

Alpine Agriculture – Risks and Options of Future Water Scarcity

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K. Wagner, 1



Objectives

- Role of agriculture in an integrated and sustainable water management
- Risks for agriculture currently and in future
- Adapted land use in view of future water scarcity, strategies/options

Content

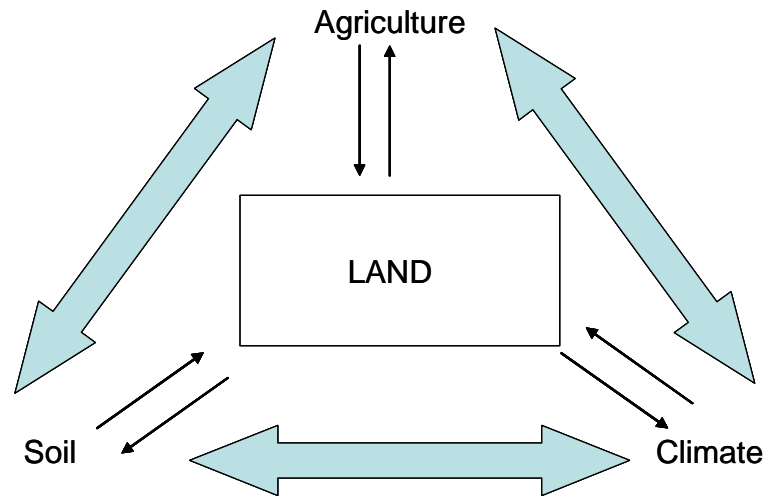
1.Impacts of climate change on agriculture

2.Agricultural risk evaluation in pilot regions

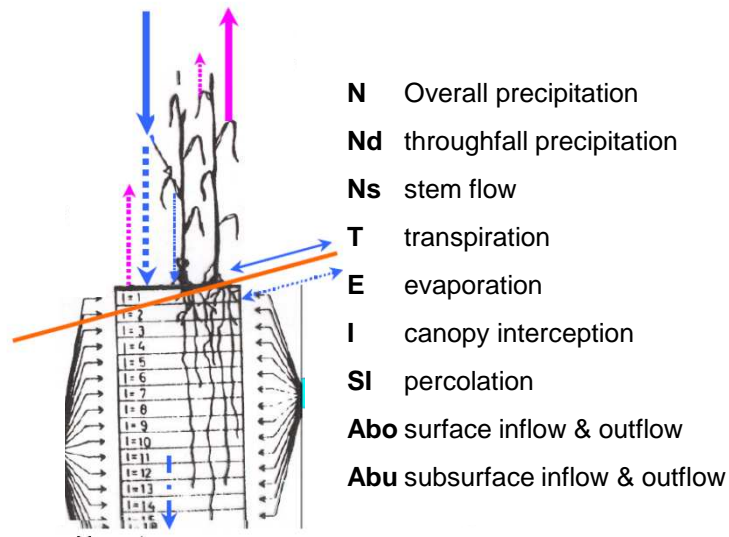
3.Agricultural policy measures and its influence on water consumption

4.Agricultural options for adaptation / mitigation of water scarcity

1 Impacts of climate change on agriculture



- Examples:
 - Quantity and quality of crops
 - Heat stress
 - Infestation by pests
 - Vegetation period
 - Degradation of land
 - Availability of nutrients



2 Risk Evaluation

Development of indicators:

Water consumption of agriculture

- **Plant cultivation** (5 classes, crop coefficient FAO)
- **Animal husbandry** (3 classes, guidelines for livestock water consumption)
- **Irrigation** (share of irrigable area)

