Collective climate change mitigation:
A pathway for Swiss farms?

Preliminary results of a survey in the region of Zürcher Weinland

PhD project Cordelia Kreft, Dr. Robert Huber, Prof. Robert Finger (Agricultural Economics and Policy Group ETH Zürich)

AECP
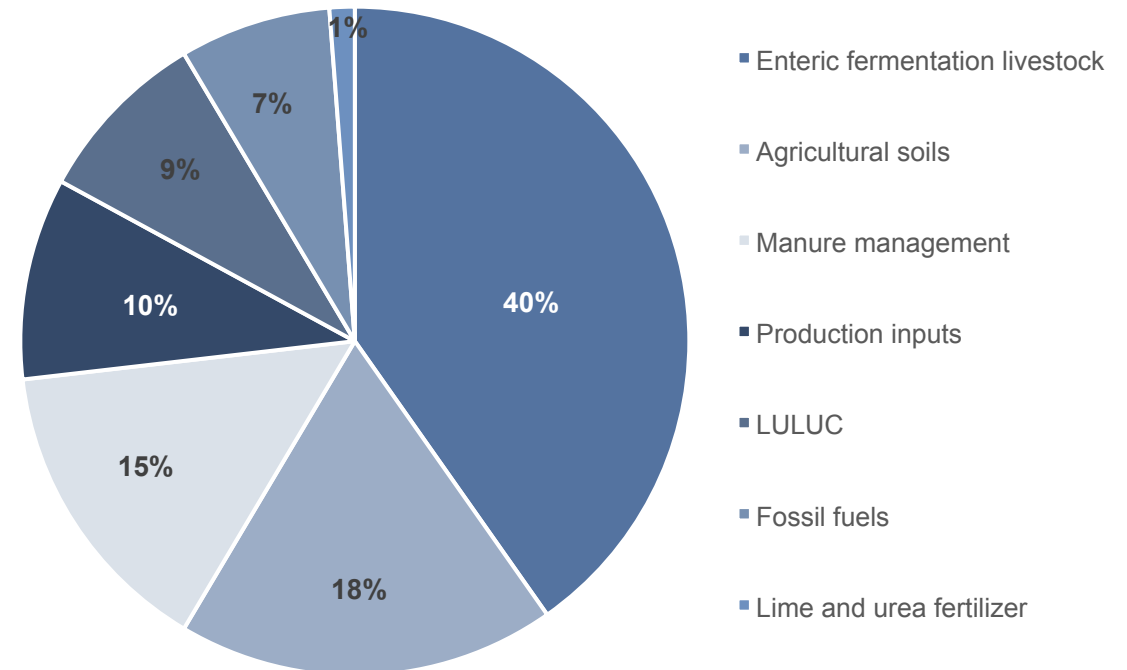Agricultural Economics and Policy

Outline

- Introduction
- Research gap and research questions of PhD project
- Case study AgroCO2ncept Flaachtal
- Data
- Preliminary results
- Outlook

