Case Study 10A – Hungarian pond aquaculture

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Implementation case

2020 International Forum on the Effects of Climate Change on Fisheries & Aquaculture
25-26 February 2020, Rome

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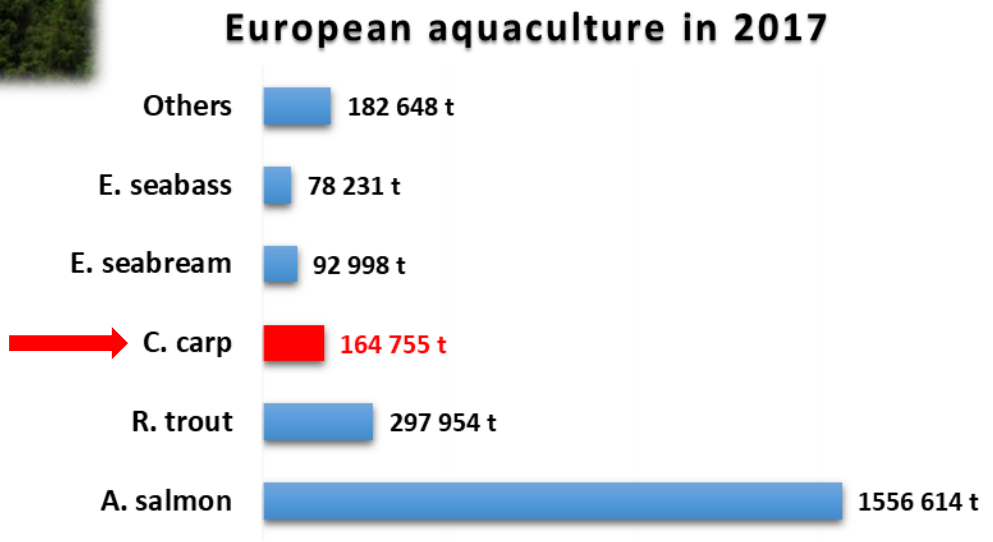
Case study: species, culture method

Carp-based pond farming



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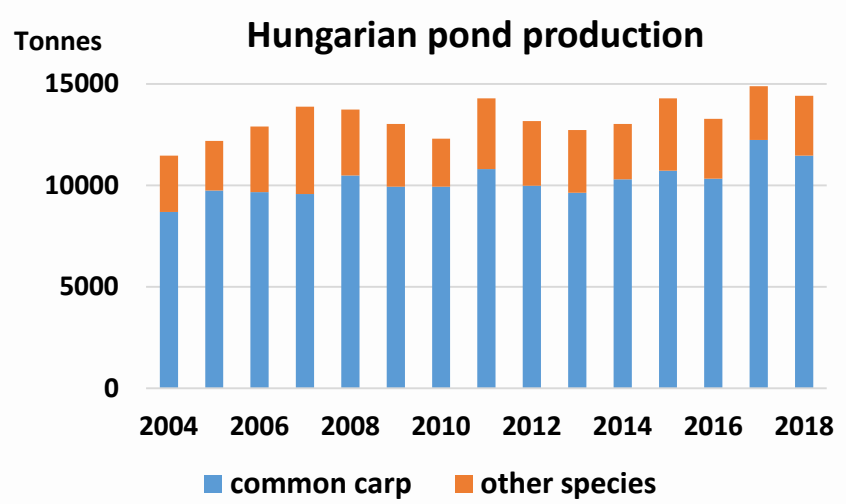
Case study: Hungary

