

Effectiveness of Multi-Peril Crop Insurances in Saxony (Germany)

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Abstract - This study examines the effectiveness of a multi-peril crop insurance in Saxony (Germany). Based on a data set of about 150 farms over 15 years it is examined how an insurance would have worked in the drought year 2018. By using farm specific yields and revenues a panel data analysis is conducted. It turns out that with low coverage level only few farms are benefitting from crop yield insurance. In regard of the current supporting schemes of the European Union the study shows that with higher coverage level crop yield insurances would be more attractive for farmers.

INTRODUCTION

Yield variability in agriculture is always in the focus of political debates when it comes to initiating new support instruments for agriculture. Especially in years with severe weather events such as droughts, floods or storms, there are calls for government support for farmers, as they suffer particularly from the meteorological effects. Crop yield insurances, which replace the physical yield, are seen as an adequate way to compensate for yield volatility. The way these insurances work can vary widely (Meuwissen et al., 2018). Some products cover any deviation from a certain value, no matter the cause, while other insurances only take effect in the case of certain causes of damage, such as hail. While hail insurance is very widespread in Germany, insurance policies that cover drought or, in some cases, multiple (weather) perils are much less common. This is often justified with the high costs of such insurances and the existing basic risk in some types of insurance. This has prompted the European Union, among others, to allow monetary subsidies for multi-peril crop insurance, so that under certain conditions the premiums can be subsidized up to 70% for insurance products with a coverage level of 80% (OJ L 350/16). The aim of this study is to investigate, based on a case study for Saxony in Germany, which insurance-relevant farm-specific yield fluctuations exist and how a crop insurance would have affected the revenue situation of the farms in 2018. For this purpose, farming accountancy data (FADN) of the Free State of Saxony are used, so that an extensive data set of about 150 farms over a period of at least 15 years is available. In total, yield and revenue data from about 2,250 annual financial statements are available. This analysis focuses on wheat as the most important crop in Saxony. For 2018, the area of wheat in Saxony was 195,150 ha and accounted for 27.7% of the total arable land (SMUL, 2019).

BACKGROUND

The question of whether and to what extent multi-peril crop insurance should be subsidized and financially supported by the state is a recurring topic

of discussion. Especially in years with severe weather events, the question arises again and again whether emergency aid is the right thing to do or whether it would not be better to establish long-term support for the introduction of multi-peril crop insurance. In particular, the year 2018, in which there were weather-related yield losses in Germany and in Saxony, around 36 million euros emergency aid was provided to farmers in Saxony to compensate yield losses (SMUL, 2019). To answer the questions, a simple look at yield statistics and average farm incomes is not sufficient. This is because in such cases, farm-specific fluctuations play the essential role when it comes to assessing whether and to what extent a farm's existence is at risk. To the best of our knowledge, this is the first structural study of individual farm yield and revenues fluctuations of identical farms in Germany, so that these analyses can be expected to provide insights for the future discussion on the introduction of state support for multi-peril crop insurance. The methodology used here assumes an insurance where there is no basis risk, no deviation from individual farm yields, and it is assumed that the insurance settlement comes with no additional cost. Another assumption is that there are no lower costs due to reduced yields.

METHODS AND DATA

The period used for the analysis here is 2004 to 2018, for which data are available from 148 farms. The farms have grown wheat in all 15 years. The farms have an average arable area of 988 ha and are distributed throughout Saxony. So-called agricultural comparison areas are used as the geographical reference unit. Saxony is divided into 12 regions with similar agricultural and geographical structures to carry out farm analyses. The objective of this study is to simulate the impact of multi-peril crop insurance in 2018 and at which proportion of farms such insurance would have been effective under which coverage levels. For this purpose, the farm average is first calculated for the years 2004-2017 and this is used as a reference value for the damage insurance. Based on different coverage levels, the shares of farms that would have included compensation from an insurance policy are determined. An indemnity is always paid if the coverage level is undercut. The income is compensated up to the coverage level. The monetary compensation is based on the farm-specific average price of the last five years. To examine the monetary impact of insurance, farms are divided into four classes based on their yield volatility, and then it is determined how insurance would have increased wheat revenue for 2018. This allows an assessment of whether and how insurance would have supported wheat in 2018.