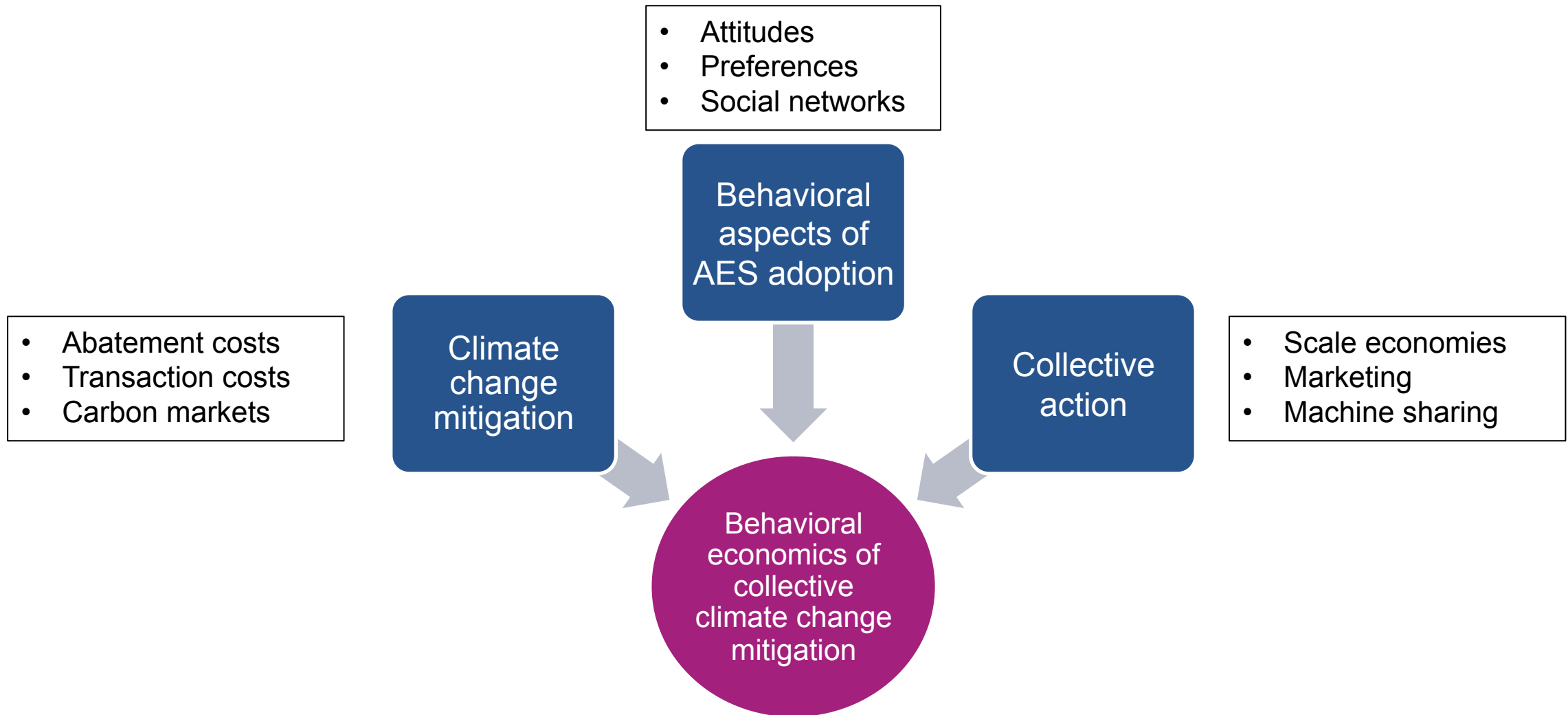# Agricultural greenhouse gas (GHG) emissions in Switzerland

- 10 – 14 % of total GHG emissions caused by agricultural production

- Policy aim: minus 30% by 2050

- Effective and efficient mitigation strategies needed

- Research on decision-making and preferences of farmers needed

Sources of agricultural GHG emissions in Switzerland
(total: 6.1 Mio. t CO2 eq)

- Enteric fermentation livestock
- Agricultural soils
- Manure management
- Production inputs
- LULUC
- Fossil fuels
- Lime and urea fertilizer

Source: Agrocleantech, 2015

Research gap

Attitudes
Preferences
Social networks

Behavioral aspects of AES adoption

Abatement costs
Transaction costs
Carbon markets

Climate change mitigation

Collective action

Scale economies
Marketing
Machine sharing

Behavioral economics of collective climate change mitigation

Why is this relevant for Swiss family farms?

- Climate change mitigation is a declared goal of agricultural policy
  - Increasing public pressure

- Collective (cross-farm) forms of mitigation can
  - Reduce marginal abatement costs
  - Increase efficiency of land-use
  - Reduce costs for information acquisition
  - Help to create regional value
 - Facilitate applications for funding

Overall research questions of PhD project

What determines farmers' adoption of climate change mitigation measures in Switzerland?

1. How do individual preferences and attitudes influence farmers' decision-making with respect to climate change mitigation?

