Conference. Water. Life Support

March 27th, 2026

Book of Abstracts

WATER CONSUMPTION IN ROMANIAN AGRICULTURE. CASE STUDY FOR SUSTAINABLE APPROACHES IN VITICULTURE AND AQUACULTURE

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Abstract

The current article shows how sustainable water use projects can be implemented for reducing consumption and stress on this resource. General Romanian water resource is taken under investigation whit a focus on the agriculture sector. By consulting the information available over a segnificant period of time 2008-2025, a series of conclusions could be drawn. Through examples from the Research and Development Station for Viticulture and Winemaking Bujoru and the Institute of Research and Development for Aquatic Ecology, Fishing and Aquaculture Galati, some strategies for reducing water consumption were highlighted, focusing mainly on yield parameters.

Keywords: *water, viticulture, aquaculture, water consumption, sustainability.*

INFLUENCE OF FLEXIBLE SUBMERGED VEGETATION ON POLLUTANT TRANSPORT IN FREE-SURFACE FLOW UNDER CONTINUOUS INJECTION

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Abstract

Understanding pollutant transport and dispersion mechanisms in free-surface flows is a key issue for water quality management in rivers, irrigation canals, and drainage networks. Among the factors that can significantly influence these processes, aquatic vegetation plays a crucial

role by modifying the hydraulic structure of the flow, velocity profiles, and turbulent mixing mechanisms.

The present study experimentally investigates the effect of flexible submerged vegetation on tracer transport in a free-surface flow under continuous injection conditions. Experiments were conducted in a 10 m long glass-sided laboratory flume installed at the laboratory of the National Agronomic Institute of Tunisia. Two flow regimes corresponding to discharges of 5 L/s and 8 L/s were examined under two bed configurations: a smooth bed and a bed covered with artificial submerged vegetation composed of flexible stems with a height of 4 cm.

The tracer used was a colored saline solution continuously injected to simulate a progressive pollution input. Concentration measurements were performed at several downstream sections to analyze the temporal evolution of the tracer. Results indicate that the presence of vegetation significantly reduces concentration peaks and increases the temporal spreading of concentration curves. This behavior reflects a slowdown in pollutant propagation caused by hydraulic resistance and temporary retention effects within the vegetated canopy.

Keywords: *pollutant transport, submerged vegetation, free-surface flow, longitudinal dispersion, continuous injection.*

OXIDATIVE STRESS AS AN INDICATOR OF ENVIRONMENTAL POLLUTION IN AQUATIC ECOSYSTEMS

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Abstract

Environmental pollution has emerged as a major environmental problem that threatens ecosystems and the survival of many living organisms. Human activities such as rapid industrial growth, expansion of cities, excessive use of agricultural chemicals, and improper disposal of waste have significantly increased the release of pollutants into air, water, and soil. These pollutants can disturb the normal physiological processes of organisms and often lead to a condition known as oxidative stress. Oxidative stress develops when harmful molecules called free radicals are produced in greater amounts than the body's natural antioxidant defenses can handle. This imbalance can damage important cellular components including lipids, proteins, and DNA, which may ultimately affect the growth, reproduction, and survival of organisms.

Aquatic and terrestrial species are particularly sensitive to pollutants such as heavy metals, pesticides, and industrial effluents. In aquatic organisms, exposure to such contaminants may cause tissue damage, weaken immune responses, and reduce the ability of species to adapt to environmental changes. Over time, these effects can contribute to population decline and loss of biodiversity. Antioxidant enzymes like superoxide dismutase, catalase, and glutathione peroxidase help organisms defend against oxidative damage. Therefore, studying these

antioxidant responses can provide useful information about environmental stress and ecosystem health. Understanding the link between pollution and oxidative stress is essential for developing effective conservation and sustainable environmental management strategies.

