Research for sustainable development of aquaculture and fisheries management in Hungary

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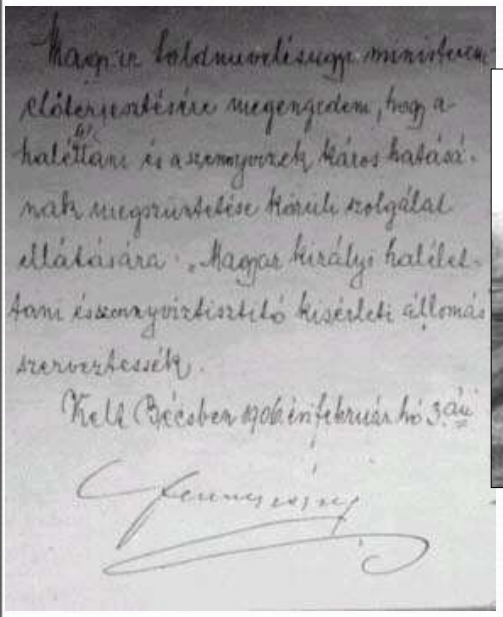
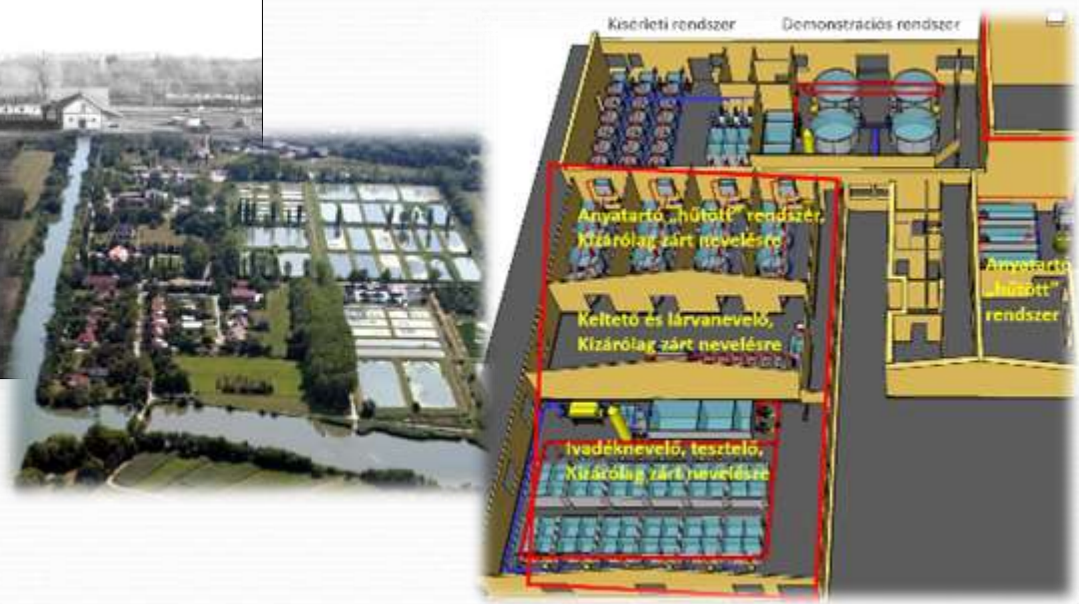
(HAKI)

NAIK
Nemzeti Agrárkutatási és Innovációs Központ

NAIK HAKI

- 1906: Hungarian Royal Fish Physiology and Wastewater Purification Experimental Station, Budapest
- 1953. The first experimental fishponds in Szarvas
- 1975. Fish Culture Research Institute, Szarvas
- 2014. NAIK Research Institute for Fisheries and Aquaculture, Szarvas





National Agricultural Research and Innovation Centre (NAIK)

1. Agricultural Biotechnology Institute
2. Agro-Enviromental Research Institute
3. Research Department of Field Crops Research
4. Food Science Research Institute
5. Forest Research Institute
6. Fruitculture Research Institute
7. Institute of Agricultural Engineering
8. Research Department of Irrigation and Water Management
9. Research Institute for Animal Breeding, Nutrition and Meat Science
10. Research Institute for Fisheries and Aquaculture (HAKI)
11. Research Institute for Viticulture and Oenology
12. Vegetable Crop Research Department

