to adjust the current functioning to the requirements of accounting to the benefit of IST.

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[2] It is worth highlighting that opposite to Swiss studies (Benni, et al., 2016, pp. 745-502), the authors assume the possibility to separate these instruments.
[3] The first three years 2004–2006 were used in order to estimate the first reference average.
[4] The system does not guarantee the presence of the same agricultural holdings in the whole period of FADN functioning.
[5] Classification of agricultural holdings by economic size and type of farming is typical for FADN and was established by Commission Decision 85/377/EEC of 7 June 1985.

Results

The results of the study indicate that in the analysed sample the number of holdings meeting the criterion of classification to payouts from IST is variable and ranges from 17.4% in 2011 to 38.5% in 2015 (Figure 2).

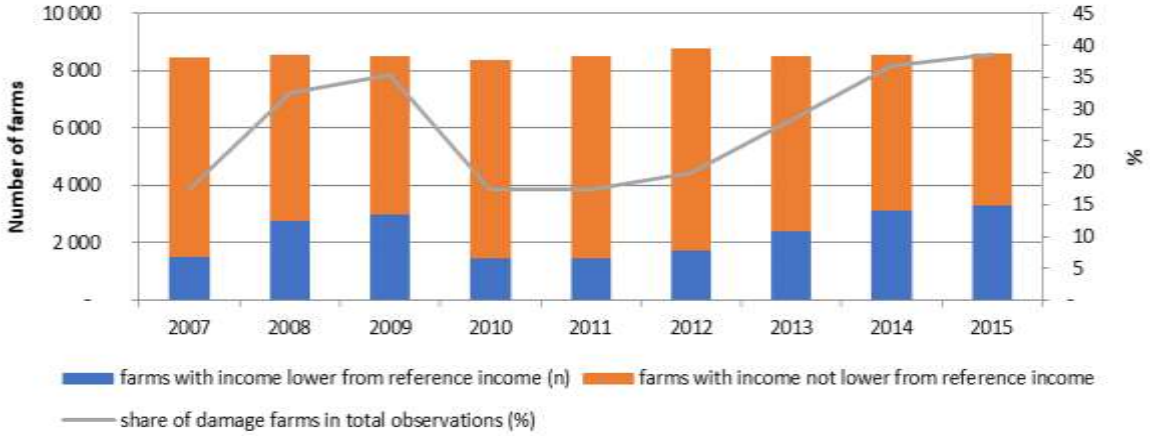

Figure 2: Share of agricultural holdings with income lower than reference income in the sample.

Source: own estimations based on the data from FADN database.

The value of payouts from IST estimated in accordance with the method presented in steps (1)–(3) is variable (Figure 3).

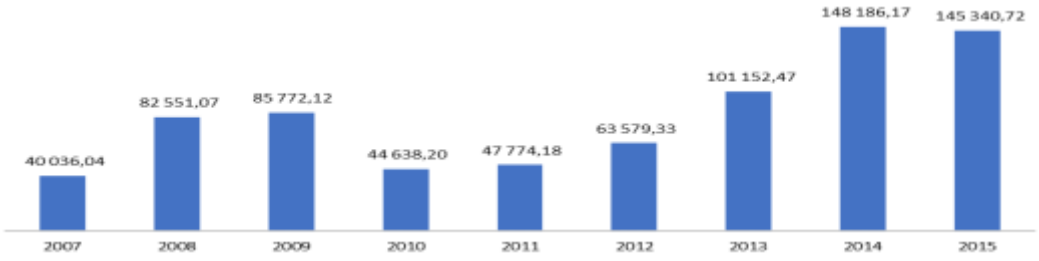

Figure 3: Simulation of compensations paid from IST in 2007–2015 (thousand PLN)

Source: own estimations based on the data from FADN database.

Payouts from IST increase the average annual income of agricultural holdings (Figure 4), but also impact insignificantly on its stabilisation in time (coefficient of variation decreases by over 1.5 p.p. from 19.5% to barely 18% after the payouts from IST). Even in such a short period of observation, this instrument displays certain traits of stabilising income in time.