2. How do social networks influence the decision to join collective climate change mitigation?

3. Is a whole-farm (result-oriented) and collective approach an efficient way of climate change mitigation?

AECP
Agricultural Economics and Policy
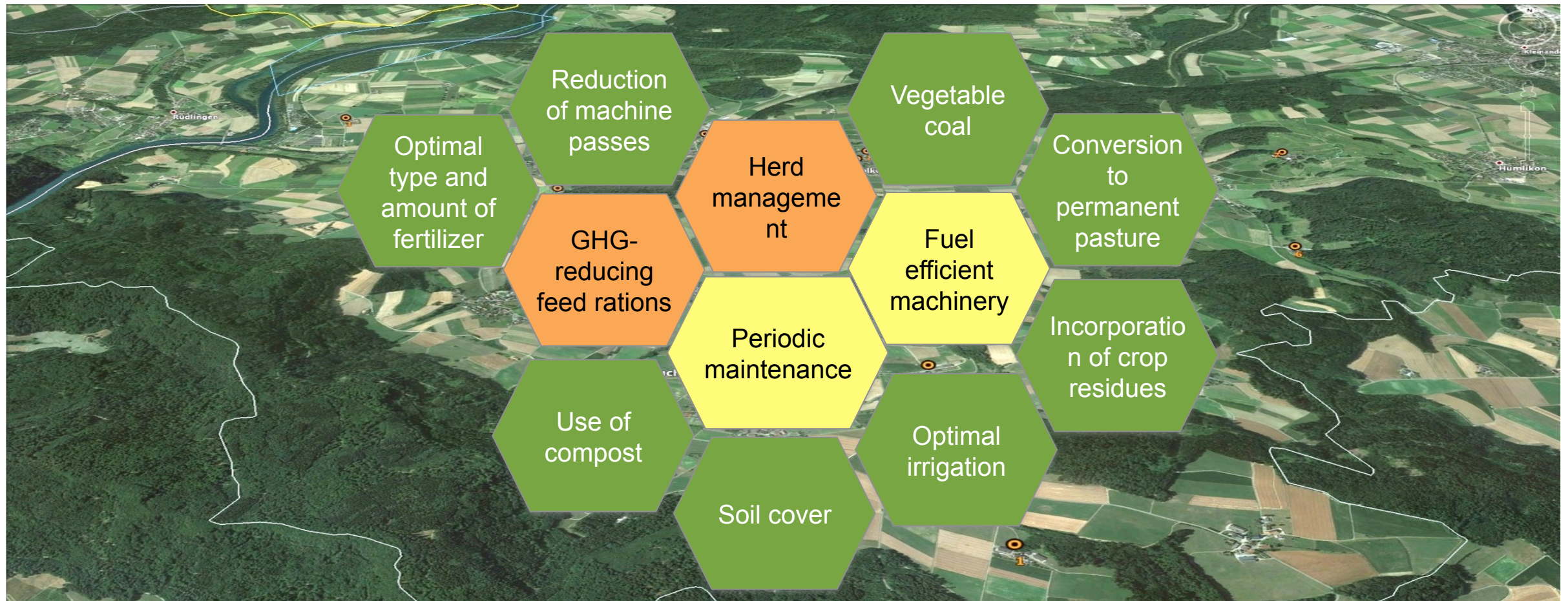
Conceptual framework
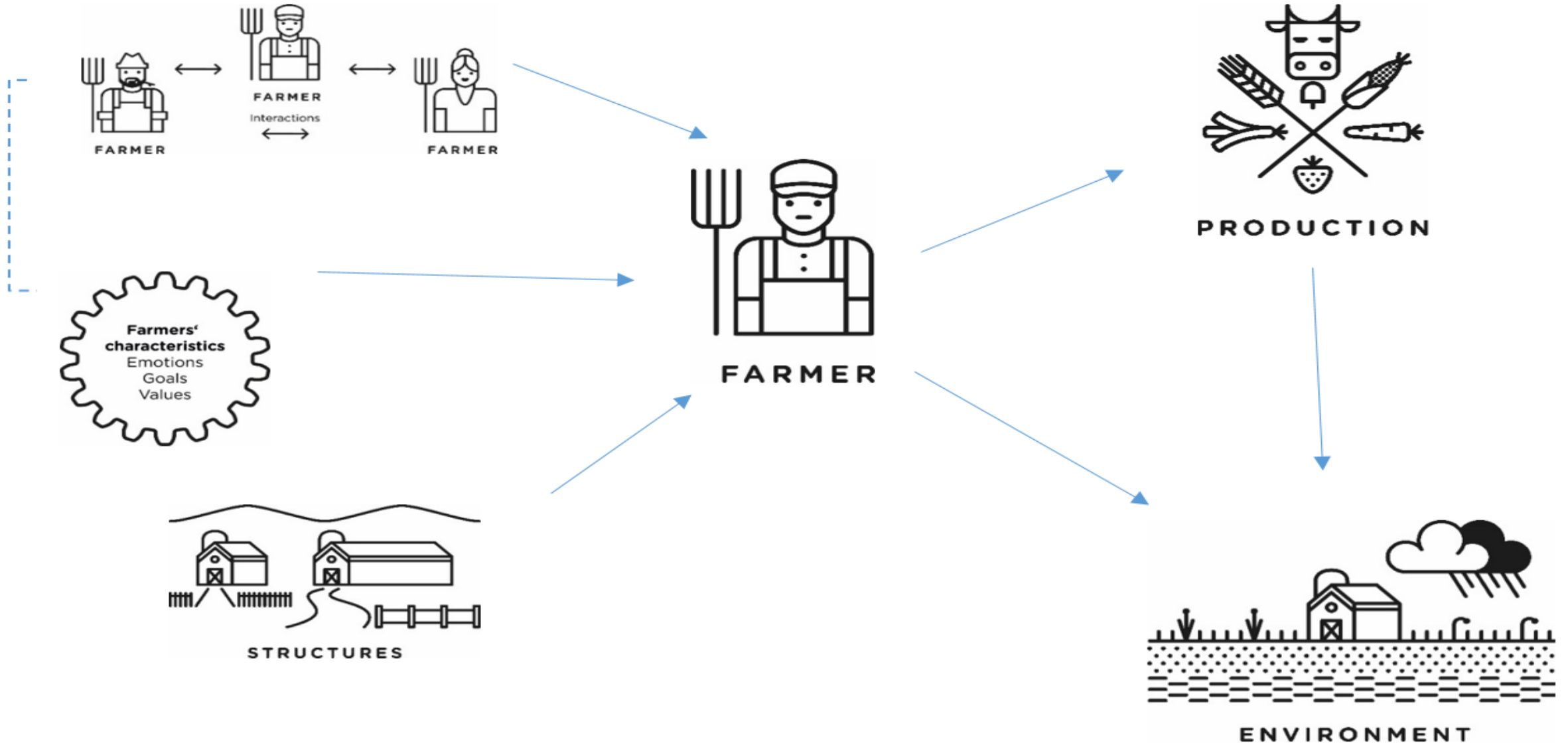
Case study: Initiative AgroCO2ncept Flaachtal

