Co-funded by the European Union

TRAINING REPORT III (WP3)

for non-teaching staff

How to operate in the laboratories

AFISHE

Development of Aquaculture and Fisheries Education for Green Deal in Armenia and Ukraine: from Education to Ecology

Grant Agreement Number: 101082557

Sumy National Agrarian University

National University of Water and Environmental Engineering

Contents

1. General part – aim, scope and duration of the training

The AFISHE project overall goal is mitigation of the adverse environmental effects of the aquaculture and fishery sectors in Armenia and Ukraine. This could be achieved by creating and enhancing Master's degree programs in aquaculture and fisheries, aligning them with top-tier European programs and tailored to local requirements.

The AFISHE project was planned to hold three types of training within the WP3 - Development of Human Resources.

The first type of training, which included training on modules in aquaculture and fishery, took place in February-March 2024 at the University of Porto (U. Porto), the University of Dubrovnik (UNIDU), and the Slovak University of Agriculture (SUA in Nitra). It has been summarized by quality assurance assessment and Training report.

For cost-effectiveness, the 2nd and 3rd types of training were conducted during October and November 2024 at AM and UKR universities: *Armenian National Agrarian University (ANAU) International Scientific-Educational Center (ISEC NAS RA) and Scientific Centre of Zoology and Hydroecology (SCZHE) of NAS RA, Sumy National Agrarian University (SNAU), and the National University of Water and Environmental Engineering (NUWEE).* The trainers were local experts who the universities employed on a sub-contracted basis.

The third type of training was the non-teaching staff on how to operate in the newly established laboratories under the AFISHE project. The duration of the training was two weeks - 10 days, 2 hours per day. The scope of the training for non-teaching staff was 60 hours (2 credits) and 2 weeks of training. In total 8 non-teaching staff (4 from AM, 4 from UKR) have been trained in their countries on usage of lab equipment, purchased during the project. On top of that, some teachers expressed a desire to participate in this training as well and form ANAU additional 13 more people (15 in total) participated in this training.

2. The place, form and period of training

2.1. Armenian National Agrarian University (ANAU), International Scientific-Educational Center of NAS RA (ISEC NAS RA)

The training pm how to operate om labs took place mainly at ANAU and SCZHE labs. This training has lasted 10 days - from October 11 to November 22, 2024. In total 17 teaching and non-teaching staff were trained on how to operation lab equipment.

2.2. Sumy National Agrarian University (SNAU)

In November 2024, non-teaching staff training took place at The Institute of Fisheries of the National Academy of Agrarian Sciences of Ukraine in the form of lectures and practical classes in laboratories.

Each class lasted 2 hours (face-to-face classes, visit). The total duration of training was 10 days from November 18 to November 28, 2024. Two non-teaching staff also participated.

The training covered the use of laboratory equipment for aquaculture, maintenance, calibration and adjustment of precision instruments.

2.3. The National University of Water and Environmental Engineering (NUWEE)

The training for non-teaching staff took place mainly at the laboratory of integrated multitrophic aquaculture (IMTA), which is located in the 4th university building and equipped with grant funds. Some part of the training was in laboratories and classes at the Department of Water Bioresources in IALM, equipped with aquariums for ornamental fish, and the drilling pavilion of NUWEE (appendix A.3.2). Besides that, during the training, there was one visit to an external institution – "Laursen Aquaculture" LLC to study the process of incubation of catfish. The training for non-teaching staff has lasted 10 days - from October 21 to November 1, 2024. In total two NUWEE non-teaching staff have been trained on the equipment in the IMTA laboratory, created under this project at the university.

3. Implemented activities and outcomes

AM and UKR universities organized the following type of training: Training of the non- teaching staff on how to operate in the new established laboratories.

Table 1. The total number of participants (trainees)

University	Non-teaching staff
ISEC+ANAU	17 (teaching and non-teaching staff)*
SNAU	2
NUWEE	2+1
TOTAL	22

** Regarding the preliminary plan only 4 non-teaching staff members should be involved in this training. In addition of them some teachers who previously participated in AFISHE training expressed their interest in participation of training on lab equipment.*

3.1. Armenian National Agrarian University (ANAU), International Scientific-Educational Center of NAS RA

Training of the non-teaching staff

The main goal of the training is to prepare qualified personnel to work in the laboratories established at ANAU and ISEC NAS RA. Thanks to this training ANAU and ISEC NAS RA and SCZHE got qualified specialist on existing lab equipment purchased in the frame of AFISHE project.

