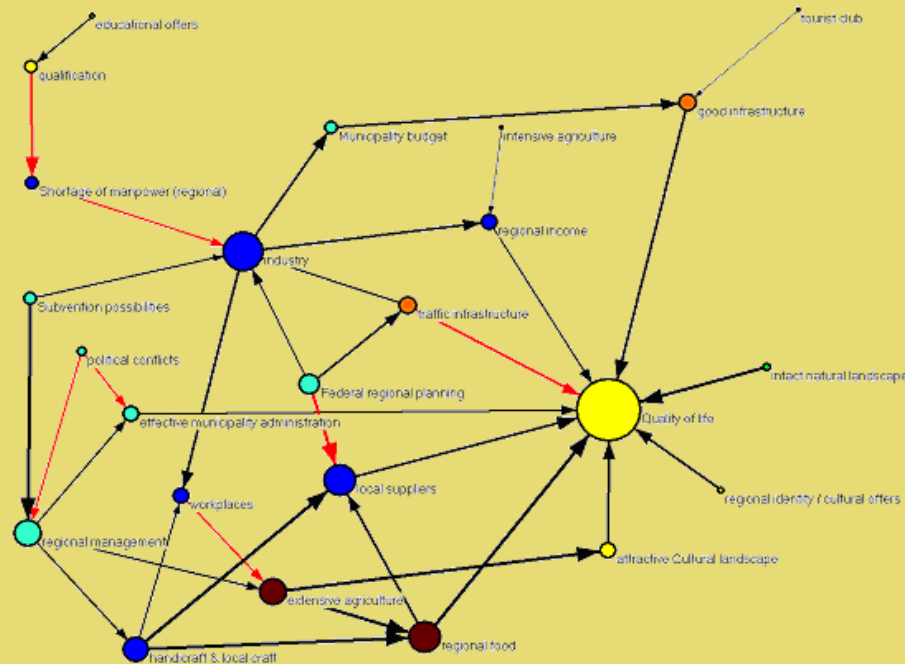


Fuzzy Cognitive Mapping

I



FCMapper

MS Excel based fuzzy cognitive mapping analysis tool

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What is FCM?

A procedure **to involve stakeholders** in a research or management processes and enhance **social learning**

A method to **extract and analyse different kinds of knowledge** about **complex systems** and their functioning

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Participative Process

- **social learning** and **understanding** of the system between the participants is fostered.
- **structures a process** in which the perception of stakeholders on a certain system (or problem) is uncovered

Mapping

- FCM can be used to **depict complex systems** as perceived by different stakeholders.
- **various elements** from the social & cultural sphere, as well as institutions, physical structures ecosystems or individual species can be included

Analysis

- The goal of FCM analysis is **detecting** and **interpreting** relations between entities found in a map and understanding its **structural properties** and **dynamics**.
- The structured way of collecting and coding data enables a comparison between different case studies and even aggregation of data..

Modelling & Scenarios

- FCM has the capability to incorporate feedback processes. It can be used to simulate the changes of a system over time and address “**what - if**” questions.

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Based on Idea from Bart Kosko (1986) to extend cognitive and mind mapping approaches based on the work of Axelrod (1976).

A Fuzzy Cognitive Map is a **directed graph**, and as such can be coded in a adjacency matrix.

A fuzzy cognitive map consists of:

Concepts (Vertices / nodes / factors / elements).