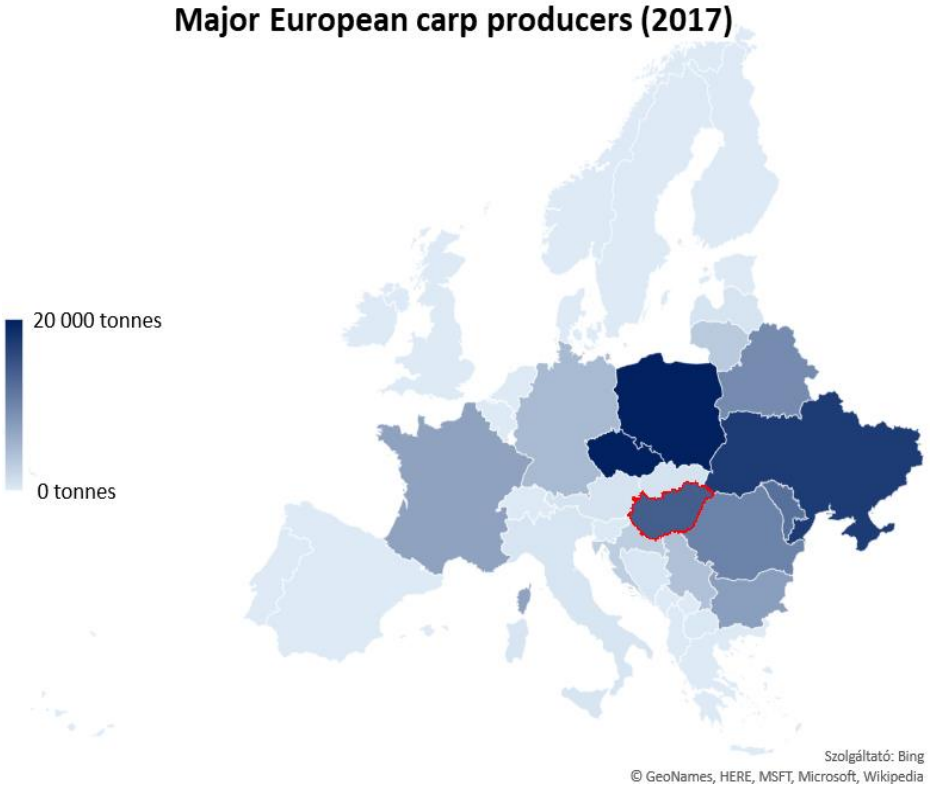
4th largest carp producer in Europe

14-15 kT production

- **10-12 kT Common carp**
- **2-3 kT other carp species**

1600 employee in carp farms





Excludes Russia. Source: FAO Fishstat J

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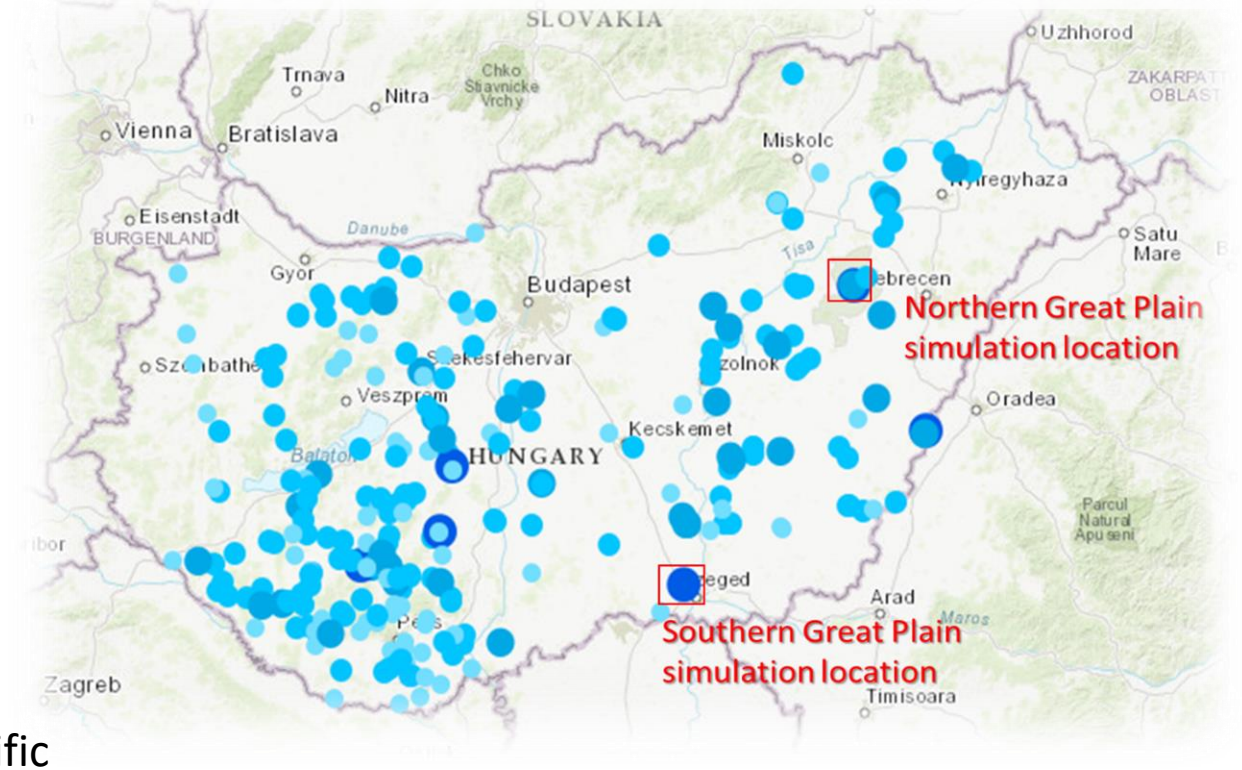
Case study localization

