Risks and Opportunities for the Agriculture of the Alpine Region in a changing climate

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The pink elephant?
Kill it?
Agriculture in the Alpine region: a future?

opportunities
benefits
demand

food crops
production

risks
costs
supply

Alps

World

Calanca, Wengen Workshop, Oct. 2006
The global context

Porter and Semenov (2005)

- “Developing countries are (overall) more vulnerable to climate change than developed countries”
- “World population is increasing, in particular in the developing world”
- “Under global warming, crop production in regions such as southern Europe, the Indo-Gangetic plane or China is at risk”

⇒ “Consideration should be given to the situation where crop production in [central] and northern Europe needs to be increased.”
The global context

Ewert et al. (2005)

• “It has been calculated that in order to meet future demands, cereal yields in developed countries will have to increase by 32% in 2020 compared to 2000.”

Olesen and Bindi (2002)

• Food crop productivity
Crops: biophysical response to climate

• increasing CO$_2$ $\Rightarrow$ positive effect on assimilation

• increasing T $\Rightarrow$ positive effects on grassland (overall extension of the growing season) but negative effects on seasonal crops (shortening of time available for grain filling);

• decreasing summer precipitation $\Rightarrow$ negative impact
Food crop productivity

Simulations with cropping system model CropSyst (Torriani et al., submit.)
Yield stability

Simulations with cropping system model CropSyst (Torriani et al., submit.)

Vidale et al. (in press)
Summer droughts: the 2003 event

⇒ 14 billions US $ losses in Europe (SwissRe, 2004)
⇒ 400 millions US $ losses in Switzerland

(Neftel et al.)
Droughts: occurrence and severity

1901 - 2005 ⇒ ~ 18 %
2071 - 2100 ⇒ ~ 50 %

Calanca (2006)
Regional patterns

Jasper et al. (2004)
Other issues: environmental impacts

GHG emissions, leaching, …

environment/climate

cropping system

T, precip, radiation, …

Environmental impacts

without adaptation


with adaptation
Adaptation: simple measures

Simulations with cropping system model CropSyst (Torriani et al., submit.)
Adaptation: breeding

Simulations with cropping system model CropSyst (Torriani et al., submit.)

Increasing thermal time (heat) requirements
Time perspective(s)

ΔT

IPCC

Breeders

Decision makers (WTO)

Farmers

2000 2020 2050 2100

Time
Uncertainties

The PRUDENCE Model Chains

C. Frei
(pers. comm.)
Uncertainties

Risk of drought

2000 2050 2100

threshold for irrigation

Time
Thank you