Soil

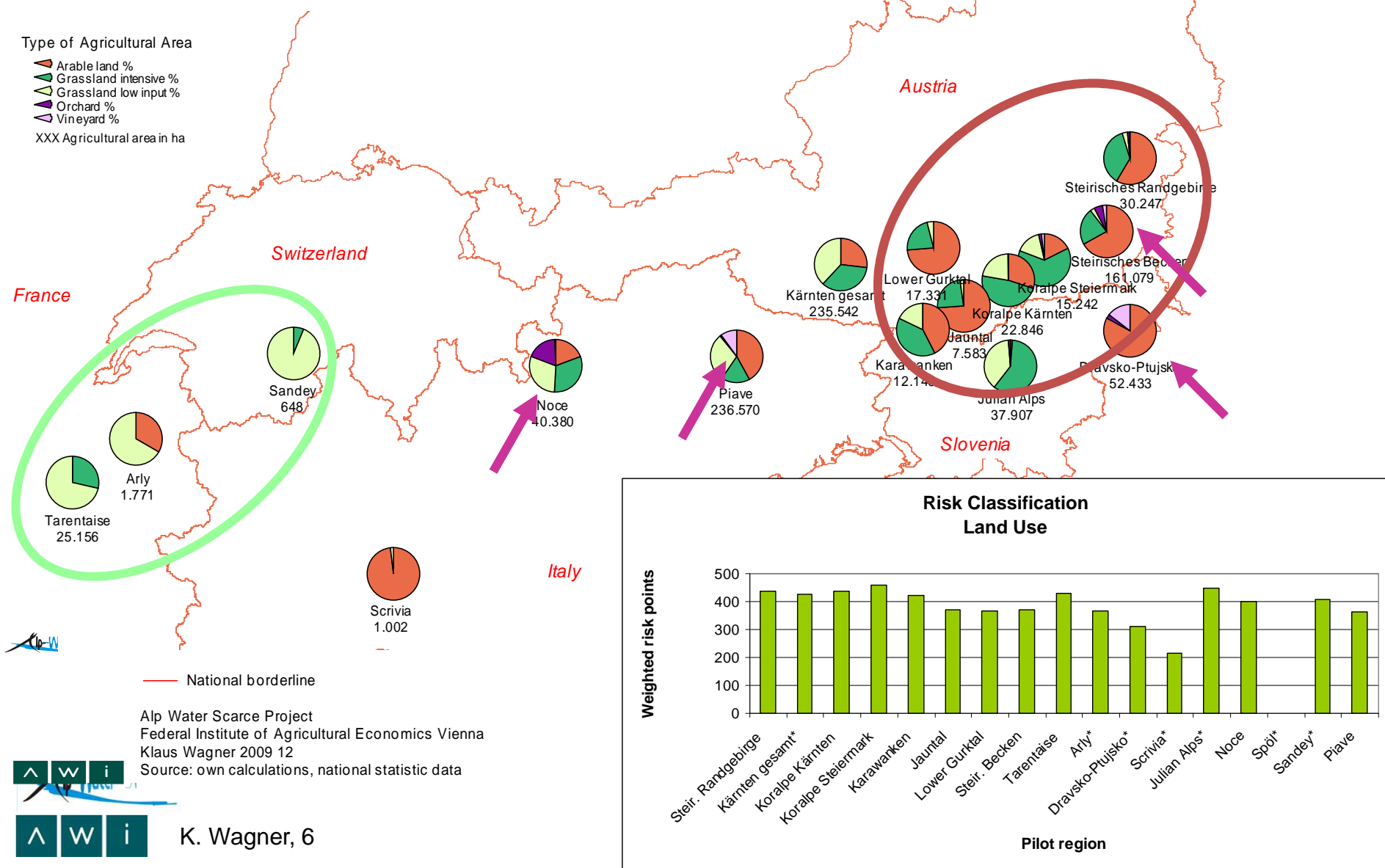
- **Capacity of available water** (3 classes)