Location of pond farms in Hungary (~360 farms)



- 2 simulation sites
- „Typical" farm approach
  - →Only climate is site-specific
  - →No site-specific soil and inlet water quality
- Model calculations are on *per-hectare* basis

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Case study description: co-creation

- 2 stakeholder meetings
  - April 2018
  - May 2019

- Involved stakeholders
  - **Hungarian Aquaculture and Fisheries Inter-Branch Organization (MA-HAL)**
  - **Ministry of Agriculture**
  - **Individual farmers**

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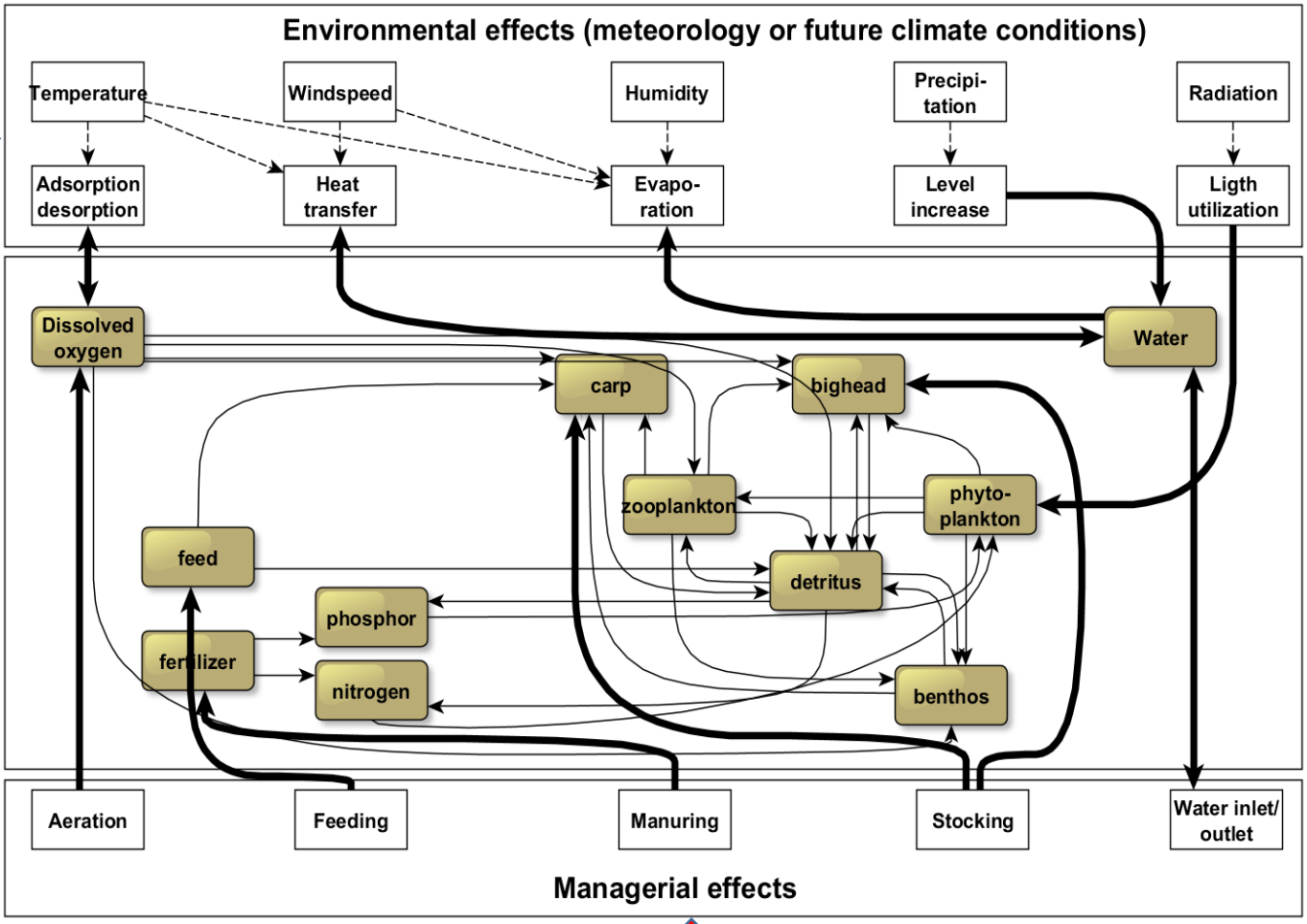
Biological forecasting: the model