Trainers: *Gevorg Martirosyan*, PhD in Biological Sciences, Head of Laboratory of Molecular Diagnostics and *Lilit Ghukasyan*, Senior specialist of Laboratory of Molecular Diagnostics.

Day 1. General introduction and requirements, safety medium

General introduction about the work at the laboratory. Safety management and approaches. The main parameters of water quality control and presentation of acceptable limits and/or residual limits of different parameters (ions, oxygen, organic materials etc.).

Day 2. Water quality testing device MultiLab/4010-2W/YSI

During the second training day on the Water Quality Testing Device MultiLab/4010-2W/YSI, participants were instructed on calibration procedures for accurate pH, conductivity, and dissolved oxygen measurements. Proper maintenance techniques, including sensor cleaning and storage, were demonstrated. Hands-on practice focused on real-time water sample analysis to ensure precise data collection.

Day 3. Thermoreactor for determination COD AQUAfast/COD165/Thermo Fisher Scientific

Training on the Thermoreactor for Determination of COD AQUAfast/COD165/Thermo Fisher Scientific covered safe operation procedures and reagent handling. Participants learned the step-by-step process of chemical oxygen demand (COD) testing, including sample preparation and digestion. Practical sessions emphasized accurate reading and interpretation of results using compatible photometers.

Day 4. Turbidimeter/AQ4500/ Thermo Fisher Scientific

Training on the Turbidimeter AQ4500/Thermo Fisher Scientific focused on setting up the device for precise turbidity measurements. Participants were guided through calibration using standard solutions to ensure accuracy. Practical exercises included analyzing water samples and interpreting results in compliance with regulatory standards.

Day 5. Oxygen meter

Training on the Oxygen Meter emphasized the principles of dissolved oxygen measurement and device calibration techniques. Participants practiced using the meter for accurate readings in various water samples. Maintenance procedures, including sensor care and storage, were demonstrated to ensure long-term reliability.

Day 6. A) Stereo Microscope with Digital Camera/SZ8 10T, ULOiS-14PA/Ningbo Icoe Commodity Co., Ltd B) Nageotte camera 40446002/ Counting chamber Nageotte/Glaswarenfabrik Karl Hecht GmbH and C. KG

Training on the Stereo Microscope with Digital Camera SZ8 10T, ULOiS-14PA/Ningbo Icoe Commodity Co., Ltd, included instruction on assembling and operating the microscope for high-resolution imaging. Practical sessions involved using the digital camera for capturing and analyzing specimens effectively. Maintenance and calibration procedures were also reviewed to ensure optimal performance.

Training on the Nageotte Camera 40446002 and Counting Chamber Nageotte/Glaswarenfabrik Karl Hecht GmbH and C. KG focused on precise counting techniques for cell and microorganism analysis. Participants practiced preparing samples, loading chambers, and interpreting results under a microscope. Emphasis was placed on maintaining accuracy and consistency during manual counting.

Day 7. Trinocular Microscope, Digital Camera/BM36T

Training on the Trinocular Microscope with Digital Camera BM36T covered assembly, focusing techniques, and camera integration for capturing high-resolution images. Participants practiced observing and documenting various samples with clarity and precision. Proper cleaning and maintenance protocols were highlighted to ensure durability and consistent performance.

Day 8-9. Spectrophotometer AquaMate 7100Vis/AQ7 100/Thermo Fisher Scientific

Training on the Spectrophotometer AquaMate 7100Vis/AQ7100/Thermo Fisher Scientific focused on its application for absorbance and concentration measurements. Participants were instructed on calibration, sample preparation, and wavelength selection for accurate analysis. Practical exercises included operating the device and interpreting spectrophotometric data for various solutions.

Day 10. Sum up – Summarizing all the gained knowledge and skills. Discussion about future implementation of purchased equipment. Presentation of preliminary ideas about usage of purchased equipment in current and future research work.

3.2. Sumy National Agrarian University (SNAU)

Training of the non-teaching staff

The purpose of the training was to improve the qualification of laboratory technicians in conducting water quality analysis and monitoring the health of aquatic organisms, to acquaint them with modern methods of assessing the main parameters of water (pH, oxygen level, ammonia, nitrate content, etc.) and to provide practical experience in determining biological indicators of the condition aquatic

ecosystems related to aquaculture. Training participants also improved their skills in working with laboratory equipment and prepared for independent work in laboratory conditions.

