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Definition of catastrophic event when developing crop insurances for Finnish markets

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1. Abstract

In Finland, there is need for new crop insurance system as the Crop Damage Compensation scheme (CDC) is abolished in 2015. Therefore, the responsibility of farmers, insurance companies and government in case of crop damages and catastrophic events need to be defined. We compared CDC data to the total value of crop production in Finland. Probability of catastrophic losses was simulated by Monte Carlo method and compared to farmers' stated beliefs on catastrophic events. Results suggest that there occurs no such catastrophic risk that crop insurance system would not be able to cover. Thus, disaster relief program by the government is not needed in Finland.

Keywords: Catastrophe, crop, insurance, Monte Carlo

2. Introduction

In Finland, there are no crop insurances available for farmers at the moment. Crop losses are compensated from Crop Damage Compensation scheme (CDC) fully financed by the government. The CDC scheme is abolished at the beginning of year 2015. Thus there is need to develop new crop insurance system for Finnish markets. Since there is no earlier experience on crop insurances in Finland, the responsibility of farmers, insurance companies and government in the case of crop damages and catastrophic events need to be defined. In the EU framework, farmers can be subsidized when purchasing crop insurances. Limits for this kind of subsidy are clearly defined. However, when it comes to the compensation of catastrophic events, defining responsibilities between the government, farmers and insurance companies gets more challenging.

First, the catastrophic event itself has to be defined. According to the OECD, establishing an explicit boundary for catastrophic risk for policy purposes means: "defining the circumstances that call for government assistance". This boundary should cover risks that are infrequent, highly damaging and systemic and for which market solutions are likely to fail. The boundaries are defined by government and there are differences in all countries concerning the boundaries of catastrophic risk (OECD). When defining a catastrophe in crop production, one criterion is to measure the material loss of the event. For example in the Netherlands, the multi-peril insurances have implicitly set a lower threshold of a natural catastrophe: an event that results in an output loss that is less than 30% is not theoretically considered a catastrophic event (Melyukhina).

In the EU member states, the main practices in preparing for crop damage include various types of joint funds for farmers and state compensation for crop damage paid on an *ad hoc* basis. These types of *ad hoc* compensation payment for crop damage amount to an average of about €920 million per year (Bielza-Diaz Caneja et al. 2009).

In Finland, the crop damages have been compensated to the farmers according to certain rules by the CDC scheme. We compared losses in the CDC data to the total value of crop production in Finland. Monte Carlo simulation was used to study the probability of catastrophic losses in crop production in Finland. Results from the Monte Carlo simulation model were compared to Finnish farmers' stated beliefs on catastrophic events in crop production.

3. Method and data

Two datasets, CDC data (1995-2011) and the total value of crop production (1995-2011), were used for simulation model. The total value of crop production was defined from the Finnish FADN data.

We defined the average amount and standard deviation of CDC compensation payments and the total value of crop production. These values were placed in lognormal distribution. Moreover correlation between CDC payments and total value of crop production was derived from the data and defined for the simulation model. The Pearson correlation coefficient between CDC payments and total value of crop production was -0.29.

Stochastic simulation model of CDC payments and total value of crop production was run with 10,000 iterations, where Monte Carlo was used as sampling technique. The ratios between CDC payments and total value of crop production were stored. The obtained distribution describes the probability and magnitude of crop losses in Finland.

Farmers' stated beliefs are derived from farm survey about agriculture risk management in Finland. Survey was conducted among Finnish farmers in 2012. Questionnaire was sent to 5,000 Finnish farmers. 1,107 of the forms were returned. Questionnaire included also questions about farmers stated preference towards agriculture risk management and crop insurance.

In the questionnaire farmers' were asked how often catastrophic events happen in Finnish crop production. Respondents were given five different choice, that catastrophic event occurs less frequently than once in 20, 30, 50 or 100 years.

4. Results

According to our simulation model, the mean share of CDC payments from the total value of crop production was 1.80%. The median value was 0.91%. In figure 1 is presented the cumulative distribution function of CDC payments from the total value of crop production. There is 93% probability that payments are less than 5% of total value of crop production.

Results from the simulation model also shows that CDC payments are more than 10% of the total value of crop production two times in a century. Losses would exceed 20% of total crop production less frequently than once in a century.

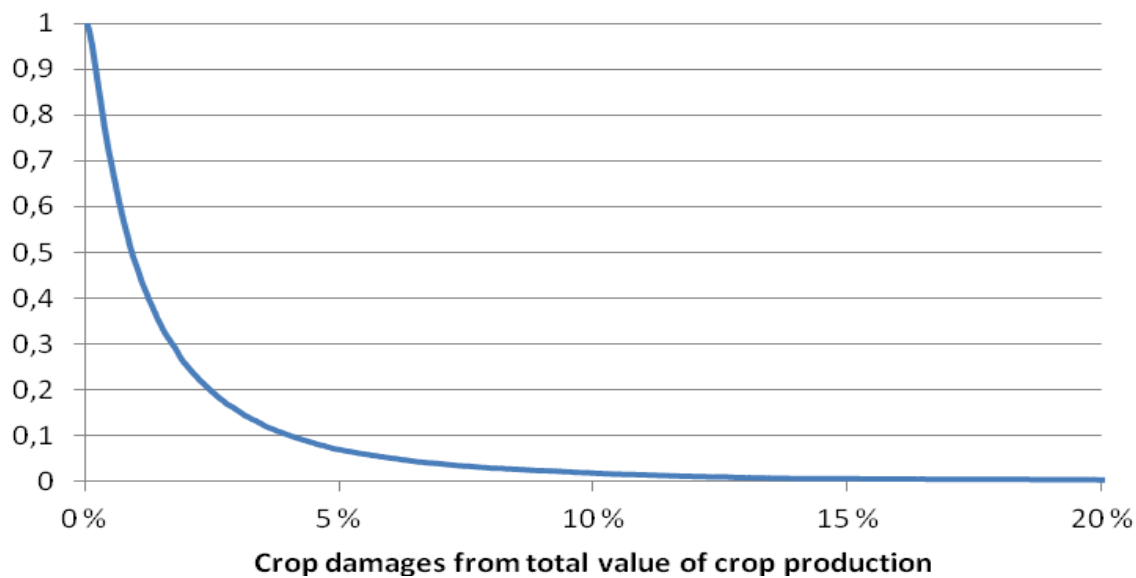


Figure 1. Cumulative distribution function of the share of crop damages in the CDC scheme compared to the total value of crop production in Finland.

Farmers' stated beliefs about the occurrence of catastrophic events in crop production differs significantly from simulation model results. Major share, 79.6% of farmers believes that a catastrophe in crop production happens in 3-4 times in a century (Table 1). Only 0.8% of the respondents stated that catastrophic events concerning crop production happen less often than once in 100 years.

Table 1. Farmers' stated beliefs about catastrophic risks in crop production.

Catastrophic event happens less frequently than once in...	
20 years.	79,6 %
30 years.	15,5 %
50 years.	4,1 %
100 years.	0,8 %

5. Discussion

As a conclusion, we suggest that there occurs no such catastrophic risk in Finland that crop insurance system would not be able to cover. Thus disaster relief program by the government is not needed in Finnish agriculture. Weather events are local in Finnish climate. Thus large scale losses that affect the whole country are extremely rare in crop production.

Farmers' beliefs differed from the realized losses. Results suggest that high losses in crop production are common (3-4 times in a century) at the farm level. Weather events causing crop losses are local in Finnish climate. Therefore crop insurance markets are the most efficient way to handle risks related crop production in Finland.

6. References

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