

Extended Abstract

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Paper/Poster Title	Economic effects of drought on agriculture: Conceptual methods and stakeholders' perceptions
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Abstract prepared for presentation at the 98th Annual Conference of The Agricultural Economics Society will be held at The University of Edinburgh, UK, 18th - 20th March 2024.

Abstract	200 words max
<p>Drought events are among the costliest natural disasters and various methods to assess the economic effects of drought exist. This paper compares four conceptual market-based methods to assess the direct and distributional economic effects of drought in the agricultural sector, focused on the case study of Flanders for the 2018 drought event. Adding to these calculations, we consulted 11 agricultural stakeholders through exploratory semi-structured interviews, to gauge their perception on two main topics: 1) how to assess the effects of drought and 2) the perceived advantages and disadvantages of four conceptual methods. Our results confirm that while some social groups could benefit from a drought event, due to a so-called natural hedge, consumers are always negatively affected. The producer-surplus method yielded the most support from our respondents, yet should include related costs (e.g. irrigation) before it is applicable in practice. Investment in adaptation measures could reduce farmers' vulnerability to drought, which in the short term could lead them to benefit from sector-wide price increases. These results could aid in the design of efficient drought-management policies and form a basis for further research on drought events' economic effects.</p>	
Keywords	Microeconomics, Distributional effects, Interviews, Economic Surplus, Agricultural Stakeholders
JEL Code	Q540 Climate; Natural Disasters and Their Management; Global Warming Q250 Renewable Resources and Conservation: Water see: www.aeaweb.org/jel/guide/jel.php?class=Q)
Introduction	100 – 250 words
<p>Human-induced climate change increases extreme weather events' intensity and frequency. Especially drought events should be investigated since their impacts are of a creeping nature, can accumulate and are difficult to quantify. The agricultural sector is particularly vulnerable to droughts. Vulnerability to drought could be reduced through investment in adaptation measures, yet implementation is lagging, possibly due to limited knowledge of the possible economic effects of drought. Various studies that</p>	

attempt to estimate the effects of drought assume that it only causes negative effects, thus encouraging the creation of compensation and government interventions. Some studies show that certain groups could gain positive effects during a drought event, due to a so-called natural hedge. In the past decade, a multitude of methods to assess the economic effects of drought has been applied. However, it is not always clear what the benefits of the different methods are and how they can be applied in practice. Additionally, the perception of agricultural stakeholders on their application is not considered. In this study, we compare four conceptual market-based methods to calculate the direct and distributive effects of drought in the agricultural sector. This will be performed for the case study of Flanders, during the 2018 drought event. Furthermore, we gauge agricultural stakeholders' perception of the effects of drought and the application of the studied conceptual methods.

Methodology

100 – 250 words

Our case study focuses in the Flanders region of Belgium, during the 2018 drought event. Data will mainly relate to main crop potatoes due to their importance in Belgian agriculture. A mixed methods approach is taken with market valuation techniques on the one hand and semi-structured interviews on the other. Firstly, four conceptual market-based calculation methods will be compared, requiring only quantity and price data. Due to data availability issues, a crop model is added to simulate historical crop production. This Soil Water Balance Model is a simplified version of the Aquacrop model. Price values are consulted from Eurostat and converted to the 2017 price level. The first two conceptual methods calculate the direct negative effects of a drought shock, while the latter two are based on the economic surplus theory and consider changes in producer and consumer surplus. Several assumptions are made to use these methods: crop losses are caused entirely by drought events, price is solely affected by quantity supplied and a closed microeconomic system is assumed. The fourth calculation method (economic surplus calculation) applies the Dutch Agricultural Price Tool to make price estimates. Four conceptual methods are calculated for the 2018 drought event. While these calculations can already provide useful insights into the different direct and distributive effects of a drought shock in the agricultural sector, their results are theoretical. Therefore, adding to the market-based calculations, the results and methods are assessed by 11 agricultural stakeholders from four different stakeholder groups.

Results

100 – 250 words

The results of the calculation methods differ greatly. 1) The "Damage-oriented calculation" resulted in a negative effect of €206 million. 2) The "Fixed price calculation" estimates direct costs at €67 million. 3) The "Producer surplus calculation" shows an increase of €210 million due to a positive price effect. 4) Lastly, the "Economic surplus calculation" shows a negative effect of €138 million. Since the potato crop is highly price inelastic (-0.16), a positive price effect can be reached for farmers. Once we compare our results with the onion crop, where prices for our case are related to a price elasticity of demand of -1.43, this positive price effect is reduced and all social groups experience negative effects of a drought event. Results of our semi-structured interviews show that while awareness of extreme weather events increased over the

years, farmers feel overly targeted by legislation changes, standards and water extraction controversies. Droughts are deemed more manageable than flooding or heat wave yet poses uncertainties on water availability. The producer surplus method gained the most support for applicability in practice, yet other cost elements should be included. Furthermore, they confirm that while the positive price effect can form an incentive to adapt, this incentive has diminishing marginal returns. Should all farmers invest in reducing vulnerability to drought, the price effect will vanish since supply is kept stable. The majority of respondents call for policymakers to provide more guidance on adaptation, to alleviate the strain of expectations on farmers and avoid lock-in.

Discussion and Conclusion

100 – 250 words

The results of the market-based approaches follow the findings of Musolino et al. (2017), stating that social groups are affected differently. Our results highlight that producers of price-inelastic crops could gain short-term benefits due to price increases following a drought shock. This price effect is context-specific, depending on the crop and farmers' practices, as shown in the appendix. We assumed a closed micro-economic system, yet in reality price changes are affected by various factors and relate to the market size of producers. This explains why local supply decreases can coincide with price decreases and vice versa. However, our results do show that farmers could gain positive short-term effects of a drought event. How different groups are affected by drought events should be considered when deciding on public aid for these calamities, to avoid inefficiencies. Relief measures during disasters could provide aid to producers who did not require compensation. This further emphasizes social justice issues resulting from climate change impacts. Additionally, it is interesting to note that the incentive to invest in adaptation could follow the law of diminishing marginal returns. Lastly, it must be noted that these conceptual methods are incomplete and should include more information on related costs such as irrigation before applicable in practice. In conclusion, the results of this paper show that positive income effects of a drought event can occur for some farmers. These results can be used by policymakers to design a more efficient relief system and can promote the implementation of climate adaptation measures.