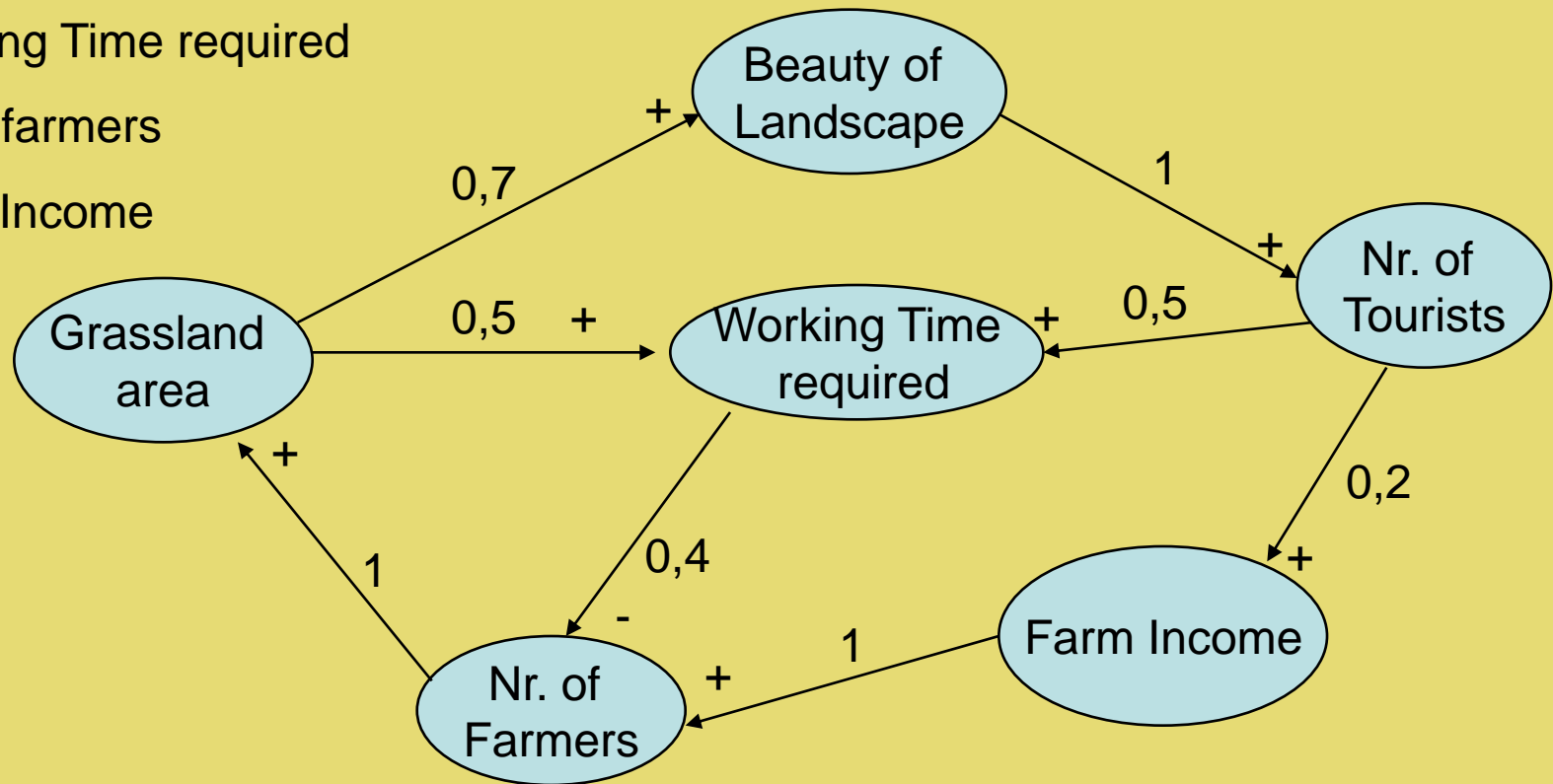
Arrows that represent either positive (+) or negative (-) causal relations between two concepts.

Weights that characterise the strength of the relations through fuzzy values.

List of concepts:

