MERINOVA : meteorological risks as drivers of environmental innovation in agro-ecosystem

Y. Curnel [(1)], A. Gobin [(2)], H. Van De Vijver [(3)], S. Zamani [(3)], A. Verspecht (4), V. Planchon [(1)]

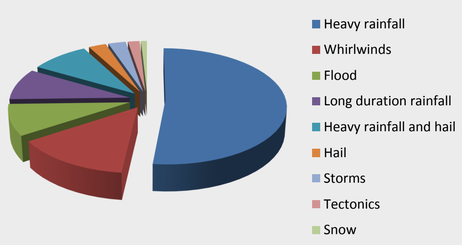
(1) Walloon Agricultural Research Centre, CRA-W (Gembloux, Belgium) – (2) Vlaams Instelling voor Technologisch Onderzoek, VITO (Mol, Belgium) – (3) Royal Meteorological Institute, RMI (Bruxelles, Belgium) – *(4) Ghent University (Gent, Belgium)*

CONTEXT

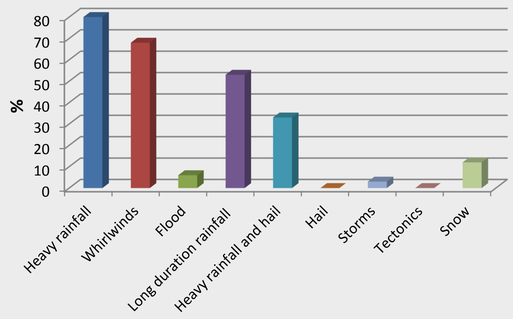
EXTREME WEATHER EVENTS such as droughts, heat stress, rain storms and floods are projected to **INCREASE** both in frequency and magnitude with **CLIMATE CHANGE**.

In this context, **AGRICULTURE SECTOR** is highly **VULNERABLE**

Extreme weather events have **SIGNIFICANT IMPACTS** on agro-ecosystem services and pose severe **LIMITATIONS** to **SUSTAINABLE** agricultural land management.



Repartition of extreme weather events per type in Belgium from 1993 (Pletinckx, 2013)



Percentage of damages amount per type of extreme events for agricultural sector (Pletinckx, 2013)

Hail damages on apples

Effect of drought on agricultural soil

Waterlogging hinders beet harvesting

Heat stress in sugar beet

OBJECTIVE

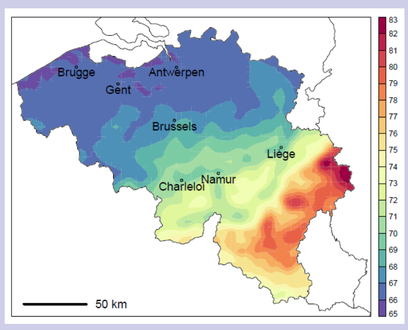
The **MERINOVA** research hypothesis is that **METEROROLOGICAL RISKS ACT AS DRIVERS OF ENVIRONMENTAL INNOVATION** in agro-ecosystem management. The major objectives are to **CHARACTERISE** extreme meteorological events, **ASSESS THE IMPACT** on Belgian agro-ecosystems, characterise their **VULNERABILITY AND RESILIENCE** to these events, and **EXPLORE INNOVATIVE ADAPTATION OPTIONS** to agricultural risk management.

METHODOLOGY

WP 1: HAZARDS - OCCURRENCE OF EXTREME WEATHER EVENTS (RMI)

The probability that extreme weather events will occur at a certain intensity, time and given place, needs to be established to reduce and quantify uncertainties as regards to hazards

The LIKELY FREQUENCY and MAGNITUDE of extreme meteorological events by means of probability density functions

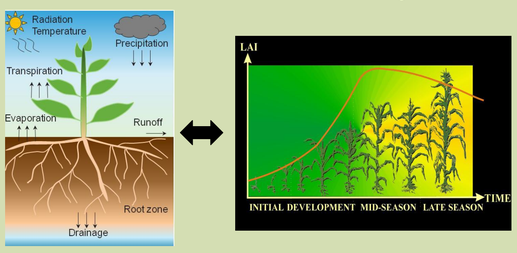


Annual 24-hour maximum rainfall with a return period of 20 years (Van de Wyver, 2012)