Keywords: *pollution, environmental problem, pollutants, water, management strategies.*

EXTREME FLOOD DYNAMICS AND VULNERABILITY OF SEMI-ARID PLAINS: 2D HYDRODYNAMIC MODELING IN THE MEDJERDA BASIN

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Abstract

Semi-arid plains are highly exposed to extreme hydrological hazards. During major flood events, river overflow directly threatens soil stability and structure. To quantify this fragility, analyzing the spatial propagation of flows and velocities over the existing topography is essential. This study investigates the physical impact of a 100-year flood event from the Medjerda River on the Bou Salem plain (Tunisia). By employing a two-dimensional hydrodynamic model (HEC-RAS) coupled with a high-resolution LiDAR Digital Elevation Model (DEM), the inundation footprint and velocity fields were mapped. The simulation outcomes highlight a near-total submergence of the existing land parcels. Moreover, the spatial analysis indicates a drastic drop in flow speeds once the water breaches the main riverbed, leading to very slow-moving currents across the floodplain. This prolonged water stagnation constitutes a major risk, severely exposing the lands to physical degradation. Ultimately, this approach proves that a precise spatial assessment of flood parameters namely flow velocity and water depth is a fundamental step to estimate spatial losses and guide effective flood protection strategies.

Keywords: *Medjerda River, 2D hydrodynamic modeling, Inundation extent, Flow velocity, Spatial vulnerability*.

CLEAN FERTILIZERS A STRATEGY IN GROUND WATER PROTECTION

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Abstract

This study reviews current scientific literature and investigates the possible benefits of using green-fertilizers, whit the aim at reducing ground water pollution. The modern era whit significant rises in global population is putting pressure on all natural resources whit geometric progression on demand for food, that is translated to the agricultural system. In order to satisfy these needs, there has been a growing reliance on agrochemicals. The use of these chemicals has the advantage of boosting crop yields, but in the race for profit whit common irrational use, these molecules are responsible for severe environmental hazards. The most notable is the contamination of a natural resources like groundwater, translating its pollution in harmful effects throughout the food chain and general population health. Agriculture is both the aggressor and victim of groundwater pollution. Green fertilizer can become a line of defense against ground water pollution for a sustainable agriculture and a healthier environment.

Keywords: *ground water, sustainability, green fertilizers*

MONITORING ENVIRONMENTAL CONDITIONS AS A TOOL FOR THE CONSERVATION OF FISH GENETIC RESOURCES AT THE NUCET FISH FARMING RESEARCH AND DEVELOPMENT STATION

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Abstract

The conservation of fish genetic resources is a major priority in modern aquaculture research, particularly in the context of climate change and anthropogenic pressures on aquatic ecosystems. The Nucet Fish Farming Research and Development Station (SCDP Nucet) manages one of the most important fish gene pools in Romania, which includes species of economic and scientific value (such as Cyprinus carpio or the sturgeon Polyodon spathula). The research focuses on the operational management of wintering ponds, where water acts as a thermal and physiological protective environment, essential for the survival of the experimental stocks. Monitoring was conducted in two experimental ponds (HC1 Ilfov and HC1 Sterp) over two consecutive cold seasons (November 2024–March 2025 and November 2025–March 2026). Parameters such as air and water temperature, turbidity, dissolved oxygen concentration, pH, and key nutrient indicators (nitrogen and phosphorus compounds) were monitored. The results obtained highlight the maintenance of stable conditions in the aquatic environment during the wintering period, with most of the analyzed indicators falling within ranges considered favorable for farmed fish species. High concentrations of dissolved oxygen, combined with low water temperatures, contributed to maintaining optimal conditions for the survival of the biological material. The study's results underscore the importance of continuously monitoring water quality parameters to maintain the stability of fish ecosystems and conserve valuable fish genetic resources within the SCDP Nucet gene stock.

Keywords: *aquaculture, conservation of genetic resources, gene bank, overwintering, parameter monitoring.*

ON THE INVASION OF SILVER CARP *HYPOPHTHALMICHTHYS MOLITRIX* (VALENCIENNES, 1844) IN THE PRUT RIVER (WITHIN THE TERRITORIAL LIMITS OF THE REPUBLIC OF MOLDOVA)

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Abstract

Ichthyological surveys conducted in 2025 in the Lower Prut River ecosystem, using a range of scientific fishing gears, revealed a fish community structure characterized by the dominance of small-bodied eurybiontic species as well as the evident expansion of the alien species *Hypophthalmichthys molitrix*.