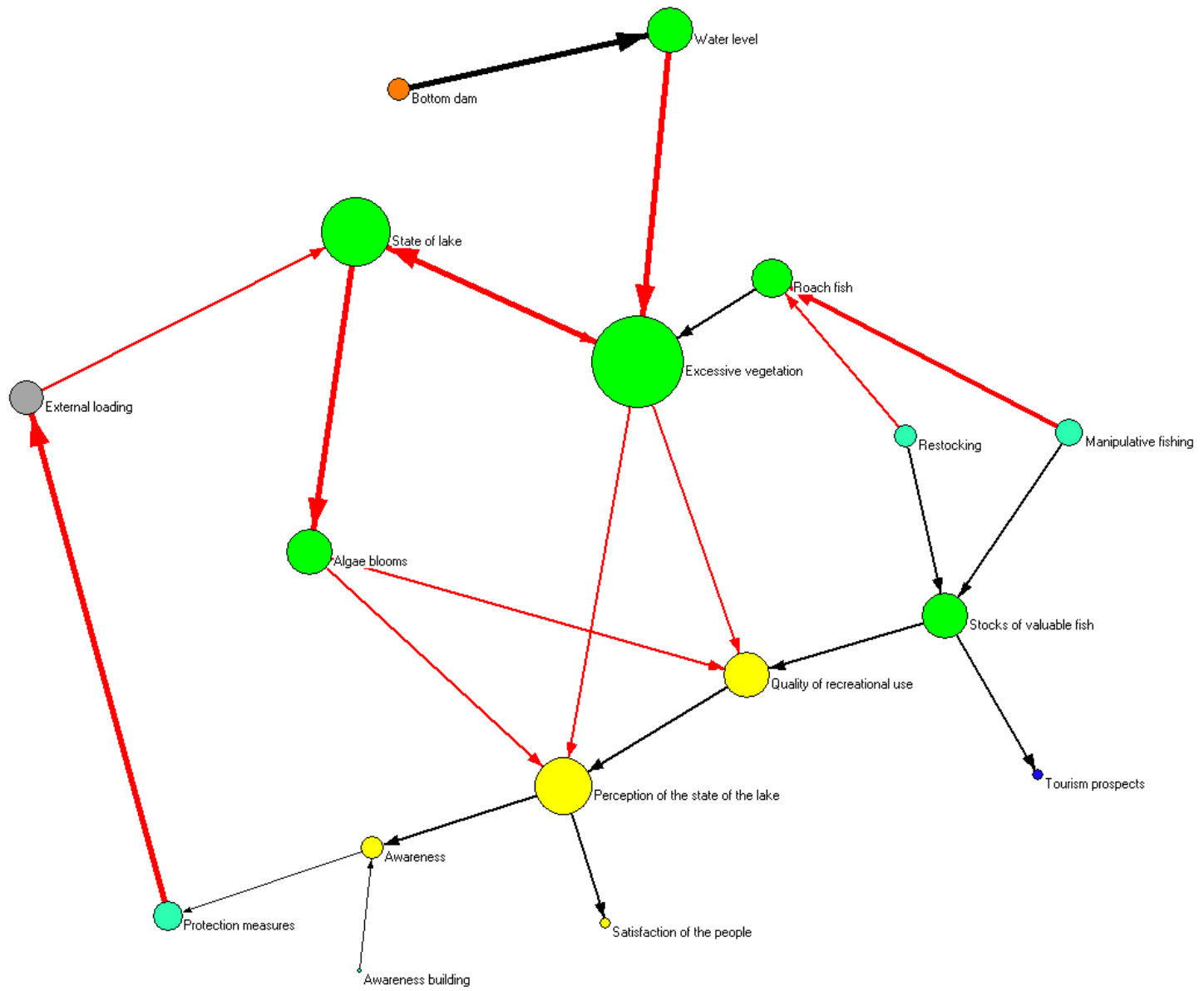
- Area of grassland
- Beauty of landscape
- Nr of Tourists
- Working Time required
- Nr. of farmers
- Farm Income