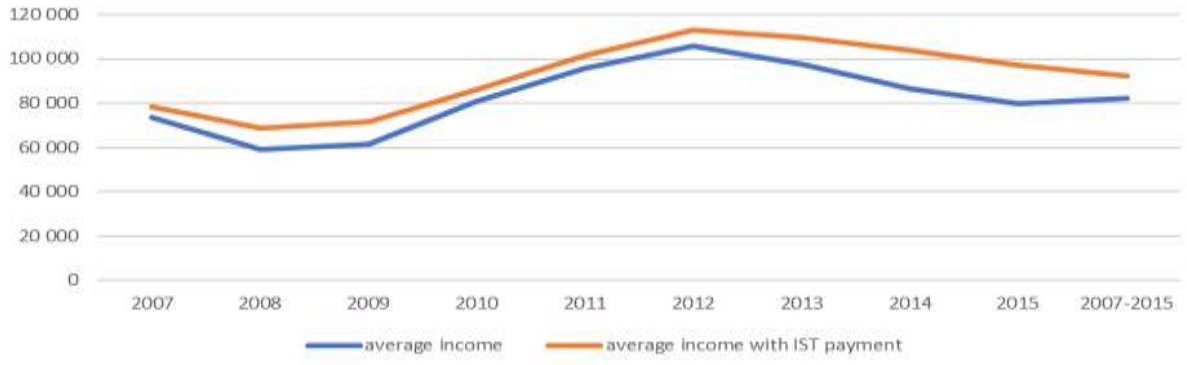

Figure 4: Average annual income from agricultural holding before and after payouts from IST (PLN)

Source: own estimations based on the data from FADN database.

In insurance practice of key importance is risk management in insurance portfolios. Basic activities associated with insurance activity, which include among others calculation of insurance premium, concern specific portfolios. Numerous analyses indicate that when estimating income important parameters include the type of conducted activity, but foremostly the economic size of holdings (Meuwissen et al., 2011). Therefore, diversification of holdings with regard to economic criterion (division into portfolios) and adopting the rules specified while defining IST might help to estimate the potential cost of new instrument. Such estimation may become one of key factors for success (i.e. acceptance by farmers) of the programme proposed by the EU.

Taking into account the accuracy of insurance premium calculation and maintenance of portfolio financial balance, it is advisable to evaluate the variability of damage in the portfolio. A basic parameter of such evaluation is the V index of portfolio variance, with the following formula:

$$V = \frac{\sqrt{Var\ (Z)}}{E(Z)}, \qquad (4)$$

i.e. the ratio of standard deviation of a random variable Z denoting the size of compensations in the portfolio to its expected value.

The value of variance index for the analysed portfolios ranges from 1.8 to over 4 (Table 1).

Table 1: Index of variance for the whole insurance portfolio and broken down by economic size

Description		2007	2008	2009	2010	2011	2012	2013	2014	2015
All farms		8,621	3,848	2,802	4,929	4,505	3,893	3,199	4,126	2,602
By economic size	Very small				2,731	2,570	2,288	3,693	2,499	2,989
	Small				3,409	3,027	3,013	2,007	1,887	1,855
	Medium-small				3,136	3,316	3,230	2,162	1,965	1,737
	Medium-large				3,496	3,626	3,258	2,207	1,852	1,649
	Large				2,922	3,211	2,799	2,524	1,954	1,656
	Very large				3,064	2,198	1,822	2,522	2,030	1,800

Source: own estimations based on the data from FADN database.

In theory it was not specified what value of V index is assumed as sufficient for assuring portfolio balance, yet in practice it is desired for the index not to exceed 10%, i.e. $V \leq 0,1$. When the index value exceeds 20% ($V > 0,2$), the portfolio is not well-balanced. In the studied case, index values considerably exceed values assumed as safe as the index value is between 1.646–3.693 (164.4–369.3%) for portfolios in effect of division into economic classes, and 2.602–8.621 (260.2–862.1%) for undivided portfolio. This signals lack of balance in the portfolio. A solution proposed in literature is reinsurance or increase of insurance portfolio. As the calculations are conducted with only about 8,000 holdings, use of the instrument in practice on all agricultural holdings could in theory increase portfolio stability. Additionally, it is worth observing (Figure 5) that these indices display a decreasing tendency even in such a short period (with the exception of very small holdings ES1), which may signal a certain tendency (with theoretical assumption regarding lack of changes in the environment).