An analysis of the long-term dynamics of catches of Asian cyprinids (silver carp, bighead carp, and grass carp) shows that their share in commercial catches from the Lower Prut River during the 1970s–1990s was consistently insignificant (below 1%), being grouped within the category "other species". Following the major floods of 2008 and 2010, these species entered the Prut River in large numbers from damaged aquaculture facilities [1, 2]. After a temporary stabilization period, a renewed increase in their abundance has been observed over the last 6–7 years.

In the catches from 2025 obtained using stationary and drifting gillnets with mesh sizes ranging from 30×30 to 80×80 mm, the fish community structure was dominated by *Blicca bjoerkna* (27.95%), followed by *Carassius auratus s.l.* (13.04%), *Hypophthalmichthys molitrix* (9.94%), *Abramis sapa* (8.70%), and *Cyprinus carpio* (7.45%). The relatively high occurrence of silver carp (*H. molitrix*) indicates an increasing ecological impact of this species within the fish community. The situation becomes even more pronounced in catches obtained with large-mesh gillnets (80×80 mm), targeting large-sized fish. In these catches, *Hypophthalmichthys molitrix* reached an extremely high dominance of 76.47%, significantly exceeding native species such as *Cyprinus carpio* (11.76%), *Aspius aspius* (5.88%), and *Silurus glanis* (5.88%).

The analysis of long-term data on the occurrence of silver carp juveniles in the Lower Prut River indicates that juveniles of this species were recorded for the first time in autumn 2016 near the village of Giurgiulești (28 October 2016), when five individuals weighing between 3.52 and 5.70 g were captured [1]. By autumn 2018, the number of individuals captured in the riverbed of the Lower Prut had already reached 35 specimens, and currently silver carp juveniles have become a subdominant component of the fish community (D3). For example, in samples collected during 2022–2025 using juvenile seine nets, the share of silver carp juveniles in the Lower Prut reached 3.12%.

The presence of silver carp juveniles in the Prut River at the end of autumn, displaying various size classes but generally smaller than those obtained under aquaculture conditions (where the standard weight of juveniles produced through artificial reproduction by the end of summer should not be less than 25–30 g), suggests that natural reproduction of this species in the river occurs relatively late, most likely in July–August, with spawning taking place in several

batches. The reproductive biology therefore appears similar to that observed in populations within the species' native range.

Thus, spawners captured in the Prut River on 13–14 August 2025 had ovaries at maturation stages IV_2–V_2. Histological analysis of ovarian samples revealed the presence of follicular membranes released from first-generation oocytes, providing clear evidence of successful natural reproduction of this species, which had previously been considered only an introduced species.

It should also be noted that the very abundant population of silver carp in the Prut River exhibits a specific migratory behavior: in early spring individuals migrate from the Danube River into the Prut River, where they remain until late autumn, after which they return to the Danube for overwintering (only a few individuals remain in the Prut River during winter). This suggests that overwintering conditions in the Prut River are less favorable.

Funding
The investigations were carried out within the framework of subprogram 010701 "Assessment of the structure and functioning of the animal world and aquatic ecosystems under the influence of biotic and abiotic factors in the context of ensuring ecological security and population well-being" (State University of Moldova, Institute of Zoology).

Keywords: *aquaculture, conservation of genetic resources, Lower Prut River ecosystem, biotic.*

THE DIVERSITY OF PARASITE FAUNA AND CHARACTERISTICS OF ICHTHYOPARASITOCENOSES IN FISH FROM FISH FARMING PONDS OF THE REPUBLIC OF MOLDOVA

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Abstract

The ecological condition of fish farming water bodies in the Republic of Moldova has significantly deteriorated due to water deficit, reduction of water surface and depth, siltation, overexploitation, and excessive anthropogenic pollution. These factors negatively affect aquatic ecosystems and contribute to increased morbidity and mortality in fish populations. Parasitic diseases represent one of the major causes of economic losses in aquaculture, especially under conditions of intensified fish farming characterized by high stocking densities, fertilization of ponds, and increased feeding practices.

The present study was based on ichthyopathological material collected from various fish ponds and reservoirs across the Republic of Moldova. Several fish species were examined, including

common carp, silver carp, bighead carp, grass carp, crucian carp, catfish, pike, and pike-perch. Parasitological dissections and hydrochemical analyses of water were conducted using standard ichthyopathological research methods.

