### Case Study 10A – Hungarian pond aquaculture

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### Implementation case

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### Case study: species, culture method



#### European aquaculture in 2017







### Case study: Hungary



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### Case study localization



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





### 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





## Biological forecasting: the model







## Biological forecasting: yields个

- 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



## Biological forecasting: evaporation个

# Higher volume of supplementary water will be needed



#### Simulated evaporation of fish ponds (cm/year)



Southern Great Plain simulation site





## Biological forecasting: production risk $\uparrow$

### Increasing occurence of suboptimal oxygen levels



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### Number of days per season with subcritical oxygen levels

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





### Risks identified by stakeholders

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



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### Production economic forecasts

- Yields  $\uparrow \rightarrow$  unit production cost  $\downarrow$ calculated with stagnating input prices
- Larger cost reduction at lower stocking density
- Cost-minimizing strategy occurs at lower stocking densities

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 more extensive stocking also comes with higher production safety which is not assessed by the model







### 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**

Governance

Breeding programmes •

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- Monitoring and mapping disease outbreaks •
- Preventive treatments and vaccines •

More detail in official statistics

**Research &** knowledge building





## Impact on local level

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



 Additional 20-25 million m<sup>3</sup> of water will be needed at Tisza catchment area (2050)









## Software-based decision support

• Model outputs are fed into a DSS

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• Further info tommorrow, session 5

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sk / Opportunities Compare scenario/location Compare individual growth	Optimization	
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Calculated profit (Ft/ha) per stocking population for different feeding rates	Economic simulation     Please enter for the economic calculations the following prices / cost.     Please enter for the economic calculations the following prices / cost.     Teed price     Carp 3 sales price     /market price     Carp 2 sales price     /market price     /market price     Carp 2 sales price     /market price     Stocking costs of other     polycultured species     Carp 2 sales     Carp 2 sales price     /market price     Stocking costs of other     polycultured species     Carp 2 sales     Carp 2 sales price     /market price     Stocking costs of other     polycultured species     Carp 2 sales     Carp 2	FCR (kg feed/kg net yield) per stocking population for different feeding rates
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### Thank you for your attention!

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