Includes physical processes

Food-web



Alternative farm management options are modelled

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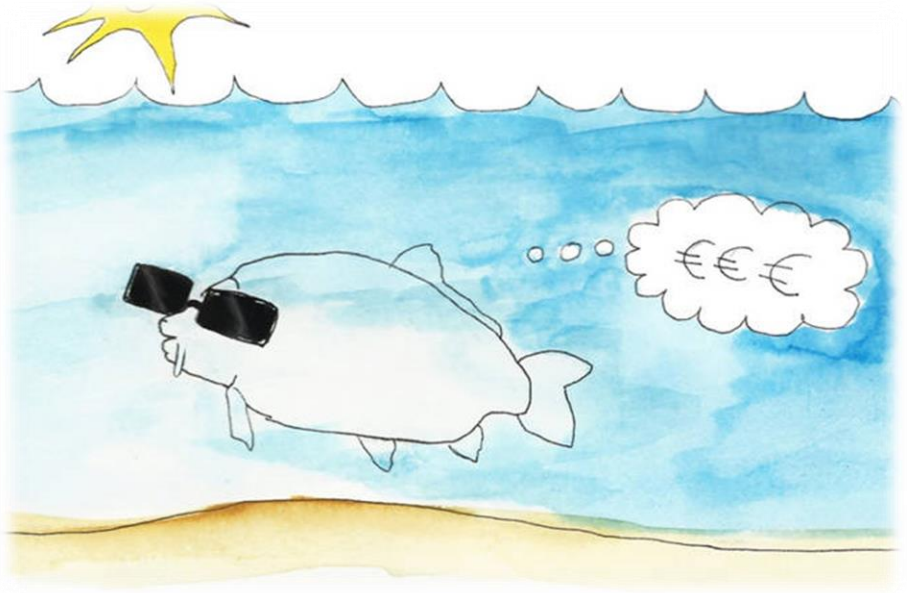
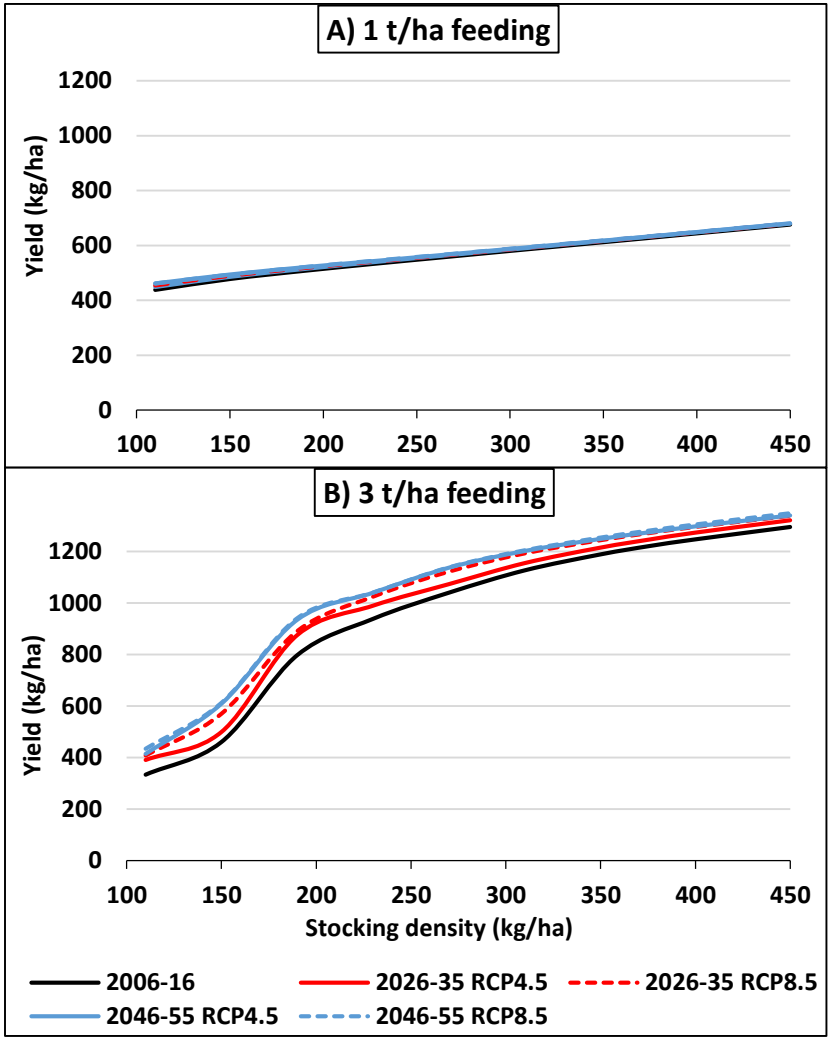
Biological forecasting: yields↑

