Extreme weather events in Belgium: calamity fund and on-farm strategies hand in hand?

Verspecht, A.\textsuperscript{1}, Van Huylenbroeck, G.\textsuperscript{1}, Buysse, J.\textsuperscript{1}

\textsuperscript{1}Department of agricultural economics, Ghent University, Coupure Links 653, B-9000 Gent, Belgium
Ann.Verspecht@ugent.be

Poster paper prepared for presentation at the EAAE 2014 Congress
‘Agri-Food and Rural Innovations for Healthier Societies’

August 26 to 29, 2014
Ljubljana, Slovenia

Copyright 2014 by Verspecht A., Van Huylenbroeck, G. and Buysse J. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.
Abstract
Risk management in agriculture has been implemented probably as long as agriculture exists. One of the factors why researchers and policymakers recently are more interested in farm risk management is the vulnerability farmers face towards extreme events (EWE) linked to climate change. This article is based on a survey with Belgian farmers to analyze how they perceive EWE and what actions they undertake to mitigate these risks. Overall it seems that on the one hand policy based recovery measures like disaster funds do not obstruct farmers to take risk prevention measures. On the other hand, 25-30% of the farmers have no strategies implemented towards EWE.

Keywords: risk management, extreme weather events, risk perception, Belgium, disaster relief fund

1. Introduction
From the mid-nineties, risk management received much more attention to the extent that Power (2004) speaks of a risk management explosion. Risk management in agriculture has been implemented probably as long as agriculture exists. Yet the topic of risk management in agriculture is more and more emphasized by policymakers (e.g. the introduction of risk management in the CAP) or other international organizations.

A farmer faces different types of risk (production risks, price or market risks, financial risks). Although more and more the idea of the interdependence of risks is emphasized (van Winsen, et al., 2013) and that risks should be tackled from an holistic approach (OECD, 2009). Farmers’ perception of risk and of how they can prevent or mitigate these risks, determine whether adaptation responses are initiated or not (Grothmann and Patt, 2005).

Extreme events linked to climatic change like heavy precipitation and strong storms, but also droughts and heat waves, can have a tremendous impact on agriculture, economy and society (Rust, et al., 2009). The more often an event occurs, the more actions are taken to minimize the damage or losses that occur, so that over time the events do not cause the same degree of damage (Wreford and Adger, 2010). Therefore it is likely that farmers have introduced a balanced portfolio of strategies.

National governments are key actors in managing the impacts of extreme weather events (Mechler, et al., 2010). Priest (1996) questions if a policy based approach is efficient to manage risks and thinks that strategies provided through the private market will give actors higher incentives to prevent risks. Some authors believe that ad-hoc disaster funds, will slow down the development of market based insurance products (a.o.Aakre, et al., 2010).

In Belgium, policy introduced risk management strategies are mainly focusing on relief through a disaster relief fund and an agricultural relief fund. To a lesser extent there are some subsidized investments or educational activities tackling risk. Today no multi-peril insurance schemes exist with private companies (de Frahan, 2008), there is only a single risk insurance for hail.

Objective of this paper is to investigate how important Belgian farmers perceive policy based instruments in risk management towards extreme weather events. The results are based on a survey of 510 Belgian farmers who were asked how they perceived four types of extreme weather events (extreme heat, extreme rainfall, extreme drought and storms and hail) and what kind of management strategies they used to mitigate or cope with them.

This article gives in the next part some information on the survey and the statistics, the third part gives the empirical results. The article concludes with a discussion.

2. Material and methods
The data was collected through an online survey. In total 766 farmers started the survey, 510 surveys were used for further analysis. The survey asked about 1) general risk
behavior of the farmer, 2) the perception of risks on the farm and how important the risk of extreme weather events is, 3) the occurrence of an EWE in the last 10 year and what the consequences were, 4) what management strategies a farmer uses on his farm to cope with EWE, 5) his perception on future occurrence of EWE and 6) to conclude some general socio-economic farm information.

Data were processed using SPSS version 21. Descriptive analysis was used for risk perceptions and the risk management strategies. For risk aversion, variables were aggregated to come to one score ranging from 1 not risk averse to 5 very risk averse. Several times, mean of groups are compared on different variables. This was done using an t-test for independent samples based on the median split to divide respondents in two groups.

3. Results
5.1 Risk perception of Belgian farmers
80% of the Belgian farmers perceive price or market risks as a large or very large risk in their farm management (see Figure 1). This is only slightly more (76%) than the importance they attach to the risk caused by weather conditions.

![Figure 1: Risk perception of farmers (%)](image)

Risk averse farmers in the survey perceive the risk for all EWE as more important than less risk averse farmers (Table 1). Furthermore it was found that farmers who already faced a certain extreme weather event, perceive the impact of these events as more serious than farmers who did not suffered form an extreme event on their farm.