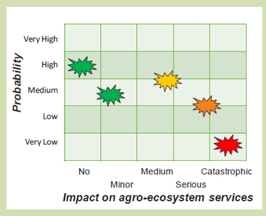
WP 2 : IMPACT ON AGRO-ECOSYSTEMS (VITO)

The potential BIO-PHYSICAL and ECONOMIC IMPACT of extreme weather events on agro-ecosystems is assessed using PROCESS-BASED MODELLING techniques commensurate with the regional scale : METRICS for heat, drought stress, waterlogging, yield, carbon sequestred… *(Gobin, 2010; Gobin, 2012)*

Water Balance *Biomass growth*



For each extreme weather event and bio-meteorological effect a risk matrix is constructed to quantify the impact on different agro-ecosystem types by means of the effect on different indicator crops.

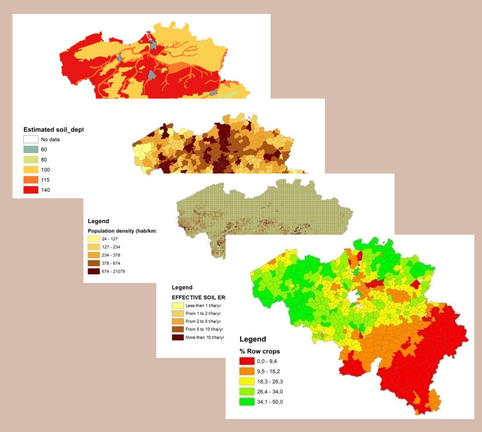


WP 3: VULNERABILITY OF AGRO-ECOSYSTEMS (CRA-W)

Spatial analysis is combined with MULTI-CRITERIA DECISION-MAKING to identify VULNERABLE AND RESILIENT SYSTEMS AND ZONES.

Agro-ecosystems vulnerability and risks maps are produced using information from the occurrence of extreme meteorological events (WP1) and the modeling of impacts (WP2).

Vulnerability is considered from an ECONOMICAL, ECOLOGICAL and SOCIETAL point of view



WP 4: RISK MANAGEMENT AND INNOVATIVE ADAPTATION STRATEGIES (UGENT)

The purpose of this WP is to look at AGRICULTURAL STRATEGIES dealing with the risk that extreme weather events create and how INNOVATIVE ADAPTATION OPTIONS can be developed.

More specifically, the objectives are to:

- identify different risk MANAGEMENT and ADAPTATION options
- estimate the ECONOMIC IMPACT of extreme weather events
- ASSESS THE ECONOMIC IMPACT of adaptation strategies
- consult farmers on PREFERENCES for the different adaptation strategies
- analyse the PERCEPTION OF RISK for extreme weather events, the role of agriculture in this and the adaptation strategies of farmers

WP 5: VALORISATION (VITO) & COMMUNICATION (ALL)

Project results will be disseminated through different media (Website, workshops, conferences, publications , communication, trainings…).
Potential users are multiple: farmers, policy makers, practitioners, research community as well as the private sector

EXPECTED RESULTS

The **MERINOVA PROJECT** concentrates on promoting a **ROBUST AND FLEXIBLE FRAMEWORK** by demonstrating its performance across Belgian agro-ecosystems, and by ensuring its relevance to policy makers and practitioners. **IMPACTS** developed from physically based models do not only provide information on the **STATE OF THE DAMAGE** at any given time, but also **ASSIST IN UNDERSTANDING** the links between different factors causing damage and determining bio-physical vulnerability. Socio-economic impacts will enlarge the basis for **VULNERABILITY MAPPING, RISK MANAGEMENT AND ADAPTATION OPTIONS**. A strong expert and end-user network is established to help disseminating and exploiting project results to meet user needs.

More information on MERINOVA project is available at https://merinova.vito.be

The MERINOVA project is funded by the Belgian SciencePolicy Office (**BELSPO**)

FACCE MACSUR mid-term meeting, 01-03 April 2014, University of Sassari, Sassari, Italy

Walloon Agricultural Research Centre
Agricultural and Natural Environment Department
Farming Systems, Territory and Information Technologies Unit
www.cra.wallonie.be