- Higher change in yield at lower stocking density
- Intensive feeding strategies get better off





Forecasted gross yields of Common carp as function of stocking density. *Southern Great Plain simulation site*

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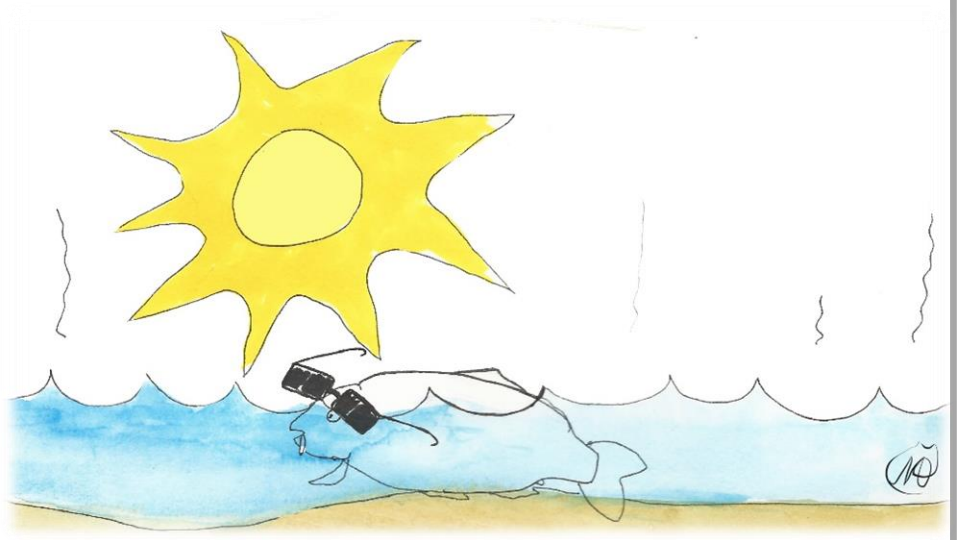
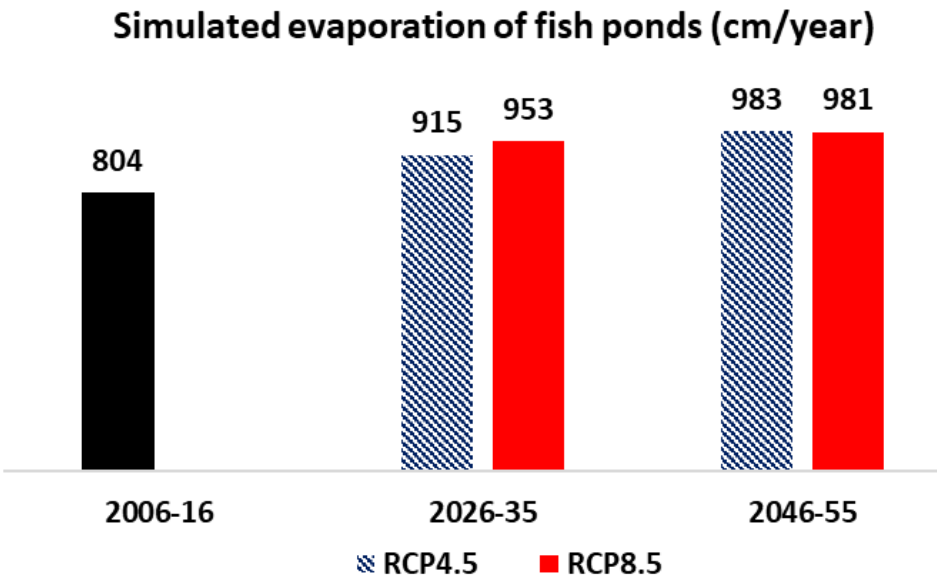
Biological forecasting: evaporation↑