### Table 1: Mean perception of impact of EWE on agriculture in the region (1:small impact to 5: high impact) in relation to risk-aversion of a farmer (ranging from 1 to 5)

<table>
<thead>
<tr>
<th></th>
<th>risk_averse*</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Sign.</th>
</tr>
</thead>
<tbody>
<tr>
<td>extreme drought</td>
<td>&gt;= 3.75</td>
<td>264</td>
<td>3.92</td>
<td>0.95</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>&lt; 3.75</td>
<td>213</td>
<td>3.56</td>
<td>1.22</td>
<td></td>
</tr>
<tr>
<td>extreme rainfall</td>
<td>&gt;= 3.75</td>
<td>264</td>
<td>3.99</td>
<td>0.90</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>&lt; 3.75</td>
<td>213</td>
<td>3.51</td>
<td>1.14</td>
<td></td>
</tr>
<tr>
<td>extreme heat</td>
<td>&gt;= 3.75</td>
<td>264</td>
<td>4.00</td>
<td>0.90</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>&lt; 3.75</td>
<td>213</td>
<td>3.69</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>storm and hail</td>
<td>&gt;= 3.75</td>
<td>264</td>
<td>4.12</td>
<td>0.93</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>&lt; 3.75</td>
<td>212</td>
<td>3.56</td>
<td>1.17</td>
<td></td>
</tr>
</tbody>
</table>

*Median risk_averse= 3.75 - Two scales for risk aversion were used. The first one is the general risk aversion (GRA) scale introduced by Mandrik and Bao (2005). A more farm focused scale was based on the developed and tested scale by Pennings and Garcia (2001). Likert-scales from 1 ‘strongly disagree’ to 5 ‘strongly agree’ were used.

5.2 How do farmers cope with extreme weather events in Belgium?
Farmers do perceive extreme weather events a risk for their farm management, however it is striking that between 20% up to 30% of the farmers who were recently
confronted with an extreme weather event is not implementing any risk management strategy (Table 2). Farmers undertake more strategies to reduce the impact of extreme rainfall (52%) than for other events (40%).

Table 2: % of farmers categorized by the number of strategies they undertake per EWE

<table>
<thead>
<tr>
<th>%</th>
<th>no strategies</th>
<th>1 strategy</th>
<th>2 strategies</th>
<th>more than 2 strategies</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>extreme drought</td>
<td>25,0</td>
<td>34,4</td>
<td>16,9</td>
<td>23,7</td>
<td>160</td>
</tr>
<tr>
<td>extreme rainfall</td>
<td>21,0</td>
<td>26,8</td>
<td>17,9</td>
<td>34,3</td>
<td>257</td>
</tr>
<tr>
<td>extreme heat</td>
<td>32,4</td>
<td>27,9</td>
<td>20,6</td>
<td>19,1</td>
<td>68</td>
</tr>
<tr>
<td>storm and hail</td>
<td>25,4</td>
<td>33,1</td>
<td>23,7</td>
<td>17,8</td>
<td>118</td>
</tr>
</tbody>
</table>

Most popular strategies are adaptation of harvesting or sowing date and the use of other inputs for all EWE. On top of that irrigation is mentioned for drought and heat and drainage for extreme rain. One policy measure is mentioned in the top 5 strategies for rainfall which is the ex-post recovery support of the disaster fund. For drought tax deduction is mentioned as a policy measures. Storm and hail is the only EWE with two market measures in the top 5. This is normal as in Belgium there is only an insurance for hail.

There is a gap between the actual undertaken measures and the preferred future strategies (Figure 2). The preferred on-farm measures are in line with the actual implemented strategies (irrigation, drainage and other technological improvements). But all other preferred strategies of the top 5 are policy based strategies. This indicates that farmers see an important role for policy intervention regarding extreme weather events.

![Figure 2: Most effective strategies to deal with future extreme weather events (% of all farmers)](image)

We thus know that policy based strategies are perceived important, but is there a correlation with the number of strategies a farmer has? Does a farmer who believes policy measures are important, will undertake less on farm measures? For extreme rainfall, storm or hail and heat there is no significant difference in the number of on-farm strategies a farmer implements related to how effective he thinks disaster fund, tax deduction is (Table 3). Surprisingly, for extreme drought farmers who perceive policy based instruments as more efficient, have also more on farm strategies.
Table 3: Number of on-farm strategies related to how effective farmers perceive disaster fund, tax deduction (mean score of the two strategies)