NAIK
NEMZETI AGRÁRKUTATÁSI ÉS INNOVÁCIÓS KÖZPONT

Infrastructural background

Main laboratory building

Innovation Centre for Agricultural Water Management

Library and Conference center

Labs

Fish nutrition laboratory

Immunology laboratory

Genetic laboratory

Experimental indoor recirculating aquaculture system

Hatchery and larvae rearing unit

Fingerling production unit

Demonstration unit

Broodstock unit with heating & cooling

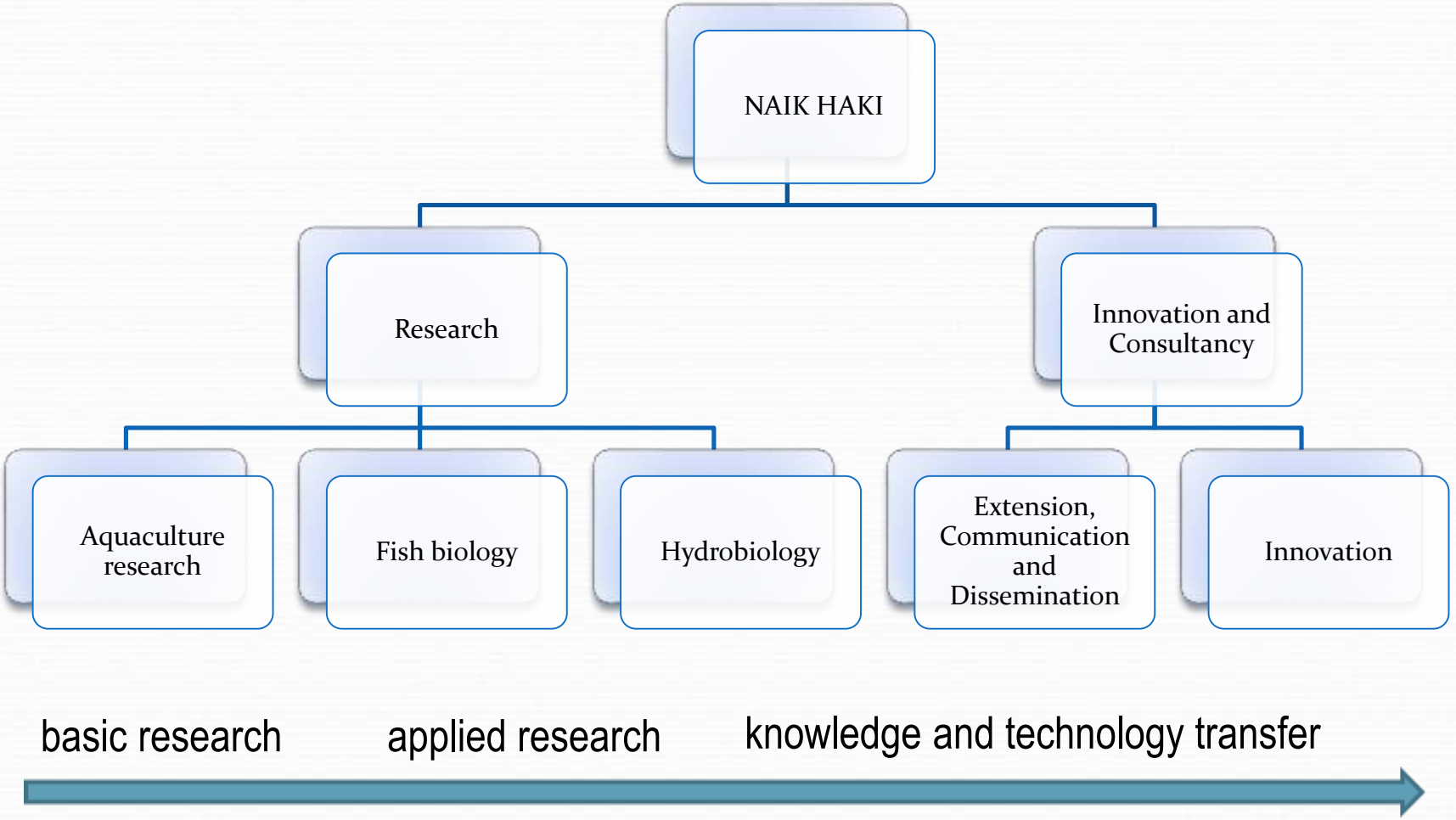
Experimental fish pond and integrated system