Higher volume of supplementary water will be needed





Southern Great Plain simulation site

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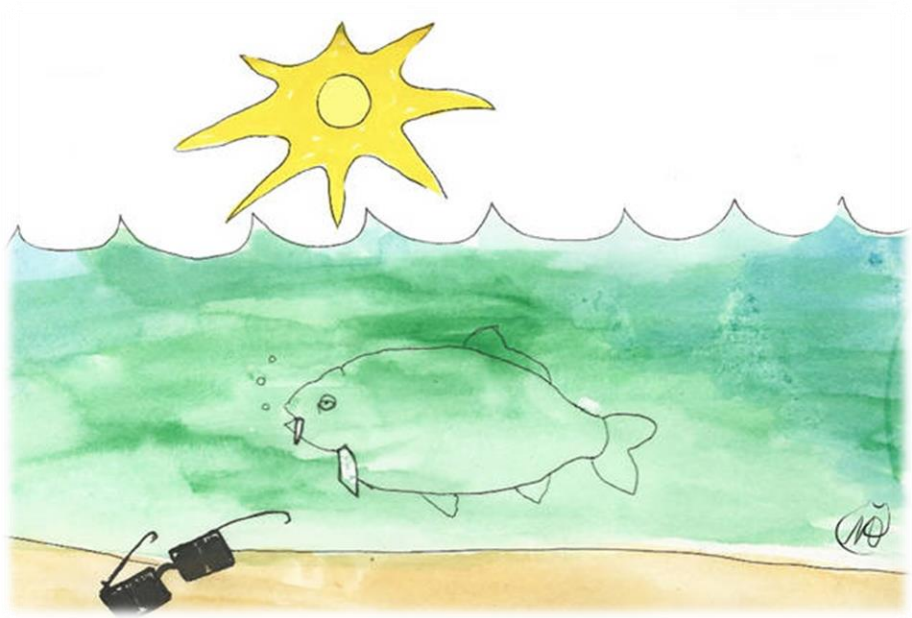
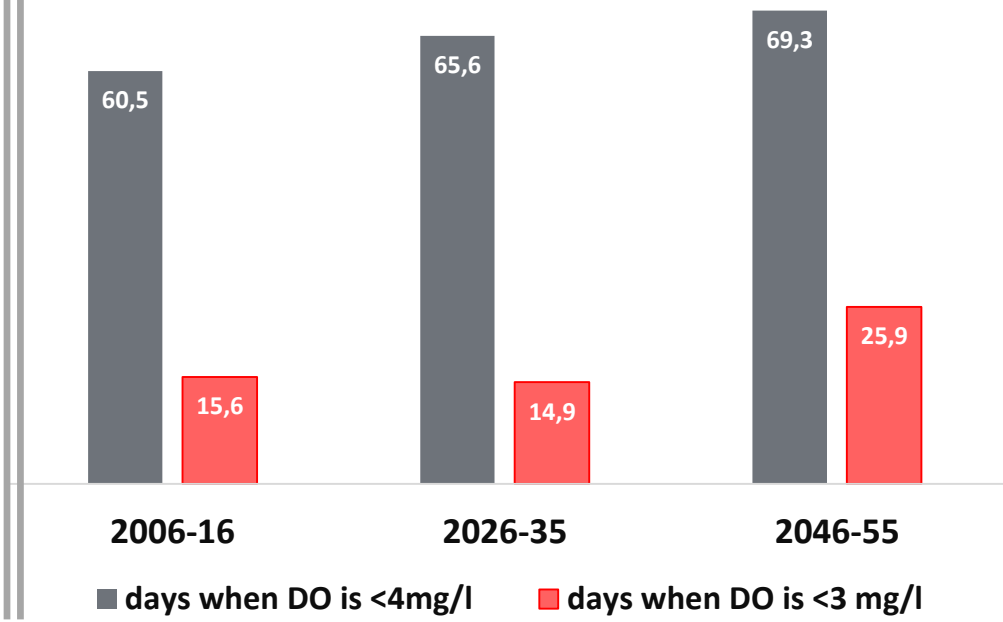
Biological forecasting: production risk↑

Increasing occurence of sub-optimal oxygen levels



Number of days per season with sub-critical oxygen levels

Management scenario: feed: 4 t/ha, stocking density: 450 kg/ha
Southern Great Plain simulation site