- Currently 24 farms
- Vision: «Climate Region Flaachtal»
  - **20% less emissions**
  - 20% less costs
  - 20% more value added
- Resource Project funded by FOAG
- Particularities
  - Pioneers in practical on-farm mitigation
  - Collective approach
  - Whole-farm approach

Mitigation measures in AgroCO2ncept

Data

- ## Online survey
  - ### 387 farmers in Zürcher Weinland
  - ### 26 questions
    - Perceptions of climate change
    - Current implementation of mitigation measures
    - Personal values
    - Satisfaction with current income situation
    - Social network
    - Risk preferences (elicitation with lottery game)

- ## Structural farm data (AGIS)
  - ### Demographics
  - ### Agricultural land
  - ### Livestock
  - ### SAK

Choice of GHG reduction / mitigation measures

- 13 measures based on literature and AgroCO2ncept

| 7 Livestock & manure management measures	3 Arable farming measures	3 Energy measures
Partly replacement of imported concentrates by domestic legumes	Usage of drag hoses or similar soil-close scattering techniques	Solar panels e.g. on roof tops
Reduction of concentrates to 10%	Cover and/or catch crops	Biogas plant for manure fermentation
Minimum of 5 lactation periods per dairy cow	Ploughless tillage	Ecodrive mode for tractor operations
Dual purpose cattle breed (e.g. Original Braunvieh)		
Feed additives		
Composting livestock manure		
Coverage of manure/slurry tank		