Inner experimental fishpond unit

Pond in pond unit

Demonstration fishpond unit

Main research areas and activities

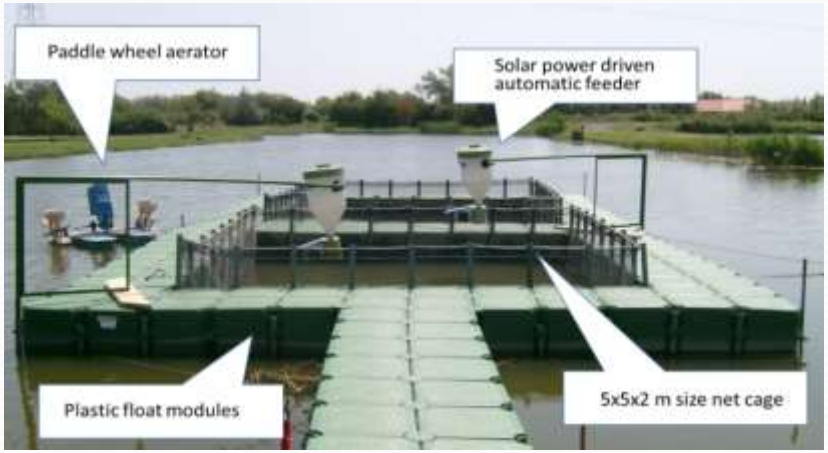


Aquaculture research

- Development and intensification of pond aquaculture technology
- Development of rearing technologies in intensive systems
- Aquaculture economic and marketing studies

Main research topics in intensification of pond farming

- Studies of sustainable intensification
- Studies of combined intensive-extensive procuction systems
- develop the freshwater integrated multitrophic aquqculture (IMTA) system
- Technological development studies



Main research topics in development of rearing technologies

- Development of larvae and fry rearing technology in intensive system for pikeperch
- Controlling the sex development and maturization of sturgeon in different temperature condition and with application of feed additives
- Development of african catfish technology

Fish biological research

- Fish nutrition and feed formulation research
- Fish-physiological and immunological research
- Genetic research

Main research topics in fish nutrition and physiology

- Fish nutrition and feed formulation
- Fish meet quality assessments
- Nutrient requirement of fish
- Environment impact evaluation, food safety and ecotoxicology
- Application of local protein sources to replace the fish meal in fish feeds due to formulate less expensive feeds
- Determination of the apparent digestibility coefficients of the ingredients (for example corn Distillers Dried Grains with Solubles-DDGS , processed animal protein-PAP) and diets.
- Examine the effects of alternative feed ingredients on fish growth and nutrient utilization, health, stress resistance and product quality

Main research topics in immunology

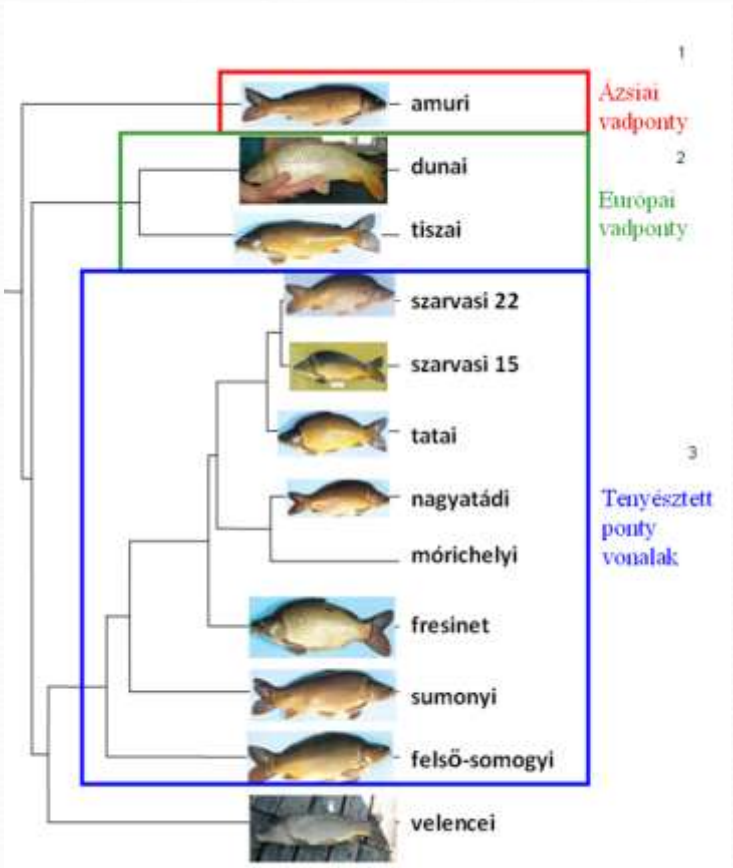
- The use of immunostimulants in fish culture as alternatives to vaccines and antibiotics
- Research on the immune response of genetically different common carp strains

