



Meteorological risks are drivers of environmental innovation in agro-ecosystem management

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Extreme weather events such as droughts, heat waves and rain storms are projected to increase both in frequency and magnitude with climate change. The research hypothesis of the MERINOVA project is that meteorological risks act as drivers of environmental innovation in agro-ecosystem management which is being tested using a chain of risk approach. The project comprises of five major parts that reflect the chain of risks: the hazard, its impact on different agro-ecosystems, vulnerability, risk management and risk communication.

Generalized Extreme Value (GEV) theory was used to model annual maxima of meteorological variables based on a location-, scale- and shape-parameter that determine the center of the distribution, the deviation of the location-parameter and the upper tail decay, respectively. Spatial interpolation of GEV-derived return levels has yielded maps of temperature extremes, precipitation deficits and wet periods. The degree of temporal overlap between extreme weather conditions and sensitive periods in the agro-ecosystem was determined using a bio-physically based modelling framework that couples phenological models, a soil water balance, crop growth and environmental models. 20-year return values for frost, heat stress, drought, waterlogging and field access during different crop stages were related to arable yields.

The spatial extent of vulnerability is developed on different layers of spatial information that include inter alia meteorology, soil-landscapes, crop cover and management. The level of vulnerability and resilience of an agro-ecosystem is also determined by risk management. The types of agricultural risk and their relative importance differ across sectors and farm types as elucidated by questionnaires and focus groups. Risk types are distinguished according to production, market, institutional, financial and liability risks. A portfolio of potential strategies was identified at farm, market and policy level.

In conclusion, MERINOVA provides for a robust and flexible framework by demonstrating its performance across Belgian agro-ecosystems, and by ensuring its relevance to policy makers and practitioners. A strong expert and end-user network is established to help disseminate and exploit project results to meet user needs.