Preliminary results of the online survey in Zürcher Weinland

Farm characteristics

- 64 farms in region Zürcher Weinland
  - 4 Bio
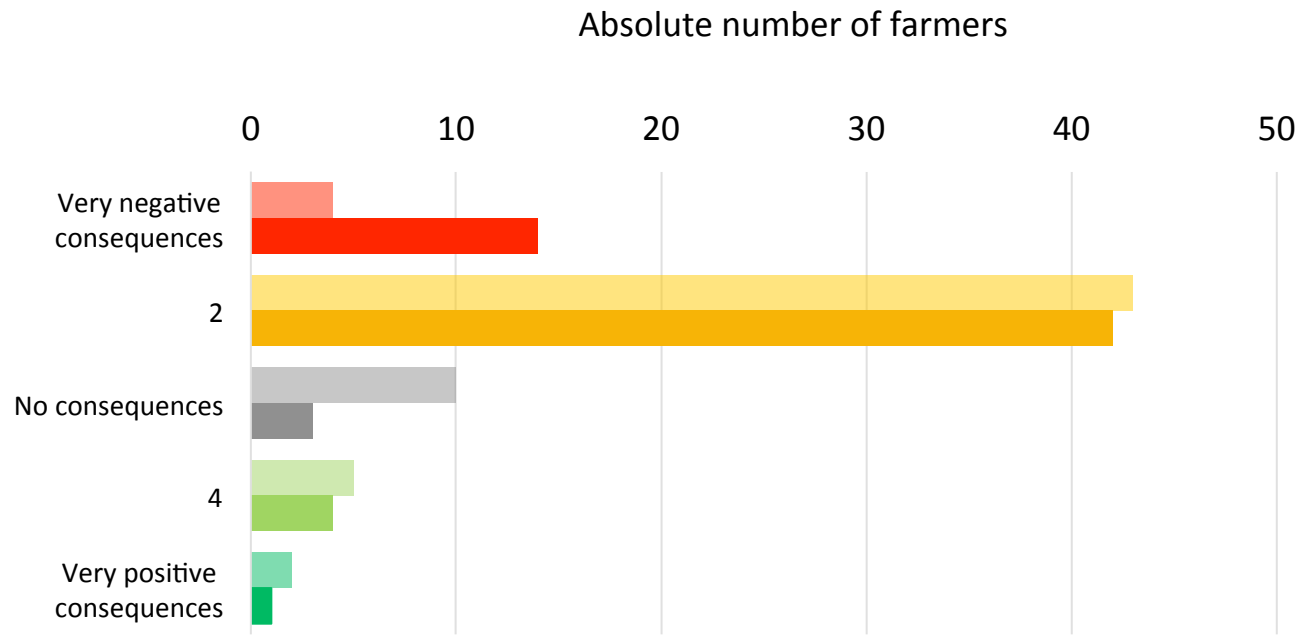 - 11 in AgroCO2ncept

- Average size: 24 ha

- Various farm types
  - Dairy
  - Suckler cows
  - Poultry
  - Pure arable
  - Winegrowing
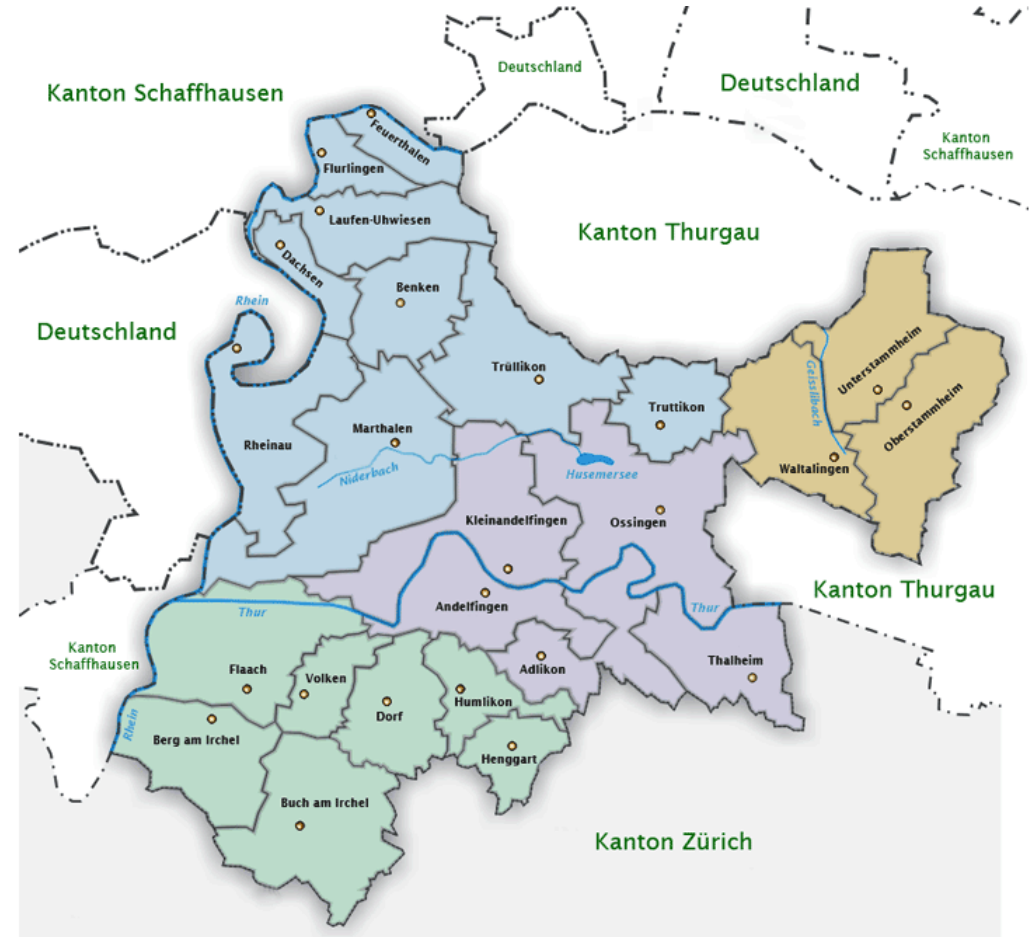
Expected consequences of climate change