Climate

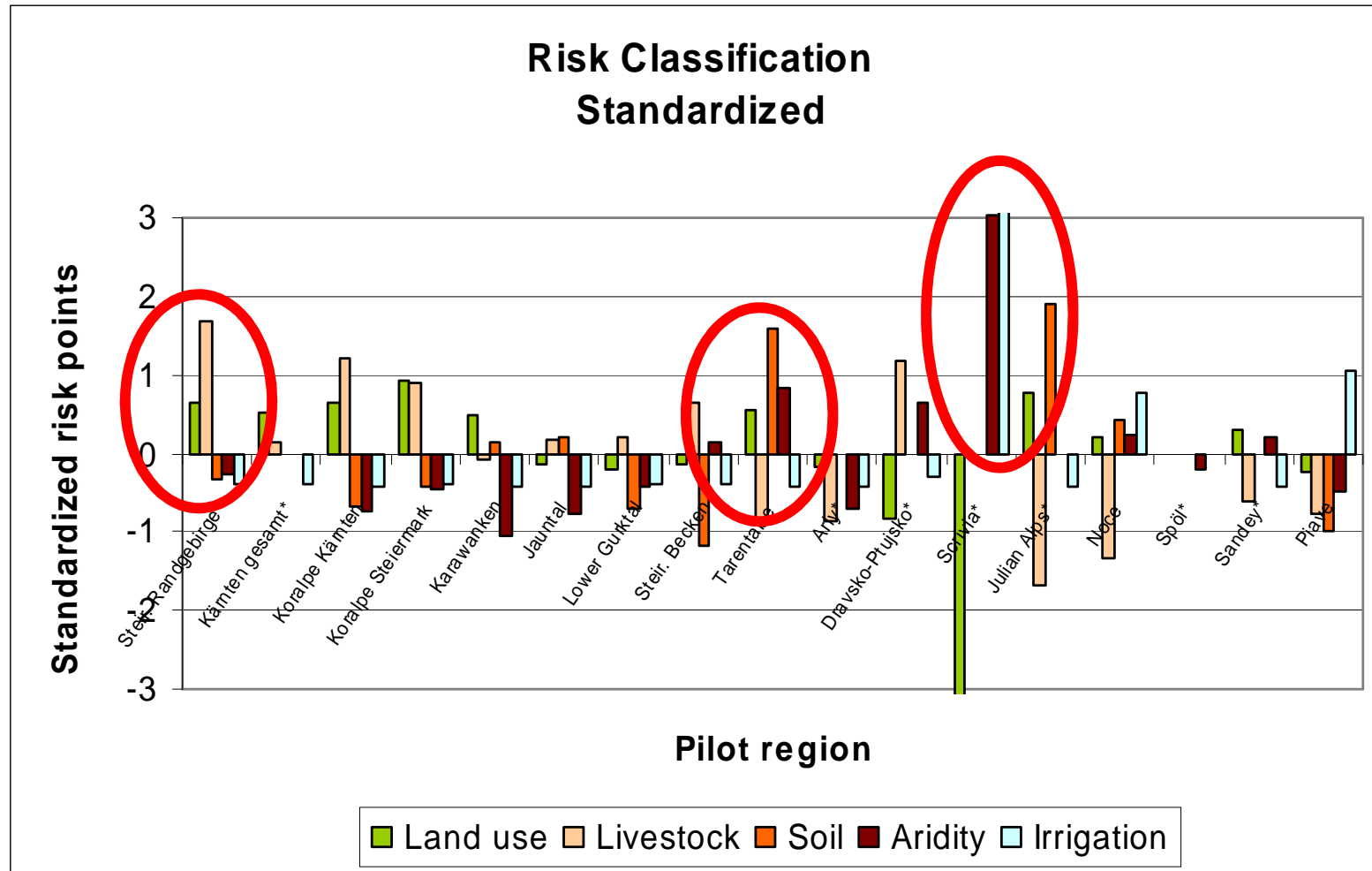
- **Aridity index** (3 classes, relation of temperature and precipitation)