Main research topics in genetic and selection programs

- Genetic characterisation of common carp- better growth and disease resistance
- Genetic characterisation of the sturgeon gene bank of HAKI
- Selection of european catfish lines with high growth potential capacities
- Selection of common carp species for intensive pond feeding and rearing technology
- Assessment of genetical and technological background of koi herpes virus in carp

Carp live gene bank

Carp species



Earlier: better production capacities

Today: diseases resistance species

Cryo-preserved gene bank of Common carp

- Carp sperm cryopreservation protocols developed
- Gene bank of sperms of Carp strains established

Sturgeon gene bank

Native species

- Sterlet
- Great sturgeon
- Russian sturgeon
- Stellate sturgeon

Non native species

- Siberian sturgeon
- Paddle fish


Paddle fish *(Polyodon spathula)*

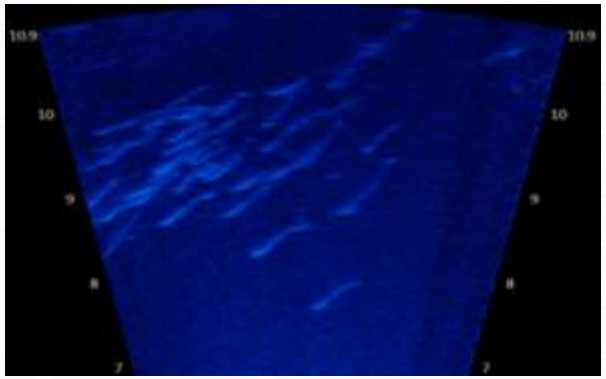

Sterlet (*Acipenser ruthenus*)


Russian sturgeon *(Acipenser gueldenstaedtii)*


Stellate sturgeon (*Acipenser stellatus*)

Hydrobiological research

- Sustainable freshwater fisheries management
- Environmental research



Main research topics in freshwater fisheries management and monitoring

- Determine good management practice in freshwater fisheries
- Monitoring of economically important fish population in surface waters
- Monitoring of endangered fish species
- Monitoring of invasive fish species population
- Design and implementation of restocking programs




Main research topics in environmental research

- Evaluation of the ecosystem services of the fish ponds
- Development of freshwater Integrated Multitrophic Aquaculture (IMTA) system: a nature friendly water treatment technologies by reusing the effluent nutrients of the aquaculture systems
- Analyzing environmental effects of fish production systems
- Exploring possibilities for previously used geothermic waters in heating systems to environmentally friendly deposit or reuse them in fish production
- Elaboration management and restoration plans of aquatic ecosystems

Knowledge and technology transfer

- Consultancy, on-site consultancy and various forms of extension courses
- Elaboration of feasibility studies and innovation proposals
- Organisation of multi-stakeholder meeting
- Dissemination of information through printed and electronic means

Meeting points of science and production in Hungary

Innovations in pond aquaculture

Intensive carp production in small size ponds

Main features:

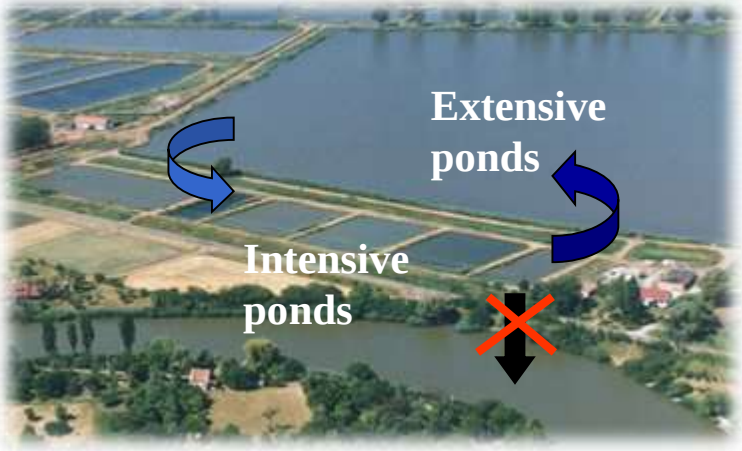
- Stocking high quality fingerling with high stocking density;
- Applying high quality feed distributed by automatic feeder;
- Providing aeration, based on regular water quality monitoring;
- Protection from predators and poaching;

Main production data :

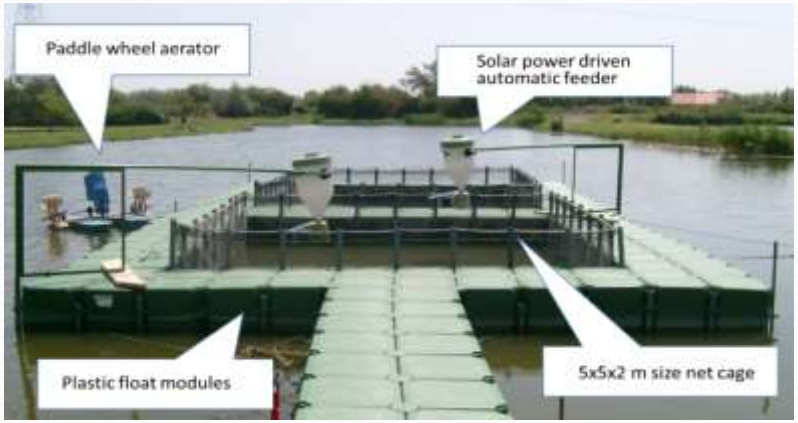
- Total yield: 10 t/ha
- Body mass at stocking/harvest: 0.3 kg/1.5 kg
- Total cost: 14,672 €/ha:
- Total income: 19,138 €/ha
- Profit: 4,293 €/ha

Innovations in pond aquaculture

Combined Intensive-Extensive Procuction



- Combined intensive-extensive earthen pond system
- Pond in pond system
- Cage in pond system



RAS – pond systems

Intensive rearing and fingerling production in RAS

Extensive market-size fish production in pond

Effluent treatment in constructed wetland

Multi-functional pond fish farming

Higher and diversified farm income

Additional employment opportunities

Natural values of pond aquaculture

- 26 ha wetland maintained by fish ponds
- More than 400 bird species, most of them protected and/or with european nature conservational significance
- Meaningfull part of the european otter population
- Huge number of protected plant and animal species

Compensation of predator's damages

Support the maintaining of natural values

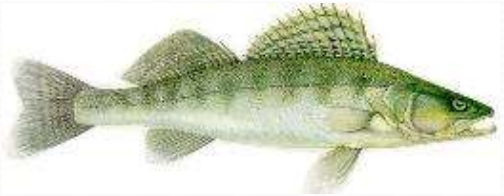
Innovative production systems

Pond in pond system

- Common carp fingerling production – protection against the predators (cormorant)
- Controlled rearing of valuable fish species

- Combines the principles of extensive pond farming and intensive rearing
- Water movement with low energy propeller pumps
- Water turn over in 4-6 hours
- Water quality control (oxygen, ammonia)
- Aeration