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Risks identified by stakeholders

Potential Impact	Risk Rating
Increased ***evaporation*** losses	Major
Heightened risk for ***suboptimal oxygen*** levels	Major
Increased ***mortality*** (biotic stress)	Major
Increased bird ***predation***	Moderate
Increased presence of ***trash fish*** (food competitors)	Moderate
Decreased ***water availability***	Moderate
Increased ***water prices***	Moderate
Deteriorated ***inlet water quality***	Moderate
Increase presence of ***harmful bacteria***	Moderate
Polluted ***effluent water***	Moderate
Infrastructure deterioration	Moderate

modelled

Non-modelled

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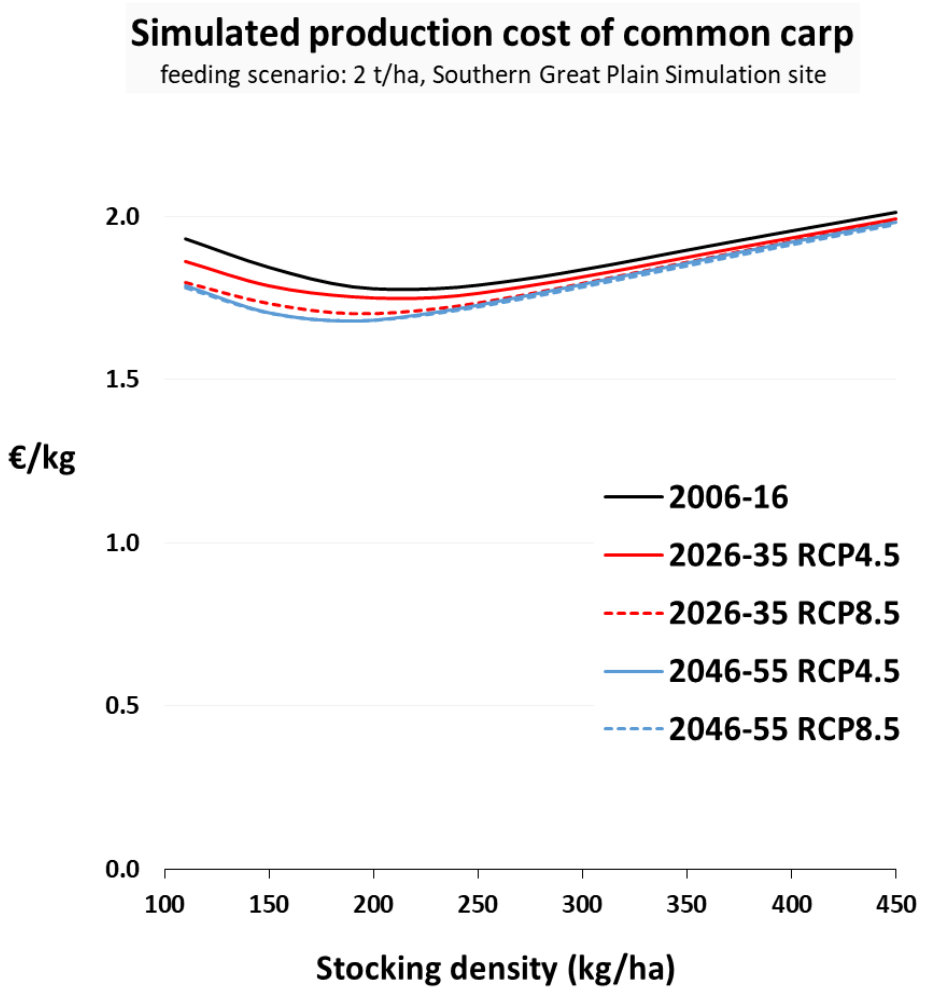
Production economic forecasts

- Yields↑ → unit production cost↓

  calculated with stagnating input prices

- Larger cost reduction at lower stocking density
- Cost-minimizing strategy occurs at lower stocking densities
- more extensive stocking also comes with higher production safety which is not assessed by the model



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Adaptation measures identified

- Monitoring (real time diagnostics)
- Develop infrastructures to withstand floods
- Use of aerators, oxygen manipulation
- Adequate stocking rate and biomass management

Industry-level

- More detail in official statistics

Governance

- Breeding programmes
- Monitoring and mapping disease outbreaks
- Preventive treatments and vaccines