A total of 168 parasite species and unidentified forms were recorded, belonging to 15 taxonomic groups. The most representative groups were Ciliophora, Cnidospora, Monogenea, Trematoda, Nematoda, and Sporozoa. More than 40 species were identified as having epizootic significance. Certain fish species showed higher susceptibility to specific parasitic infections, such as argulosis, lernaeosis, ergasilosis, and eustrongylidosis.

The results indicate that the diversity and intensity of parasite infestations are strongly influenced by ecological conditions and hydrobiological characteristics of the studied water bodies. The study highlights the importance of ichthyoparasitological monitoring for assessing fish health and improving disease management strategies in aquaculture.

Keywords: *aquaculture; fish parasites; ichthyoparasites; parasitic diseases; parasite diversity.*

BODY CONDITION DYNAMICS OF PONTIC SHAD (*ALOSA IMMACULATA,* BENNETT, 1835) DURING SPAWNING MIGRATION IN THE LOWER DANUBE (RIVER KM 133 – 197), 2020–2025

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Abstract

The Pontic shad (Alosa immaculata), an ecologically and commercially important anadromous species of the Danube–Black Sea basin, undergoes spawning migration under variable hydroclimatic conditions. This study assessed the evolution of body condition during spawning migration in the lower Danube (river km 133–197) between 2020 and 2025. A total of 2,130 individuals were analyzed, and Fulton's condition factor (K) was calculated from length and weight measurements. Significant interannual differences in K were detected in both males ($\chi^2 = 92.503$, $p < 0.001$) and females ($\chi^2 = 142.47$, $p < 0.001$). In males, variation was primarily driven by 2023, whereas females exhibited a stronger and delayed divergence, with 2025 differing significantly from all other years. Spearman correlations indicated a positive association between K and river water level in both sexes, moderate in males ($\rho = 0.6$) and strong in females ($\rho = 0.829$), suggesting that hydrological variability influences energetic status during migration. These findings highlight significant interannual restructuring of somatic condition in A. immaculata, with females showing greater sensitivity to hydroclimatic variability, potentially affecting reproductive performance and population resilience.

Keywords: *Fulton's condition factor, hydroclimatic drivers, interannual variability, sex-specific variability.*

THE ROLE OF WATER IN MODULATING FUNCTIONAL MECHANISMS UNDERLYING ALGAL ECOPHYSIOLOGY

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Abstract

The present study aims to conduct toxicological experiments to determine the toxicity threshold of a chemical substance considered toxic on a culture of Chlorella pyrenoidosa. These tests observe the rate of cellular growth of microorganisms in the presence of the toxic compound CBM, as well as the inhibition percentage caused by the analyzed substance. The intensity of the toxic effect of a chemical depends on the organism subjected to testing and their tolerability at different concentrations. Chemical substances, upon contact with microorganisms, are utilized by them in biochemical processes in which they are involved. Thus, in metabolic reactions, organic substances serve as sources of carbon and energy for biochemical processes that generate the energy necessary for vital activities.

Keywords: *Toxicity, Inhibition, TEM and SEM Spectroscopy, CBM.*

OPTIMIZATION OF WATER SUPPLY SYSTEMS THROUGH QUALITY MONITORING AND LOSS REDUCTION

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Abstract

This study investigates the pivotal role of water quality and environmental stressors in modulating algal ecophysiology, with a focus on microalgae's capacity for bioremediation in

aquatic ecosystems. Emphasizing the impact of pollutants such as heavy metals, organic compounds, and nutrients, the research highlights mechanisms like biosorption, bioaccumulation, and biotransformation employed by microalgae such as diatoms and Spirulina platensis to remove toxic substances. The findings demonstrate that algae not only serve as biomonitoring agents due to their rapid responsiveness to toxic stimuli but also effectively biodegrade hazardous compounds like naphthenic acids under optimal environmental conditions. These insights underscore the potential of microalgal systems in enhancing water quality and environmental sustainability, emphasizing the importance of understanding water's chemical and microbiological interactions in mitigating pollution and supporting aquatic life.