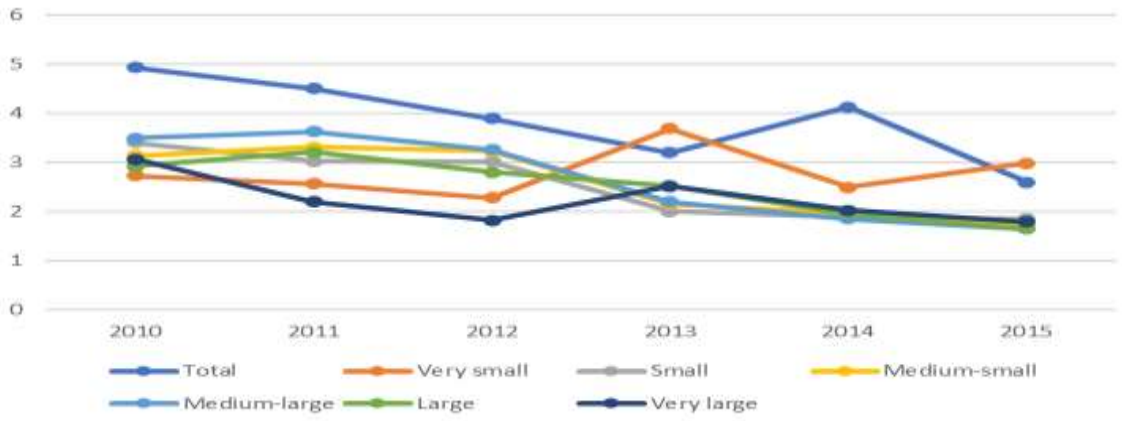

Figure 5: Indices of portfolio variance in 2010-2015.

Source: own estimations based on the data from FADN database.

With such variance parameters probably none of commercial insurance companies would decide to conduct such insurance (due to the necessity to own big capital). The solution of creating IST on the basis of *mutual fund*s stipulated in EU regulations may be the only acceptable tool, and including in the regulation rules the possibility of taking credits or specifying payout limits may be of key importance for the functioning of this system.

Despite high indices of portfolio variance (and consequent difficulties with precise risk quote) it is still worth striving to estimate the participation cost of agricultural holdings in the system of income stabilisation. Insurance premium ought to be established on the level which assures financial resources for realization of compensations and payouts, but also covers the costs of activity of the subject which assures protection or profit of insurance company. In IST of key importance is estimation of net premium which constitutes a part of the premium (including premium rate) for settlement of claims. The size of premium is estimated on the basis of expected number and value of fortuitous events.

In order to conduct risk analysis, distribution of number and value of damage were constructed.
Distribution of damage number in portfolios is two-point (zero-one), in the case of IST in a particular year in agricultural holding the damage may occur X=1 or not X=0. For distributions of damage value distribution functions were constructed empirically.

It served to estimate net premium. The estimation was based on a classic method of net insurance premium, i.e. the principle of pure risk (premium equivalence). It is based on the assumption of balance between collected net premiums and expected value of compensations and benefits during insurance period and in particular risk groups, i.e.

$$P = E(Z) \qquad (5)$$

Although in practice the principle of pure risk tends to be modified by introducing security loads which include uncertainty during premium calculation (in case of so big variance such modification would be advisable), IST is based on mutuality, i.e. indefinite premium, therefore it is worth specifying its minimum level. Premium calculated with this method will constitute a reference level to evaluate if such solution with regard to price (with lowest possible net premium) will be at all acceptable for farmers.

Diversification of holdings in accordance with the criterion of economic size allows for approximate estimation of insurance in the portfolio (in a given classification scale) for a similar sum of insurance; in the calculation it was assumed as reference income of the holding. Thanks to that it is also possible to make estimation for the rate of net premium (Table 3).

Thanks to the possibility of receiving subsidies to compensations from Rural Development Programme, the expected value of compensations and payouts is significantly lower and, in effect, the premium rate is lowered (to 30% of preliminary value of tariff premium).

Table 3: Expected values and estimation of net premium for income stabilisation tools

Class	2010	2011	2012	2013	2014	2015
Expected value of compensations (PLN)						
Very small	1 827,09	2 537,75	3 400,18	3 439,77	4 792,12	4 437,12
Small	2 888,57	3 331,09	4 511,80	5 257,33	7 665,02	6 171,94
Medium-small	4 234,36	4 503,96	6 342,61	9 457,65	13 089,68	11 586,36
Medium-large	8 465,81	7 777,33	7 763,90	15 371,10	20 646,39	23 449,83
Large	21 167,54	19 814,45	27 436,71	37 937,48	48 160,66	56 638,97
Very large	111 872,78	108 896,34	59 896,87	55 316,72	568 106,50	202 523,49
Premium rate (in%)						
Very small	8,51	12,08	15,61	20,15	30,56	29,01
Small	6,57	6,87	8,53	13,48	20,97	16,89
Medium-small	4,83	4,57	5,73	10,69	15,78	14,66
Medium-large	5,53	4,43	3,95	9,33	13,27	16,18
Large	6,72	5,21	6,91	10,12	13,08	16,6
Very large	11,81	12,78	6,68	4,37	48,52	17,71
Premium rate with subsidies from RDP (in %)						
Very small	2,55	3,62	4,68	6,05	9,17	8,70
Small	1,97	2,06	2,56	4,04	6,29	5,07
Medium-small	1,45	1,37	1,72	3,21	4,73	4,40
Medium-large	1,66	1,33	1,19	2,80	3,98	4,85
Large	2,02	1,56	2,07	3,04	3,92	4,98
Very large	3,54	3,83	2,00	1,31	14,56	5,31

