Adapting farming systems to climate variability and change in Europe: the Macsur (www.macsur.eu) experience

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CONTENTS

- Introduction to MACSUR: structure, objectives and major accomplishments
- Motivation for this session – introduction to modelling adaptation of agricultural systems to CC
- Some points for discussion

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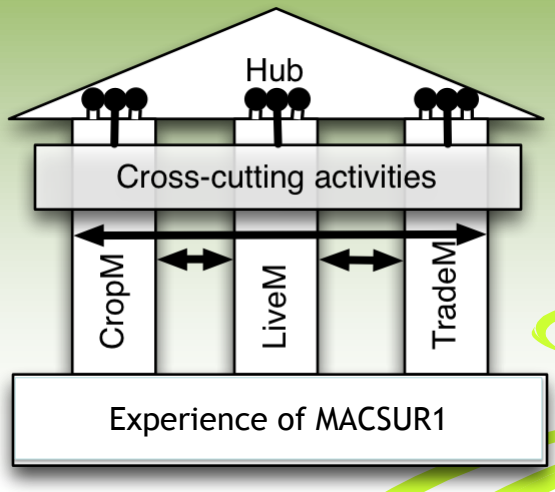
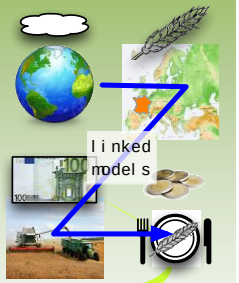
1. MACSUR1 => MACSUR2 structure



MACSUR's aims

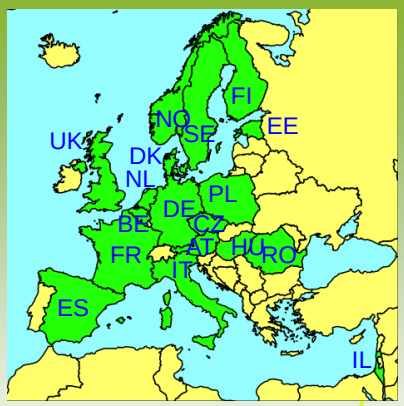
- improve individual AgSyst models
  - crop and livestock production, farms, and national & international agri-food markets
- Model integration & linking
  - of models for selected farming systems and regions
- provide hands-on training
  - to junior and experienced researchers in integrative modeling



- Assess climate-induced risks/ opportunities & the consequences of adaptation and mitigation in agriculture

for better availability, accessibility & affordability of food

- MACSUR *2012,
  17 countries,
  180 members, 0-1M €
- MACSUR 2015,
  18 countries,
  300 members,
  phase 2 started in June 2015 (⇒ May 2017)
- output after 3 years
  - 300 papers
  - 500 presentations
  - 20 workshops/conferences
  - 13 funded new projects
  - 20 PhD/MSc students



2. Modelling adaptation of agricultural systems to climate change

Climate is changing...

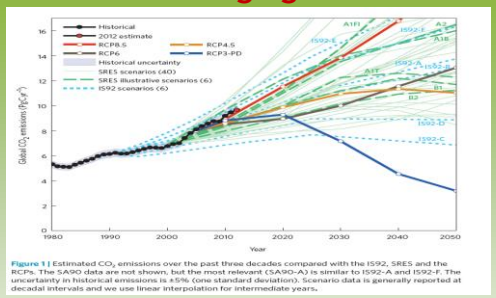
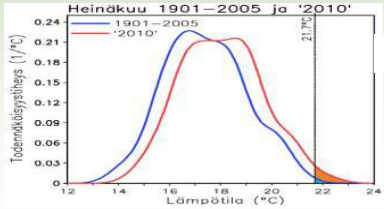


Figure 1 | Estimated CO_2 emissions over the past three decades compared with the IS92, SRES and the RCPs. The SA90 data are not shown, but the most relevant (SA90-A) is similar to IS92-A and IS92-F. The uncertainty in historical emissions is ±5% (one standard deviation). Scenario data is generally reported at decadal intervals and we use linear interpolation for intermediate years.