New, valuable fish species production in RAS



Pikeperch *(Sander lucioperca)*

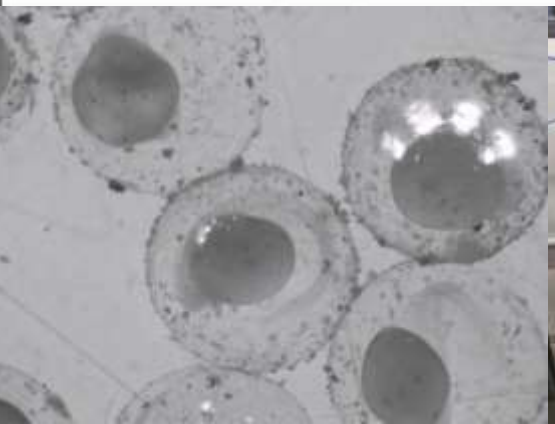
- Development of offseasonal rearing technology
- Work out the technology of intensive nursery (special equipments, special processing)
- Applying probiotics feeding larvae
- Development of outgrowing technology in controlled pond in pond system.
- Development of broodstock technology (feeding and technology elements)

As a results of the research program the intensive production technology of the pikeperch can be introduced at farm level as well. Good and controlled quality native fish can cost consumers less than the current one.

New, valuable fish species production in RAS

European catfish *(Silurus glanis)*

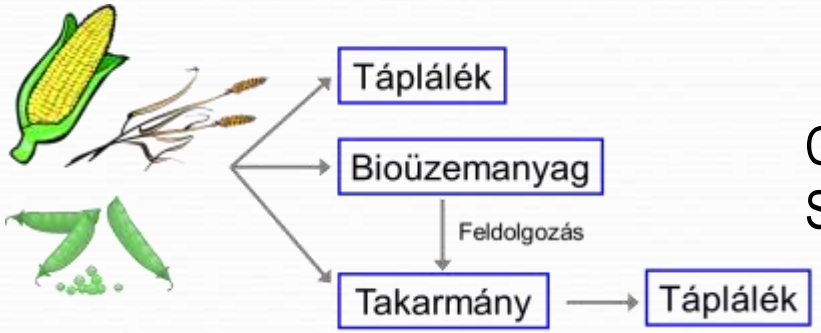
- Development of intensive production techonology
- Introduce a breeding program (intensive technology tolerant, fast growing, desease resistance, better meat quality strains)
- Work out different way of intensive-extensive



Innovations in feeding

Sustainable fish-feed raw materials and additives

Insect protein (black soldier fly – *Hermetia illucens*)

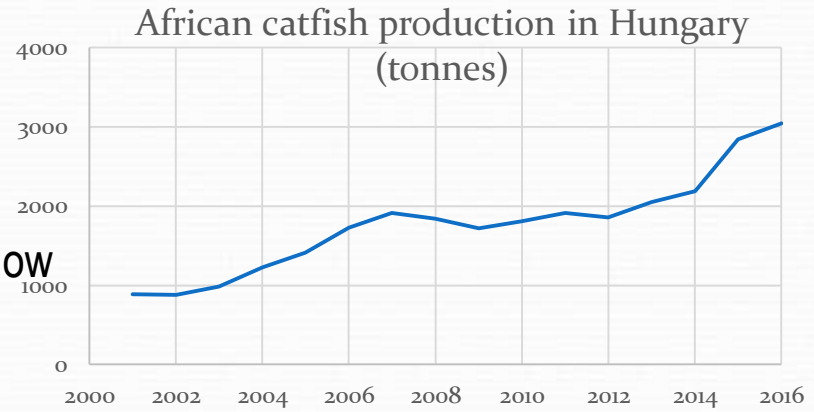


Corn DDGS (Distillers Dried Grain with Solubles)

Immunstimulants, utilized natural algae extract

African catfish production in Hungary

- Hungary is the largest producer of A. catfish in Europe (Clarias gariepinus; Clarias gariepinus x Heterobranchus longifilis)
- Sterile population
- Good fillet yield (40-42%)
- Air breathing catfish
  - → tolerates high densities (400 kg/m3) → low level of specific fixed cost (€/kg)
  - → is not sensitive to water quality
- Steady growth in industry
- Developed post-harvest chain



Sturgeon production in Hungary

- Hungary is one of the largest producer of caviar in Europe
  - Caviar 3-5 t/year
  - Meat 140 t/year
- Fry rearing is also significant → restocking of endangered sp.

Thank you!