Research & knowledge building

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Impact on local level

- **Yields increase by 3-5% (2050)**
- **~ 500 t at country level**
- **Mortality rates?**
- **Production cost/ risk ↑**
  - Cost of water ↑
  - Cost of veterinary treatment ↑
  - Cost of water quality management ↑

- **Additional 20-25 million m^3 of water will be needed at Tisza catchment area (2050)**

- **20% (RCP4.5) – 26% (RCP8.5) lower summer mean flow**
  (Stagl&Hatterman 2016)

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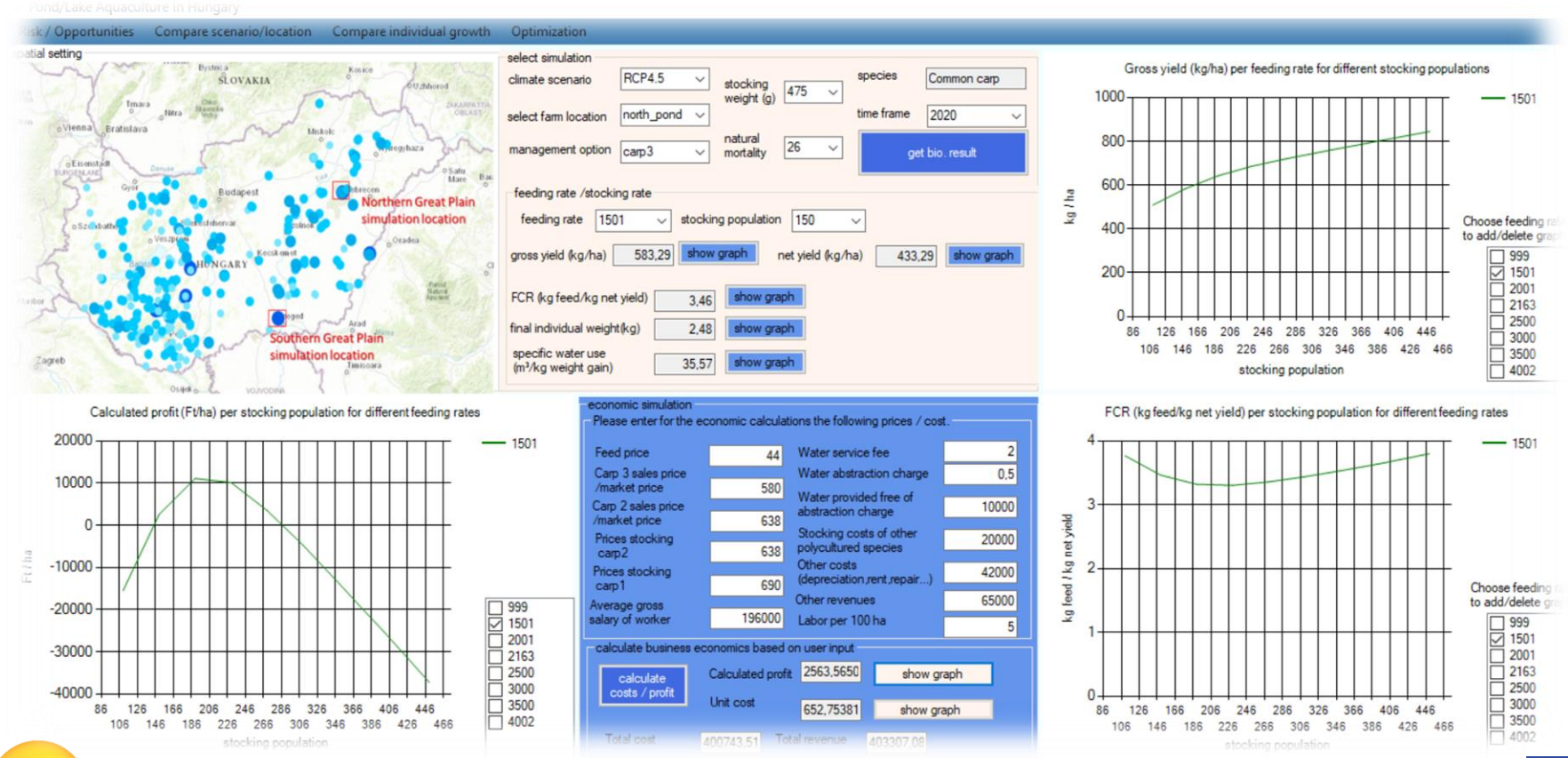
Software-based decision support

- Model outputs are fed into a DSS
- Further info tommorrow, session 5



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Thank you for your attention!

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