



University of Natural Resources and
Life Sciences, Vienna
Department of Economics and Social
Sciences

WP4: Assessing farm adaption options against weather, market and policy related cropping risks

COMBIRISK – 2nd annual meeting

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WP4: Objectives



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- Establish a list of farm adaption options to manage
 1. observed and future climate risks, and
 2. policy and market risks on farm production
- Develop scenarios on agricultural development
- Set up/apply a stochastic farm optimization model
- Model impacts of multiple risks to develop farm adaptation portfolios
- Dissemination of results (presentations, publications)

WP4: Methods



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- Analysis of data base (WP1)
- Literature review/modelling experiences
 - We have extensive experiences in modelling market and policy risks as well as climate change adaptation in agriculture (see. Mitter H. et al. 2016, Heumesser C. et al. 2012, Karner K. et al. 2017, Kirchner M. et al. 2015, Schönhart M. et al. 2016)
 - A new field of research for us is modelling pest risks, therefore
 - We reviewed publications in the field of modelling pests/diseases, and
 - Scanned the collected data to make use of it.
- Decision: Pest Modelling
 - Start with 1 crop & 1 pest
 - → Maize & Western Corn Rootworm (*Diabrotica Virgifera*)
- Set up a basic model
 - Cooperation with Dr. Elena Molchanova (University of Canterbury, New Zealand)
 - Aim: Model the influences of climatic conditions on the spread of WCR in Austria.

WP4: Methods



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- Pest modelling
 - Count data with many zeros → Zero-inflated Poisson Mixture Model following Lyashevskaya et al. (2016)
 - Regression model, that combines two probability distributions
 1. **Bernoulli model**: Probability that WCR occurs
 2. **Poisson model**: Number of expected individuals
 - Data base:
 - Count data for WCR (from 2002 – 2015 about 5,300 traps)
 - Climate: INCA data (1,000 × 1,000 m)
 - Maize share: Gemeindedatenbank
- Predictions
 - For a grid with spatial resolution of 1,000 × 1,000 m
 - Covers cropland area of Austria
 - Data base: INCA, IACS for maize share, slope and cropland area

WP4: Methods



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Starting point:

Use annual count data for WCR
to set up a regression analysis

Predictors:

- Climate factors
 - Mean temp. summer (June – August)
 - Mean temp. winter (November – February)
 - Max. temp. July/August
- Management information
 - Maize share

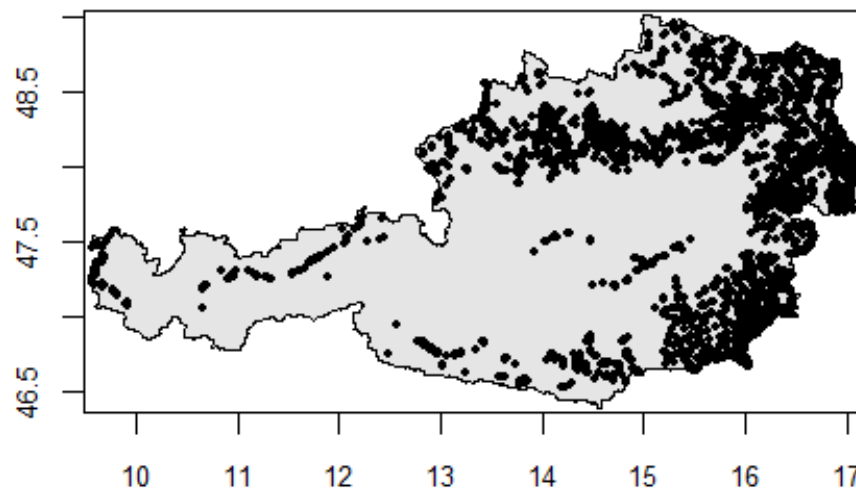


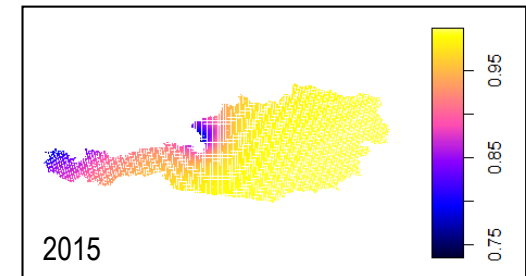
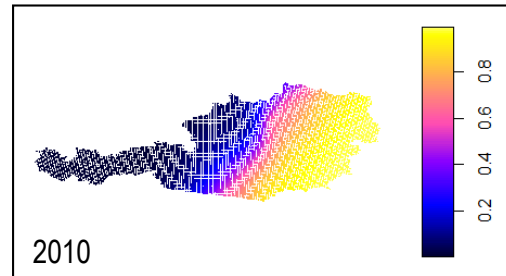
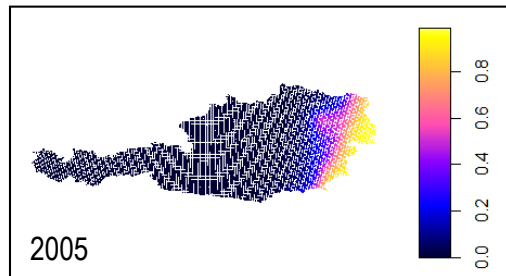
Fig.: Points for which count data of WCR is available (2002 – 2015)

WP4: First Results



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- First model run
 - For each year from 2004 – 2015 separately
 - Gives first ideas how WCR spread has developed



- Predictions
 - What is the possibility of WCR occurrence?
 - What is the number of expected individuals?

WP4: Outlook – Future Activities



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- Optimize the model
 - Other/further important predictors or climate factors?
 - Analyse weekly occurrence of WCR as a function of climate factors.
e.g. Are there differences in the date of peaks and number of individuals according to the start of warm periods?

- Use climate scenarios to make predictions about WCR spread in the future.

- Establish a list of possible adaptation options
 - Evaluate the viability of these measurements

WP4: Outlook – Future Activities



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- Multiple risk analysis
 - Use results of pest modelling in economic analysis
 - Combine market/price risks and environmental risks
- Evaluation of all results
 - Master thesis
 - Publication

Open questions



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- Are there empirically proven relationships between WCR occurrence and maize yield damage potentials? If not, which assumptions could be made?
- How do you assess the chosen climatic factors for regression analysis? (mean temp. summer/winter, max temp. July/August, maize area)
 - Any suggestions for other important factors?
 - Who can be a good contact person for further questions when developing e.g. the function for analysing weekly WCR occurrence?
- Any other crop-pest/disease combination where monitoring activities are dense and a model like this could be useful?



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