2.1 Current Situation

Agricultural Risk Analysis for Water Scarcity
Pilot regions - overview



2.1 Current Situation



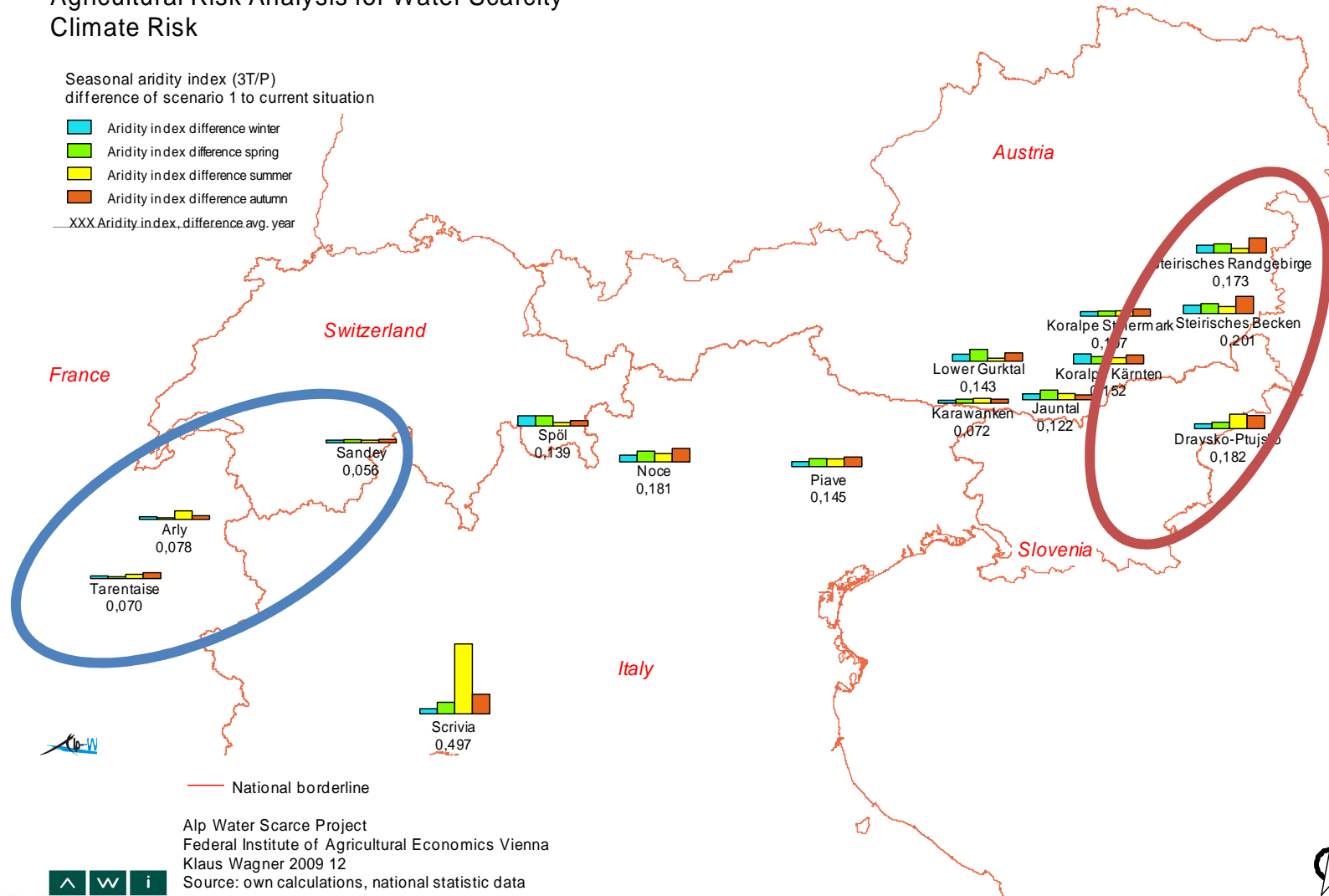
2.2 Future Situation (2050)