The estimated premium rate fluctuates significantly. In the case of obtaining subsidies from RDP it ranges from 1.19% for medium-large holdings up to over 9% for very small holdings (and in one case almost 15% for very large holdings). Due to a very small number of observations (number of damage during observation period <15) it would seem just to discount the analyses for the group of very large holdings. Also, results regarding very small holdings, particularly in the last three years, indicate very high tariffs (unacceptable for farmers); in this period high index of portfolio variance was also reported.

Conclusions

Simulation of income stabilisation tool indicates that it is a solution which in practice raises a number of doubts and poses risks. The group which was the subject of the analyses is small (as compared to the total number of agricultural holdings in Poland) and not representative[6], therefore drawing general conclusions is not possible. It is difficult to evaluate the precision of forecasts regarding the number of participating holdings and the annual value of incurred losses due to varied nature and often systemic risk. Available data indicate a high instability of this solution (significantly variable value of portfolio variance indices) and consequently hard to predict the value of RDP resources for support of this instrument as well as the value of premiums paid by farmers. Yet, conducted analyses (even on this level) still cause a number of doubts and some practical issues need to be resolved.

Taking into consideration own and global empirical research (dell'Aquila, Cimino, 2012; Capitanio et al., 2016), an important element ought to be settlement of principles regarding premium calculation. The aforementioned estimations of net premium only assume linking the annual member payment for each member separately with the size of their income. In effect, in order to obtain a complex implementation project, it essential to deepen the analysis with respect to the risk assessment model directed at each member, in accordance with their income record, property parameters or detailed localisation. However, this requires containing additional data, which currently is often not collected.

[6] However, it ought to be taken into consideration that it is the only database available in Poland which allows for any simulation, it also constitutes the basis of other empirical research in other countries.

Simultaneously, conducted simulations indicate that IST has no chance to function in Poland without subsidies from RDP budget. What is more, even with the assumption of subsidy on the level of 70%, its functioning may still cause problems. The rate on the level of several (even as much as 15%) is unacceptable. Presented calculations concern only net rates. As for practical implementation of the solution it would be also important to specify proper mark-ups for net premium (assuming lack of acquisition costs which would at least cover administrative and loss adjustment costs). Even their minimum level (10–15%) will increase net premium. Moreover, it needs to be taken into consideration that launching and operation of IST system will also require construction of proper IT systems which collect data required for loss adjustment or IST quoting (though these costs may also be co-financed from RDP resources).

On the basis of analyses it may be concluded that the instrument of income stabilisation tool as stipulated in EU regulations causes some doubts and problems regarding its application. Nonetheless, it may impact on the stability of functioning of agricultural holdings in Poland. In order to start functioning, IST should constitute one of key elements of complex system of agricultural insurance. Therefore, insurance instruments of risk management in the form of subsidized insurances, *mutual fund* and IST proposed in EU regulations (Regulation No 1305/2013) should not be applied randomly, but jointly in the form of a three-pillar system.

Key issue that needs to be resolved is assuring the integrity of functioning of such system. Insurances and IST are substitutional elements (Pigeon et al., 2012; Castaneda-Veraa, et al., 2017) on the other hand, resignation from agricultural insurance will significantly increase the payout of compensations from the fund and may disturb the stability of IST. As a result, it seems necessary to introduce additional incentives for agricultural holdings to use insurances. It could be introduction of obligation to own insurance (particularly in the countries with lower insurance awareness) or a necessary requirement: owning an insurance agreement to cover farmers with IST protection. Still, the obligatory character of insurance (as requirement for joining IST) may not be sufficient. It would be also worth considering to reduce the compensation in the situation when IST member does not purchase a particular blanket insurance.
Nonetheless, IST implementation may become a necessity if the EU wishes to effectively compete with other countries on the global market of agricultural goods.

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