(Source: Peters et al., 2013; Nat Clim Change)



Shift in PDF of July temperatures S Finland (*Source:* Räisänen 2010)

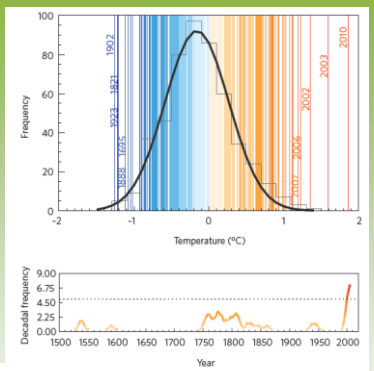
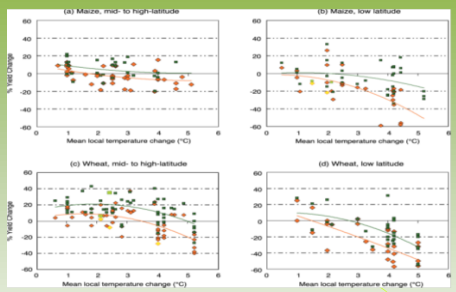


Figure 4 | European summer temperatures for 1500–2010. The upper panel shows the statistical frequency distribution of European (35° N, 70° N; 25° W, 40° E) summer land-temperature anomalies (relative to the 1970–1999 period) for the 1500–2010 period (vertical lines). The five warmest and coldest summers are highlighted. Grey bars represent the distribution for the 1500–2002 period with a Gaussian fit shown in black. The lower panel shows the running decadal frequency of extreme summers, defined as those with a temperature above the ninety-fifth percentile of the 1500–2002 distribution. A ten-year smoothing is applied. Reproduced with permission from ref. 69, © 2011 AAAS.

Source: Coumou & Rahmsdorf, 2012

Modelling adaptation of ag systems

- Jeff White's review (2011): modelling studies mostly simplistic: mono-crops, pl. time, cultivar, irrig, N fert
- IPCC WGII : Easterling et al 2007; ---- Porter et al 2014 (and Challinor et al 2014, Rötter, 2014 in NCC)
- Van Wijk et al 2014 review paper bio-economic modelling studies – and Vermeulen 2013; Lobell 2014



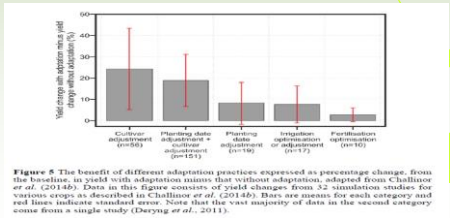
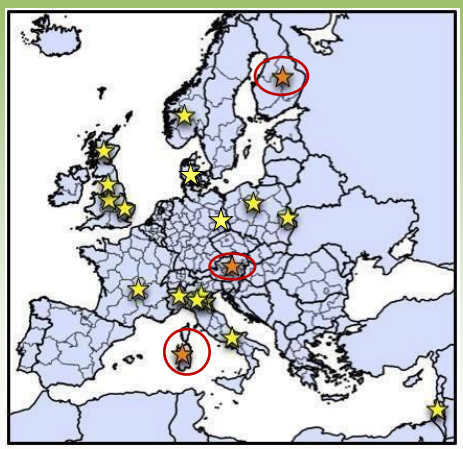


Figure 5 The benefit of different adaptation practices expressed as percentage change, from the baseline, in yield with adaptation minus that without adaptation, adapted from Challinor *et al.* (2014b). Data in this figure consists of yield changes from 32 simulation studies for various crops as described in Challinor *et al.* (2014b). Bars are means for each category and red lines indicate standard error. Note that the vast majority of data in the second category come from a single study (Deryng *et al.*, 2011).

Regional case studies



Finland: Northern Savo
Austria: Mostviertel
Italy: Oristano, Sardinia

Focus: 2020, 2030, 2050

Integration of models; participation of regional and national stakeholders

3. Points for Discussion

- 1. What were the key questions/challenges discussed in each paper ?
- 2. How has the research presented contributed to addressing these challenges?
- 3. What next steps were suggested for each case and commonly, and who should be involved?
- ➔ in particular for the 3 regional cases: which are key drivers for making farmers change their practices (i) access to weather information (ii) assets related to household and agric production, (iii) participation in local social institutions.

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