Keywords: *Water quality, Microalgae, Bioremediation, Toxicity, Ecophysiology.*

ESTIMATED TOTAL BIOMASS OF HIRUDINEA ACROSS FIVE LAKES OF THE MATITA-MERHEI COMPLEX FROM THE DANUBE DELTA IN 2025

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Abstract

This study quantified the total biomass and spatial structure of *Hirudo verbana* populations across five lakes of the Matita–Merhei complex (Danube Delta, Romania) in 2025. A total of 24,212 individuals were sampled using standardized fixed-point disturbance techniques, and biomass estimates were extrapolated from representative control surfaces to ecologically suitable habitats (approximately 30% of lake area).

The cumulative estimated biomass reached 18.49 tons, with pronounced spatial heterogeneity among lakes (CV = 51.36%). Approximately 82% of the total stock was concentrated in the three largest lakes (Alb, Meșter, and Martin), indicating a structurally aggregated distribution pattern.

Log–log regression analysis revealed a significant sublinear scaling relationship between lake area and total biomass ($R^2 = 0.876$, $p = 0.019$; $b = 0.627$), demonstrating that biomass increases with habitat size at a rate lower than proportional surface expansion. Consistently, areal biomass efficiency (kg ha^{-1}) declined significantly with increasing lake area ($R^2 = 0.905$, $p = 0.013$), indicating reduced biomass density in larger lakes.

These findings demonstrate that medicinal leech stocks within the lake complex are spatially structured rather than uniformly distributed. The integration of total biomass estimation, scaling analysis, and areal efficiency modeling provides a quantitative framework for spatially differentiated stock-based management of *Hirudo verbana* in natural lacustrine systems.

Keywords: *Hirudo verbena, medicinal leeches, Danube Delta, exploitable biomass, environmental monitoring.*

CLIMATE CHANGE IMPLICATIONS FOR FISHERIES AND AQUACULTURE IN ROMANIA

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Abstract

This research examines the impacts of climate change on fisheries and aquaculture in Romania, highlighting the significant effects of rising temperatures, altered hydrological regimes, and extreme weather events on aquatic ecosystems. The study synthesizes climatic data analysis, literature review, and field observations to assess changes in water temperature, oxygen availability, and fish productivity. Findings reveal that increasing temperatures reduce oxygen levels, impair fish growth and reproduction, and increase system vulnerability, thereby threatening the sustainability of Romanian fisheries and aquaculture. The report emphasizes the necessity for adaptive management strategies, technological innovations, and species diversification to bolster resilience against ongoing climate-related challenges. This work underscores the urgency for sustainable practices to mitigate climate impacts and ensure the long-term viability of aquatic resources in Romania.

Keywords: *Climate change, Fisheries, Aquaculture, Romania, Resilience.*

EFFECTS OF DIETARY *ULVA LACTUCA* EXTRACT ON IMMUNOLOGICAL AND OXIDATIVE STRESS PARAMETERS IN *COMMON CARP* EXPOSED TO OXYTETRACYCLINE AND FLORFENICOL TREATMENT

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Abstract

The intensive and, in some cases, inappropriate use of antibiotics in aquaculture promotes the development of bacterial resistance, thereby reducing the effectiveness of antimicrobial therapies.Among the most common antimicrobial agents included in therapeutic protocols in the fish farming sector are oxytetracycline (OTC), a broad-spectrum bacteriostatic tetracycline antibiotic derived from species of the genus Streptomyces, and florfenicol (FLO), a structural derivative of chloramphenicol, known for its efficacy against numerous pathogenic bacterial strains.

The growing concern about the amplification of antimicrobial resistance, driven by the recurrent use of these substances, combined with increasing awareness of their ecotoxic effects on aquatic ecosystems, has led to a pronounced shift in research focus. This shift is characterized by an increased emphasis on the identification and evaluation of natural compounds that possess adjuvant properties., In recent years, researchers have focused their attention on green marine algae, particularly the species *Ulva lactuca*, which is notable for its high concentration of bioactive compounds, including pigments, polyphenols, sulfated polysaccharides (ulvan), essential fatty acids, and vitamins. The present study evaluated the ability of this species to act as a natural neoadjuvant, with the potential to support the efficacy of antibiotics - particularly oxytetracycline (OTC) and florfenicol (FLO) - while limiting the side effects associated with antimicrobial treatment.