Agricultural Risk Analysis for Water Scarcity Climate Risk

Seasonal aridity index (3T/P)
difference of scenario 1 to current situation

- Aridity in dex difference winter
- Aridity in dex difference spring
- Aridity in dex difference summer
- Aridity in dex difference autumn

XXX Aridity in dex, difference avg. year



— National borderline

Alp Water Scarce Project
Federal Institute of Agricultural Economics Vienna
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Source: own calculations, national statistic data



3 Agricultural policy measures and its influence on water consumption

Measure category	Effects related to water scarcity		Austria	France	Italy	Slovenia	Switzer-land
	Type	Tendency					
Decoupled direct payments	Indirect	Positive	X	X	X	X	X
Coupled direct payments	Direct	Positive	X	X	X	X	X
Market regulation measures	Direct / indirect	Positive/ indifferent/ negative	X	X	X	X	X
Rural Development – Competitiveness	Direct	Positive	X	-	X	X	X
Rural Development - Environment and Countryside	Direct / indirect	Positive / indifferent	X	X	X	X	X
Rural Development - Quality of Life and Diversification	Indirect	Indifferent	X	-	X	-	X
Leader	Indirect	Indifferent	X	X	X	X	-
Source: A: Lebensministerium 2010 a, F.; I. SI: European Union, Directorate-General for Agriculture and Rural Development, 2010; Information of Pilot region project partners, CH: Bundesamt für Landwirtschaft, 2010							



Subsidies in pilot regions

Percentage of subsidies with:	Austria	France	Italy	Slovenia	Switzerland
Effects of increasing water consumption	0	0	0	0	n.a.
Indifferent effects	65	77	46	51	n.a.
Effects of decreasing water consumption	35	23	54	49	n.a.

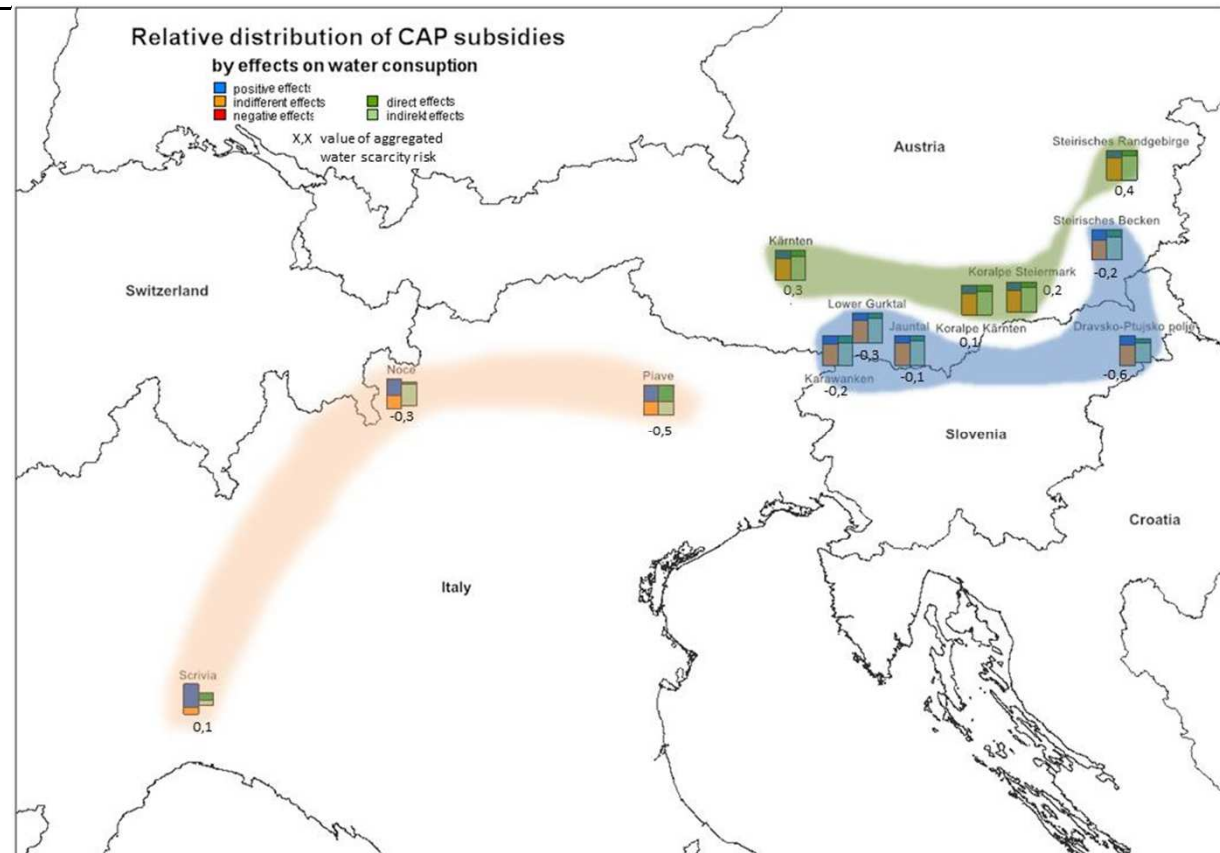
Source: A: Lebensministerium 2010, F:, I. SI: European Union, Directorate-General for Agriculture and Rural Development 2010, Information of Pilot region project partners, CH: Bundesamt für Landwirtschaft 2010