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Table 1. Descriptive statistics for wheat (2004-2018)

Area	#-farms	Mean Yield	Variability Coefficient ^a
1	8	55.90 dt/ha	26.18%
2	26	69.77 dt/ha	17.18%
3	10	60.41 dt/ha	22.39%
4	14	68.60 dt/ha	16.34%
6	11	67.76 dt/ha	19.48%
6a	16	68.98 dt/ha	19.88%
7	16	79.34 dt/ha	13.07%
8	29	78.87 dt/ha	17.76%
9	11	74.01 dt/ha	17.45%
10	7	55.73 dt/ha	26.70%

^aStandard Deviation/Mean.

RESULTS

In Table 1, the yields have different levels between the regions. It is noticeable that the regions with the lowest yields also have the highest variability. 2018 is a below average year with an average yield of 62.72 dt/ha in Saxony. The average over the years 2004-2018 is 70.5 dt/ha. However, the focus here is not on the average yield of Saxony but on the farm-specific yield. Figure 1 shows how the yields in 2018 deviate from the farm yield on average. Here, too, the regions are affected to varying degrees. In regions 6 and 6a, no negative deviation can be detected. The regions in the northern part of Saxony show noticeable deviations from the operating mean. On average, about 25% undercutting is present in area 10. The areas 1, 2 and 9 have an underrun of 15% - 20%. This uneven distribution is also reflected in the possible compensations by an insurance. Table 2 shows the compensation payments for coverage levels. At low coverage levels, hardly any payments would have been made for 2018. Even at a coverage level of 85%, more than half of the farms would not have received an insurance pay out.

Table 2. Compensation per farm in %-havalue

Coverage level	Mean	25%-quantile	Median	75%-quantile
70%	1.03%	0.00%	0.00%	0.00%
75%	1.76%	0.00%	0.00%	0.00%
80%	2.81%	0.00%	0.00%	0.00%
85%	4.43%	0.00%	0.00%	4.85%
90%	6.69%	0.00%	0.65%	9.85%
95%	9.82%	0.00%	5.65%	14.85%
100%	9.82%	0.00%	5.65%	14.85%

Table 3 further supports the findings from the previous analysis. It again shows that only certain farms benefit from coverage levels up to 80%. On average, the farms with the lowest historical revenue volatility would not have received any increase in revenue in 2018 up to a coverage level of 80%. In contrast, farms in the second and third quartiles do not differ significantly. The farms with the highest volatility have a considerable increase in revenue at all coverage levels.

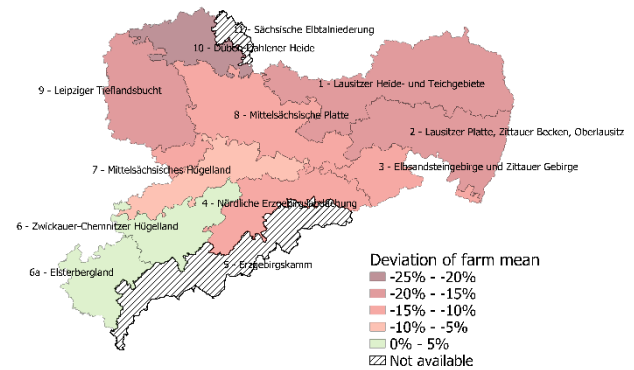


Figure 1. Deviation from average wheat yield in dt/ha in Saxony (Germany) for 2018

Table 3. Increase in % of wheat revenues in year 2018 with insurance grouped by historic yield volatility

Coverage level	1-Quartile	2-Quartile	3-Quartile	4-Quartile
70%	0.00%	1.00%	0.96%	6.03%
75%	0.00%	1.82%	2.08%	8.83%
80%	0.00%	3.10%	3.61%	12.24%
85%	0.20%	5.07%	6.04%	16.56%
90%	1.19%	8.06%	9.22%	21.35%
95%	3.86%	12.00%	13.24%	26.37%
100%	3.86%	12.00%	13.24%	26.37%

DISCUSSION AND CONCLUSION

The results of this analysis show that, particularly at relatively low coverage levels, only a few farms would have benefited from insurance in 2018. Against this background, it is right that the EU regulations have been raised to promote not only insurance with a maximum coverage level of 70%, but that 80% is now also possible. Further adjustments up to 90% would further expand the circle of beneficiaries and possibly make crop insurances more effective and more attractive as a risk management tool. Another finding is that the farms that would have particularly benefited from insurance have also had high volatility in the past. This means, in a broader sense, that experience with yield fluctuations has existed and so the fluctuations in 2018 were not a new phenomenon. For this reason, the payment of emergency aid can also be viewed critically, as such aid is intended for unforeseeable events in particular.

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