270 juvenile common carp (*Cyprinus carpio*), with a mean initial weight of 20.20 ± 0.13 g, were fed for 11 weeks with two diets supplemented with or without *Ulva lactuca* extract. At the end of this stage, the fish were randomly divided into six experimental groups, with three replicates per group and 30 individuals in each replicate: (1) C – control group fed a conventional diet; (2) C + FLO – conventional diet with florfenicol treatment; (3) C + OTC – conventional diet with oxytetracycline treatment; (4) UE – diet supplemented with Ulva lactuca extract (50 mg kg^{-1} feed); (5) UE + FLO – diet with Ulva lactuca and florfenicol; and (6) UE + OTC – diet with *Ulva lactuca* and oxytetracycline. The administration of antibiotics was carried out through the feed, over a period of 10 days, in concentrations frequently used in

aquaculture practice (15 mg/kg/day florfenicol (FLO) = 30 mg/kg/day Florfeniden and 75 mg/kg/day oxytetracycline (OTC) = 150 mg/kg/day Oxydem). The results of this study will contribute to improving the understanding of the impact of FLO and OTC on biomarkers of oxidative stress and immune function (TAC, MDA, lysozyme) in *Cyprinus carpio* and the possible ameliorative effects of the algal extract of *Ulva lactuca*.

The results obtained indicate that the administration of both antibiotics had negative effects on the health status of the fish, while supplementing the diet with *Ulva lactuca* contributed to reducing these effects. These results suggest that this macroalga can act as an effective immunostimulant and as a natural adjuvant. In addition, the findings provide relevant information on the impact of antibiotic use in aquaculture and support the inclusion of *Ulva lactuca* in fish diets as a sustainable strategy for increasing the body's resistance and reducing stress associated with antibiotic treatments.

Keywords: *Common carp ,Florfenicol, Oxytetracycline,Ulva lactuca.*

EMPOWERING STUDENTS AS WATER STEWARDS: EDUCATION FOR SUSTAINABLE USE, ECOSYSTEM PROTECTION, AND POLLUTION PREVENTION

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Abstract

Water and its importance on ecosystem are known to us. This natural resource is facing critical challenges globally, which are indirectly connected to many problems affecting environmental sustainability. Bangladesh is one of the country which is facing serious threats to the water sector. Empowering youth towards water resources, their importance, linkage to the ecosystem, pollution issues, and sustainable consumption can ensure that our future generation meets the challenges and acts accordingly.

We conducted a mixed-method study with 310 students across a variety of activities (workshop, field visit, case study competition, idea challenge, sustainable solutions, etc.) over 6 months as part of their cocurricular activities, and recorded their feedback and observations. Our study reveals that the students involved in this plan showed much positive understanding of water science, changed their actions towards nature and natural resource conservation, followed a sustainable lifestyle, and showed academic excellence on these topics. About 85% reported a strong commitment to follow a green lifestyle to save water by 30-35%, about 67% reported having enriched knowledge on the aquatic ecosystem and its interdependence, and 72% committed that they will take initiative to empower other students of neighboring schools in the coming school year. 62% respondent reported that they did many things which was harmful to the aquatic body due to a lack of scientific knowledge on it, 83% strongly agreed that the field-based and interdisciplinary approach helped a lot to know about the issues happening in

this sector, ways to deal with them, and best practices. 76% respondent reports that they will follow sustainable consumption habits for the betterment of this sector.

About 90% confirm that this stewardship can be a replicable model for the other institutions, which is cost-effective and more effective in ensuring global sustainability.

Keywords: *Water, Aquatic Ecosystem, Sustainability, Environment, Stewardship.*

Event make by

The Academy of Agricultural and Forestry Sciences of Romania „Gheorghe Ionescu – Șișești," the Food Industry Section, and the Institute of Research and Development for Aquatic Ecology, Fishing, and Aquaculture Galați, Romania.

DOI - **10.5281/zenodo.19436457**