3 Clusters:

Italian regions: measures concerning water saving in force, highly dependent on irrigation, some regions with high aridity risk

South-eastern regions: relatively low aggregated risk of water scarcity, only special sectors concerned, small share of money in water saving measures

North-eastern regions: grassland farming, water intensive livestock, only a small share of subsidies dedicated to water saving measures



4. Agricultural options for adaptation to / mitigation of water scarcity, Regional specific, depending on risk patterns:



4.1 Short-term measures in every case

(positive environmental effects, indifferent economic effects)

- Adapted nutrient, weed, pest management
- Conservational tillage, mulch seeding, landscaping measures
- Adapted crop calendar, plant density, grazing / stable systems
- Efficient irrigation technology



- **Risk management** (insurance systems to minimise risk of crop losses for farmers, multiple risks, hail, frost, public support in some member states, special funds for flooding or droughts)

4.2 Long- term measures to change structures and systems

(negative economic effects, indifferent effects on production, landscape, regional economy)

- **change from intensively used grassland to low input systems** (focus in Steirisches Randgebirge, Koralpe, Karawanken, Julian Alps, Noce Tarentaise)
- **Adapted crops** (winter / spring, reduction of field forage crops..., focus in Steirisches Randgebirge, Koralpe, Karawanken, Pohorske, Dravsko-Ptujsko Polje, Scrivia)
- **Reduction of livestock intensity, Change of livestock systems** (focus in Steirisches Randgebirge, Koralpe, Jauntal, Unteres Gurktal, Steirisches Becken, Noce, Pohorske, Dravsko-Ptujsko Polje)
- **Extension of irrigation only under certain conditions.**



4.3 Economic effects: advantages, disadvantages for farm enterprises, examples for Austria:

- **Land management, soil cultivation** (additional expenditure for autumn mulch seed in planting: **109€/ha**, saving of expenditure in case of direct seeding in winter planting: **31€/ha**)
- **Crop rotation** (important in Austria: maize ear silage, change to maize whole plant silage which makes better use of winter humidity means **1,359.- €/ha** disadvantage for farmers per year)
- **Irrigation** (to reduce climate-induced yield variations, but most expensive investment in agriculture, also high operative costs, (**400 - 1,900 €/ha** per year), does pay only in case of special products, high producer prices and really dry years, long term sustainability??)