

TECHNOLOGICAL STANDARDS ON FISH FARMING IN AQUACULTURE PONDS AND RECIRCULATION AQUACULTURE SYSTEMS (RAS)







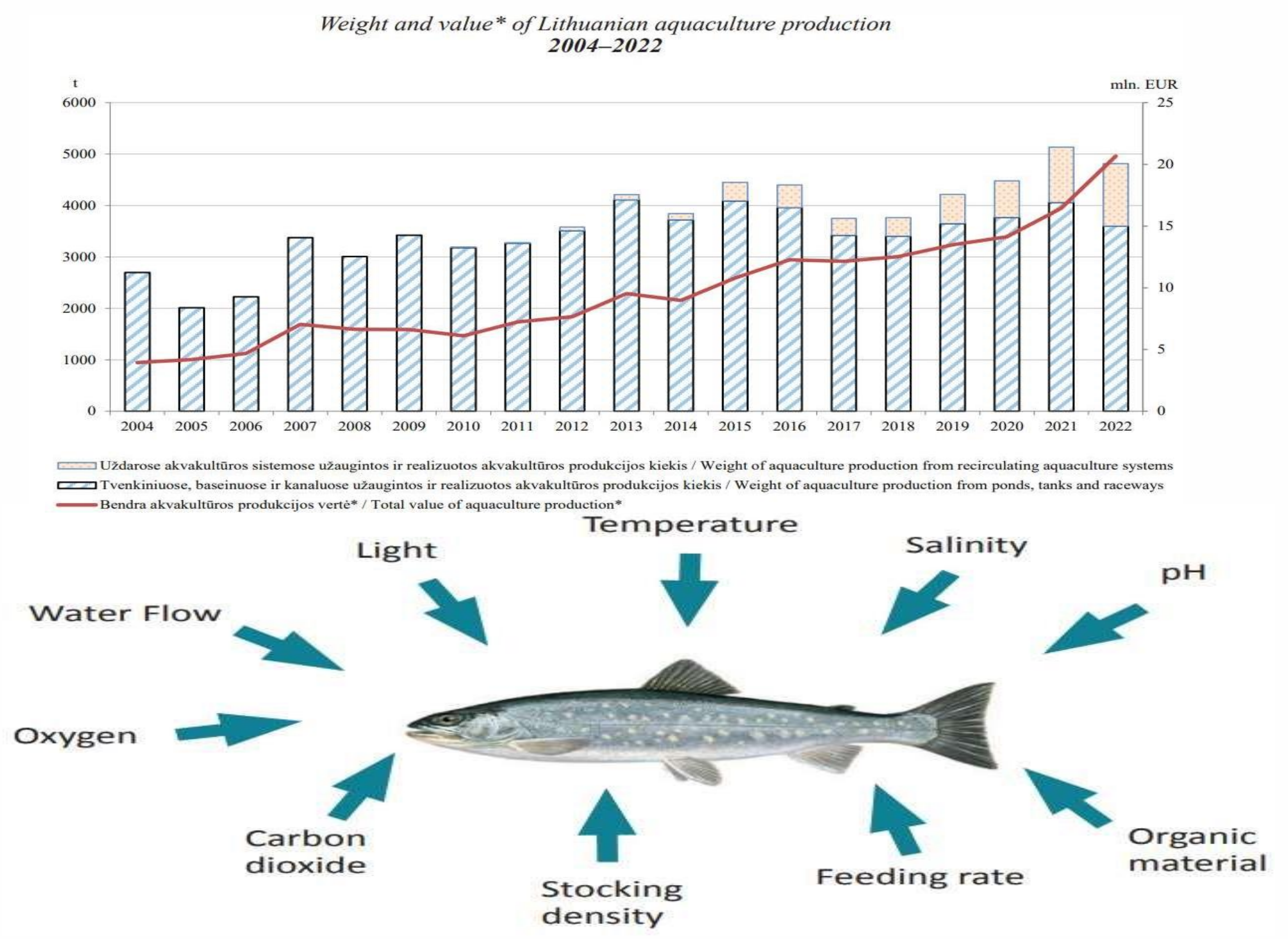
Grazina Zibiene, Alvydas Zibas, Mantas Brazauskas
 Vytautas Magnus University, Universiteto 10,
 Akademijos mstl., Kauno raj., Lithuania +370 37 397 298,
 e-mail: grazina.zibiene@vdu.lt, alvydas.zibas@vdu.lt, mantas.brazauskas@vdu.lt

There are more than 10.200 hectares of aquaculture ponds, more than 14.000 m³ of water in recirculation systems of aquaculture in such a small country as Lithuania (2022)



Aquaculture production (fish, shrimp etc.) is a most effective source of proteins

-  1 kg of beef ~ 18 kg of feed (~ 15,5 m³ of water)
-  1 kg of pork ~ 4 kg of feed (~ 4,8 m³ of water)
-  1 kg of pork ~ 3,2 kg of feed (~ 3,9 m³ of water)
-  1 kg of fish ~ 1,1 kg of feed (~ 0,35 m³ of water)



Key indicators of physical and chemical water quality parameters in aquaculture farms

	Warmwater fish	Coldwater fish
Oxygen concentration (saturation %)	> 40	>60
pH	6,5-9,0	6,5-8,5
Water temperature(°C)	<30	<20
Total nitrogen (mg/l)	<1,0	<0,2
Nitrite (mg/l)	<0,5	<0,2
Ferrum (mg/l)	<1,0	<0,5
Solids (mg/l)	100	80
Carbon dioxide (mg/l)	25	5