Question:

Do you think that climate change will have consequences for Swiss agriculture/ for the future of your farm?
(Scale: 1: Yes, very negative to 5: Yes, very positive)
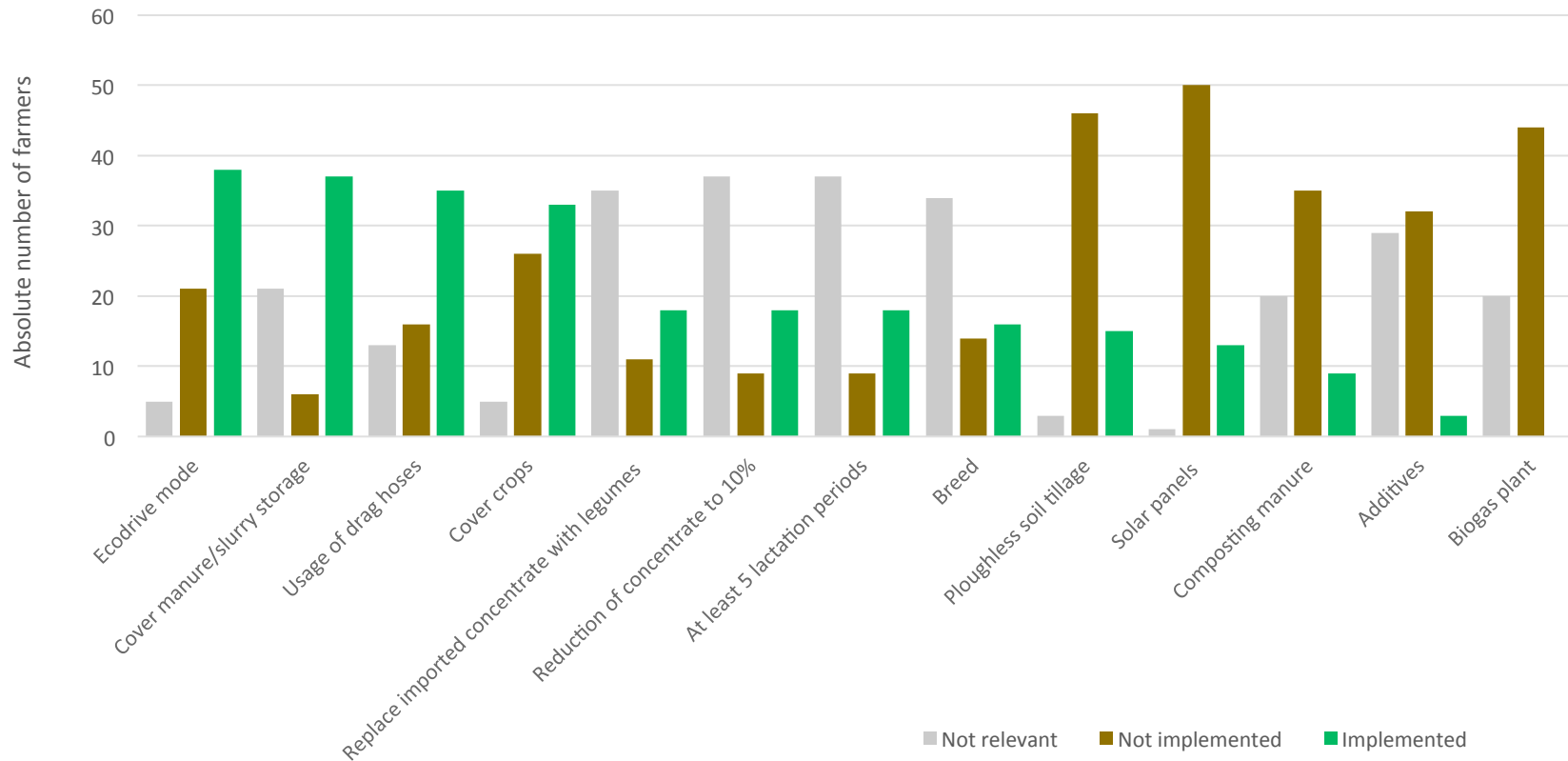
Absolute number of farmers

