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CERES storyline - trout in the Eastern Mediterranean

What do we expect under climate change?

Trout is a diadromous cold-water fish species with high oxygen demand. Rainbow trout farming is generally carried out in land-based farms using cold spring water or in natural/artificial lakes using floating cages. Climate related changes such as rise in inland water temperatures, Increased frequency of extreme events (e.g. storms, floods, drought) and water stress are expected to have direct or indirect negative impacts on rainbow trout farming both in land-based and cage farms. For instance, rising temperature in inland waters and decreasing dissolved oxygen concentrations will result in hypoxia and lower growth rates and poor feed conversion ratios (FCR). Droughts and water stress are likely to limit freshwater water availability and quality for trout farming. Rising water temperature will also increase incidents of diseases and parasites in trout farms resulting in higher mortalities and losses.

How vulnerable is trout?

Cold-water species like trout with high demand for dissolved oxygen are very vulnerable to rise in water temperature. Since rising inland water temperature will directly lower dissolved oxygen concentrations. Trout is also very sensitive to high water temperatures. Water temperatures above 15-18 °C during grow-out period would limit trout feed intake due to lower dissolved oxygen levels and lower fish growth.

What are the expected economic consequences?

Climate related changes such as rise in inland water temperatures, Increased frequency of extreme events (e.g. storms, floods, drought) and freshwater availability and quality are likely to have direct or indirect negative impacts on performance and productivity of rainbow trout farming both in land-based and cage farms in natural/dam lakes. This would not only mean an increase in production costs but would also lower harvest and income levels in rainbow trout farms.

What are the challenges?

One of the most important challenges for sustainability of inland aquaculture sector is to develop mitigation or adoption tools and strategies with respect to impact of climate change on farmed species and thus farming operations. To this end, projecting direct and indirect impacts of climate change on productivity and financial performance of rainbow trout farms is crucial for addressing climate change related challenges. In this respect CERES trout-storyline is a proactive approach for projecting the impact of climate change on productivity and financial performance of inland aquaculture farms.

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What is the working program in CERES?

A series of field studies will be conducted to collect environmental, bio-technical (e.g. growth rates, mortalities, FCR, stocking densities, diseases outbreaks), structural and financial data from Turkish rainbow trout farms (land-based and cage). The aim is to contribute to modeling the direct effects of climate change on farmed rainbow trout and further to construct theoretical farms for examining the impact of climate change on productivity and financial performance of rainbow trout farms.

Collected bio-technical, structural and financial data from rainbow trout farms will be used to construct virtual Turkish rainbow trout farm according to "Typical Farm" approach (Lasner et. al., 2017). Based on findings on direct effects of climate change on rainbow trout, the impact of climate change on productivity and financial performance (e.g. production costs, profitability) of Turkish rainbow trout farms will be simulated on engineered virtual farm using the "Agri benchmark Simulation Model TIPI-CAL (Deblitz & Zimmer, 2005).

Literature

Deblitz & Zimmer (2005) A standard operating procedure to define typical farms, http://literatur.thuenen.de/digbib_extern/dk038513.pdf

Lasner et al. (2017). Establishing a benchmarking for fish farming – Profitability, productivity and energy efficiency of German, Danish and Turkish rainbow trout grow-out systems. Aquaculture Research, doi:10.1111/are.13144

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