Recommended indicators in recirculating systems

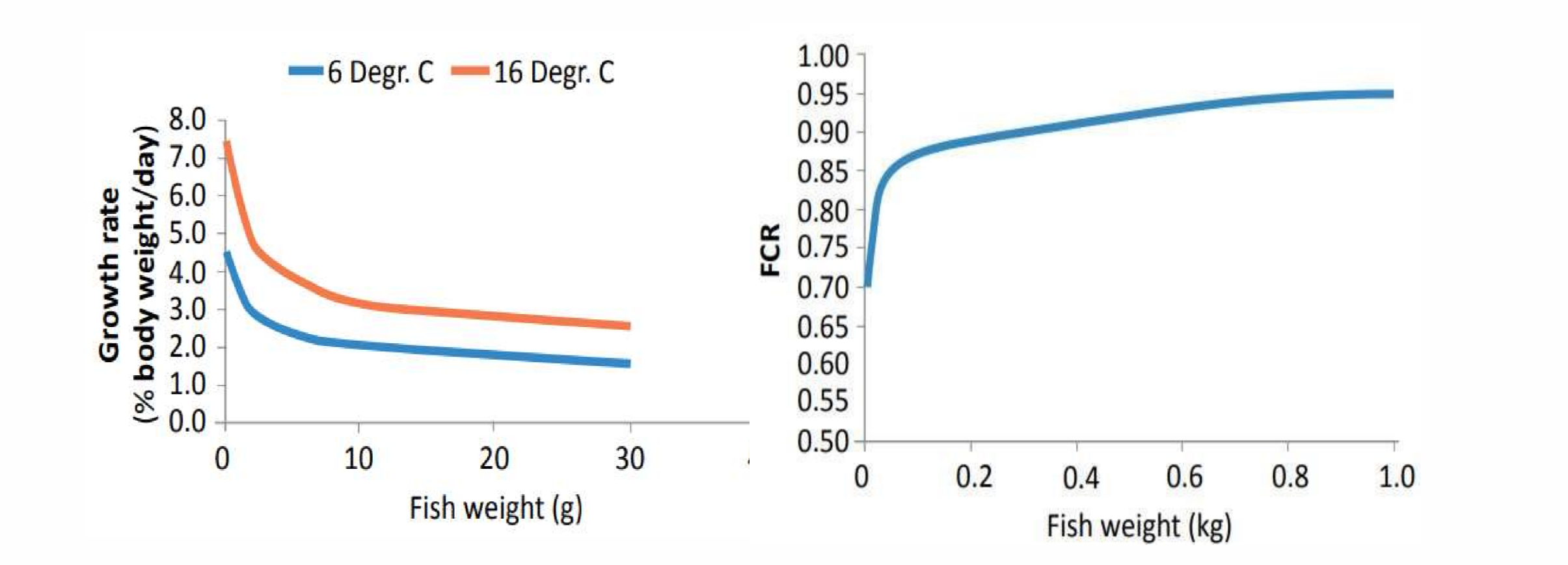
Indicator	Technological level	Short-term permissible values
TSS, mg/l	to 30	>100
pH	6,5 – 7,5	6,2 – 8,5
Nitrite, mg N/l	0,0 – 0,5	1,0
Nitrate, mg N/l	to 60	100 - 200
Ammonium nitrogen, mg N/l	0 – 2,5	to 10
Ammonia, mg/l	<0,01	-
Biochemical Oxygen Consumption, mg O ₂ /l	5 - 20	70 - 100
Chemical Oxygen Consumption, mg O ₂ /l	25-100	100-150
Oxygen, mg/l, including: at the effluence opening of the tank after biological treatment	10 – 15 5 – 12 4 - 8	to 40 2 – 3 >2
Carbon dioxide, mg/l	25	30
Hydrogen sulfide, mg/l	-	-
Phosphates, mg/l	0,2 – 0,5	2,0

Recommendations for technological standards on fish farming in aquaculture ponds and recirculation aquaculture systems (RAS) are based on R&D projects, carried out at Aquaculture Center of VDU:
 •Preparation of recommendations on innovative solutions that reduce the use of natural resources in aquaculture and the possibilities of using sludge produced in aquaculture ponds and closed aquaculture systems, 2022-2023. - Ministry of Agriculture of the Republic of Lithuania.

Preparation of recommendations on rates and periods of fertilizing aquaculture ponds with organic and mineral fertilizers, 2021-2022. - Ministry of Agriculture of the Republic of Lithuania.
 •Investigation of equipment effectiveness and process of hatchery and growing of Salmonids fish part 2. 2018-2020.
 •Investigation of equipment effectiveness and process of hatchery and growing of Arctic charr. 2016-2017.
 •Influence of closed fish farming systems on natural ecosystems and preparation of recommendations for the implementation of these systems, 2015-2016. - Ministry of Agriculture of the Republic of Lithuania.



The growth rate of rainbow trout at 6 degrees and Feed conversion rate (FCR) of rainbow trout at 16 degrees Celsius as a function of the fish size recirculation system, related to fish weight at 15-18 degrees Celsius
 Source: A Guide to Recirculation Aquaculture. Jacob Bregnballe.- FAO, EUROFISH, 2015



An example of recommended technological standards on fish farming in aquaculture ponds
 Norms for the use of natural organic fertilizers for increasing of pond's productivity:

- Poultry manure - up to 5t/ha;
- Cattle manure – up to 10 t/ha;
- Hay, straw, compost or vegetation – up to 20 t/ha.
- The obtained results show that the use of natural organic fertilizers does not deteriorate the water quality of the ponds and is an excellent measure for increasing the natural nutritional base of the fish, especially fish larvae.

Unfertilized ponds typically produce 50 to 500 kg/ha of fish per year. Productivity of fertilized ponds increases up to 4-5 times or even more. The amount of fish production in fertilized ponds is also influenced by the feeding habits of fish.