- More negative expectations for Swiss agriculture than for own farm
- Perception of climatic changes over past 10 years
  - Increase of dryness, heavy rain, heat waves
  - Decrease of long rain periods
  - No change of hail and frost in spring/autumn

Current adoption of mitigation measures

Question:

Which of the following measures are you currently implementing on your farm?

Absolute number of farmers

Legend: Not relevant | Not implemented | Implemented

X-axis categories: Ecodrive mode, Cover manure/slurry storage, Usage of drag hoses, Cover crops, Replace imported concentrate with legumes, Reduction of concentrate to 10%, At least 5 lactation periods, Breed, Ploughless soil tillage, Solar panels, Composting manure, Additives, Biogas plant

- Often adopted:
  - Ecodrive
  - Coverage of slurry storage
  - Drag hoses
  - Cover and catch crops
  - Livestock measures

- Rarely adopted:
  - Ploughless tillage
  - Solar panels
  - Composting of manure
  - Feed additives

- Currently, no biogas plants

Estimated efficacy of measures

Question:

How effective do you estimate these measures for climate protection?
(Scale: 1: "not effective at all" to 5 "very effective")

- 61 percent of farmers who implement a certain measure are convinced of its efficacy
- Option "don't know" is often chosen

	Rated as effective	Rated as not / less effective
Livestock measures	• Reduction of concentrates • Increasing no. of lactations	• Dual purpose breed • Feed additives
Manure management	• Coverage • Drag hoses	• Composting manure
Arable farming measures	• Cover/catch crops	• Ploughless tillage
Energy measures	• Solar panels • Ecodrive	• Biogas plant

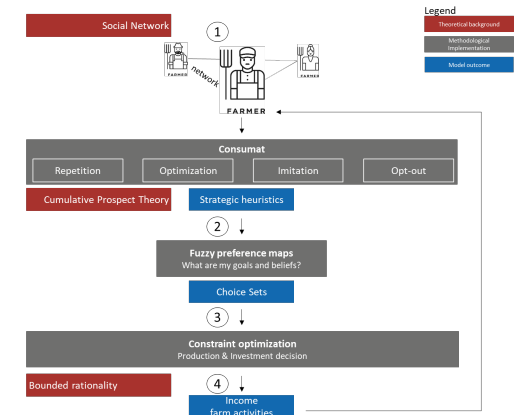# First glimpse into risk preferences

- Elicitation of risk aversion parameter based on lottery choices

- Most farmers are risk averse

- Farmers who adopt mitigation measures seem to take more risky choices

Outlook

- Econometric analysis of survey and structural data (AGIS)
  - Relationship between multiple factors and adoption of mitigation measures (e.g. farm characteristics, risk and loss aversion, satisfaction, attitudes towards environment and climate change, size of social network etc.)

- Participative network analysis with AgroCO2ncept farmers
  - Participative network mapping
  - Reveal & visualize patterns of network

- Parametrization of Agent Based Model FARMIND
  - Developed in AECP group
  - Simulate counterfactual situation
  - Generalize findings from rather small sample
  - Optimization

Thank you!