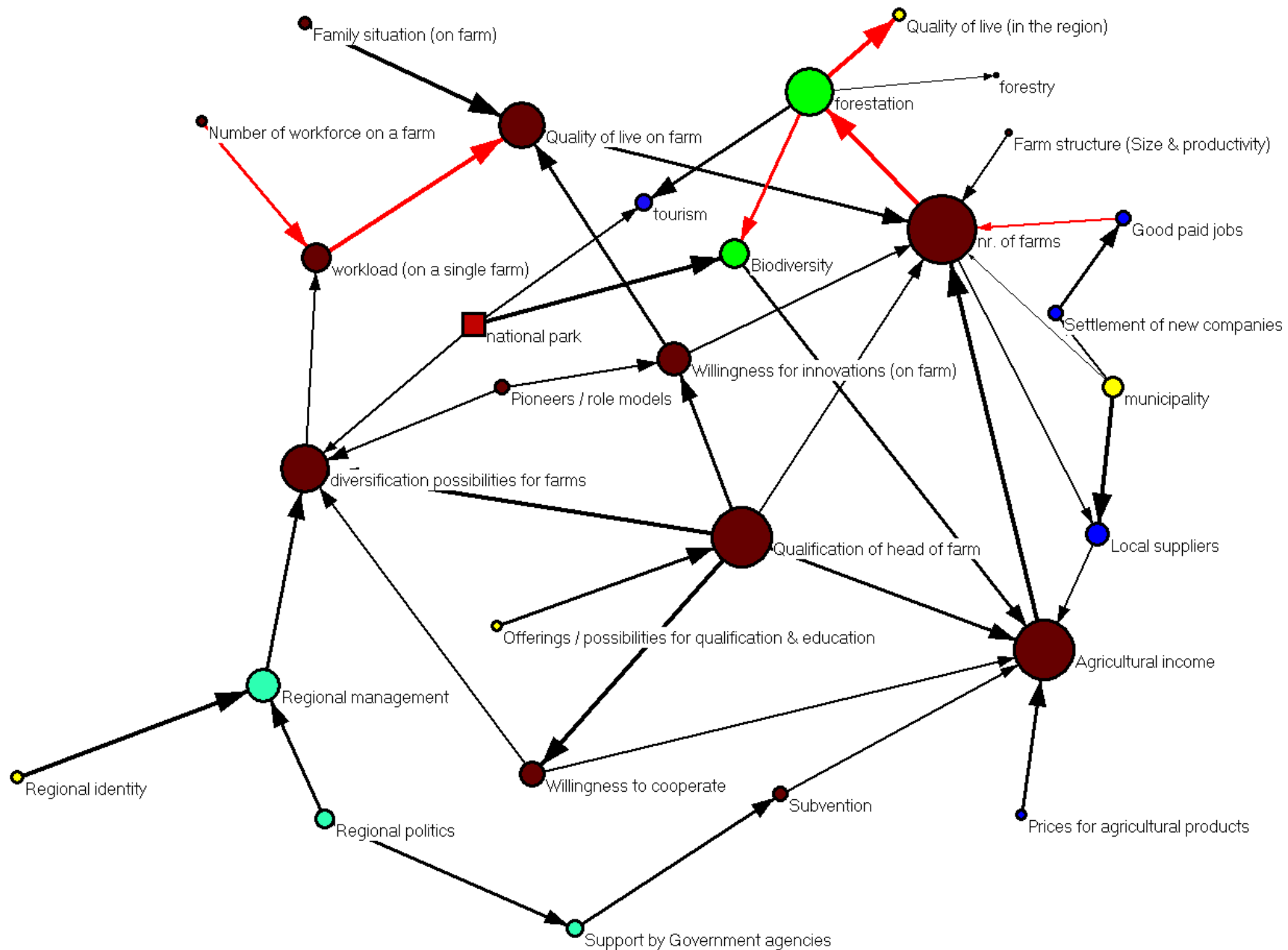
FCM example



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The Mapping Process

1. **Central Question or Statment**
2. **List of concepts considered important for question**

Good concepts = decrease or increase can be described

If the meaning is unclear (e.g. Biodiversity) specify shortly

3. **Start drawing**

- *Put those concepts which you think are highly connected rather into the middle*
- Connect the concepts immediatly and assign + / - to the arrows
- When you think your map is complete (or the time is almost over) start assigning weights to the arrows
- Putting weights can sometimes be rather difficult – remember: they represent **descriptive values** (e.g. 0.1 = a very low influence 0.8 = a rather strong influence) – so just follow your feeling.

What to do...

We would like you to draw a fuzzy cognitive map!

The central question:

What factors will lead to a change in the natural environment and how will that effect human well-being?

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1. Take a sheet of paper
2. Put your **name** & your **discipline** in the left upper corner.
3. **Think about the Central Question:**
What factors will lead to a change in the natural environment and how will that effect human well-being?
4. Make a **List of Concepts** you think are important in the context of the question
5. **Describe the Concepts** (shortly!) if necessary
6. **Start drawing** the Map
7. Less then 5 min. to go – start giving the **weights**

If you have questions do not hesitate to ask me!

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Next Steps...

1. Coding the maps into a adjacency matrix
2. Analysis with FCMapper (www.fcmappers.net)
3. Visualisation with Pajek
4. Second Mapping towards the end of the course (14.09 Monday - evening)
5. Presentation & discussion of results (17.09 Thursday – after lunch)

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