<table>
<thead>
<tr>
<th></th>
<th>Effect of fund &amp; tax deduction*</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Sign.</th>
</tr>
</thead>
<tbody>
<tr>
<td># strategies drought</td>
<td>&gt;= 2.00</td>
<td>86</td>
<td>2.12</td>
<td>2.73</td>
<td>.028</td>
</tr>
<tr>
<td></td>
<td>&lt; 2.00</td>
<td>71</td>
<td>1.35</td>
<td>1.49</td>
<td></td>
</tr>
<tr>
<td># strategies rain</td>
<td>&gt;= 2.00</td>
<td>59</td>
<td>1.59</td>
<td>1.68</td>
<td>.792</td>
</tr>
<tr>
<td></td>
<td>&lt; 2.00</td>
<td>54</td>
<td>1.52</td>
<td>1.27</td>
<td></td>
</tr>
<tr>
<td># strategies heat</td>
<td>&gt;= 2.00</td>
<td>35</td>
<td>1.86</td>
<td>1.67</td>
<td>.158</td>
</tr>
<tr>
<td></td>
<td>&lt; 2.00</td>
<td>28</td>
<td>1.25</td>
<td>1.69</td>
<td></td>
</tr>
<tr>
<td># strategies storm/hail</td>
<td>&gt;= 2.00</td>
<td>138</td>
<td>2.30</td>
<td>2.35</td>
<td>.382</td>
</tr>
<tr>
<td></td>
<td>&lt; 2.00</td>
<td>110</td>
<td>2.06</td>
<td>1.70</td>
<td></td>
</tr>
</tbody>
</table>

*median effect of fund & tax deduction = 2.00 - Likert-scales from 1 'strongly disagree’ to 5 'strongly agree’

4. Discussion and conclusion

Our study could confirm that farmers do consider the impact of weather as an important risk, almost as important as price or market risks. Risk averse farmers believe this risk to be more severe compared to less risk averse farmers which is in line with literature (Bond and Wonder, 1980), but also the experience of farmers with a certain EWE determine the perception of the impact of an EWE (Slovic, et al., 2004).

We notice that most often strategies are taken up at farm level. Farmers facing extreme rainfall or storm and hail (and to a lesser extent drought) mention policy measures to be important. Only storm and hail events have a market measure. Indeed farmers insurance against extreme weather events are in Belgium offered as single peril schemes, without subsidy of the government (de Frahan, 2008).

In contrast to the perceived importance for EWE, Belgian farmers have not yet introduced a portfolio of risk management strategies to cope with these extreme events. One out of 4 to 5 farmers who were recently confronted with an extreme weather event is not implementing any risk management strategy. It seems that some farmers are not aware of possibilities to cope with or mitigate the impact of extreme events on their farm. It could be that risks on farm level consist more of a network (van Winsen, et al., 2013), farmers may undertake certain strategies that could help to cope with EWE but are initially implemented for another risk (e.g. crop diversification to cope with market risks).

The most mentioned strategies are on-farm strategies that include changes to the production management (adaption to cropping dates, use of other inputs) or technological improvements (drainage or irrigation). The disaster fund and tax deduction could help to reduce the ex-post impact of rainfall and storms. Farmers that are confronted with extreme rainfall have more often more than one strategy compared to other events (52% vs 40% of the farmers).

Interesting is to see that farmers believe policy measures such as a disaster fund, tax deduction, subsidies or investment support are often mentioned as very effective for future extreme events. Those are strategies that put the responsibility for coping with the EWE with off-farm actors and could therefore delay the uptake of on-farm prevention measures (Priest, 1996). This link between number of strategies and the need of policy/insurance measures was only significant for extreme drought and heat. For extreme rainfall and storm or hail this study did not find any significant relation. This indicates that farmers see that for example the disaster relief fund which function in Belgium ad hoc, is seen by farmers as a last resort for coping with an EWE. They will still take on-farm measures to prevent or mitigate these extreme events. Why is this not the case for extreme drought? The significant difference could indicate that farmers with crops sensible to drought, already undertake the most effective measures to prevent drought, which is irrigation. And even irrigation may become impossible.
when water is limited during extreme heat and that therefore they are more in need for
government intervention.

As in Belgium the existence of multi-peril insurance is limited, it could be interesting
to investigate the influence of insurance on the uptake of on-farm strategies in countries with
more (partially subsidized) insurance for EWE. Insurances put part of the responsibilities also
with external actors, yet farmers want to minimize the private market premiums and are
therefore more eager to implement prevention strategies.

Overall it seems that on the one hand policy based mitigation or recovery actions like
tax deduction or disaster funds do not obstruct farmers to take their own responsibilities. On
the other hand, due to the considerable percentage of farmers not undertaken any strategy
towards EWE, it is recommendable to create awareness of on-farm strategies through
extension and education.

References