Trainers: *Dragan Lyudmila, Hrygorenko Tetyana, Dereny Olga*
Dragan Lyudmila, head of the Environmental Research Laboratory. Hrygorenko Tetyana, Head of the Laboratory of Hydrobiology and Technologies for the Cultivation of Valuable Invertebrates. Dereny Olga, head of the Laboratory of feed and fish feeding.
Trainees: *Hanna Petrenko, Iryna Lobachova*

The training lasted 10 days, each day a class was conducted on a relevant topic:

1. Introduction to aquaculture and water quality. Key water parameters (pH, temperature, salinity)
The training began with an overview of aquaculture and its importance for aquatic ecosystems. Participants learned about key water quality parameters such as pH, temperature, and salinity, which affect the health of organisms. The instructor explained how these parameters change depending on environmental conditions. The impact of each parameter on the growth and development of aquatic organisms was discussed. Participants also discussed methods for measuring and controlling these parameters in aquaculture practices.

2. Monitoring oxygen levels in water and its impact on organisms
This training focused on the importance of monitoring oxygen levels in water, a critical factor for the survival of aquatic organisms. Participants learned about methods for measuring dissolved oxygen concentration, including the use of oximeters. It was discussed how low oxygen levels can cause stress and diseases in fish. Methods for maintaining optimal oxygen levels in aquaculture systems were explored. The lecture also highlighted examples of issues arising from oxygen shortages in different aquaculture systems.

3. Study of ammonia, nitrites, and nitrates: measurement methods and their effects on aquaculture
In this training, participants were introduced to key chemical compounds such as ammonia, nitrites, and nitrates, which affect water quality. The instructor explained methods for measuring the concentration of these substances in water and their significance for aquaculture. The toxic effects of elevated ammonia and nitrite levels on fish and other aquatic organisms were discussed. Methods for reducing the levels of these compounds in water through filtration and aeration were examined. The lecture concluded with practical examples of how to control and regulate these substances in aquatic systems.

4. Methods of physicochemical water analysis: conductivity, hardness, metal content
This training covered methods for physicochemical analysis of water, including measurements of electrical conductivity, hardness, and metal content. Participants learned about the effects of these parameters on the health of aquatic organisms and the overall state of aquaculture. Various instruments and methods used for analyzing the physicochemical characteristics of water were reviewed. The instructor explained how high metal content can lead to toxic effects in fish. The lecture concluded with ways to adjust physicochemical parameters to maintain healthy conditions in aquaculture systems.

5. Biological indicators of water quality: microbiological analysis
This training focused on biological indicators of water quality, particularly microbiological analysis. Participants learned about the main methods for detecting bacteria and microorganisms in water samples. It was discussed how the presence of certain microorganisms can signal contamination or a

decline in water quality. The instructor explained methods used to reduce bacterial contamination in aquaculture systems. Participants also learned about the importance of regular microbiological monitoring to maintain the health of aquatic organisms.

6. Assessment of aquatic organism health: fish health and stress factors
This training discussed methods for assessing the health of aquatic organisms, particularly fish. The instructor introduced participants to the main signs of diseases and stress in fish, such as changes in behavior and appearance. Various stress factors were explored, including changes in water parameters and overcrowding. Participants learned about methods to reduce stress in fish, including improving living conditions and monitoring water quality. The lecture concluded with a discussion on the importance of regular health checks for fish in aquaculture systems.

7. Methods for collecting and processing water samples for laboratory testing
This training focused on methods for collecting and processing water samples for laboratory analysis. Participants learned how to properly collect water samples to ensure accurate analysis results. The basic rules for transporting and storing samples were discussed. The instructor explained how to prepare samples for the analysis of various parameters, such as pH, ammonia content, and microbiological indicators. The lecture ended with practical recommendations to ensure the accuracy and reliability of test results.

8. Use of laboratory equipment for water quality monitoring (spectrophotometer, pH meter, oximeter)
In this training, participants were introduced to the key laboratory equipment used for water quality monitoring. The principles of operation of spectrophotometers, pH meters, and oximeters, which are used to measure relevant water parameters, were explained. The instructor demonstrated how to use these instruments to obtain accurate readings. Participants had the opportunity to practice using the equipment and learn about potential errors in measurements. The lecture emphasized the importance of regular monitoring to ensure proper conditions in aquaculture systems.

9. Practical water quality analysis: conducting comprehensive water sample tests
This training was practical and involved conducting comprehensive water quality tests based on collected samples. Participants performed measurements of pH, oxygen levels, ammonia, and other key parameters. Various equipment, including spectrophotometers and oximeters, was used to obtain accurate results. Participants analyzed the data and identified possible causes of deviations from normal parameters. The lecture helped solidify theoretical knowledge through hands-on experience.

10. Internship conclusion: analysis of results, discussion of issues and solutions
The final training was dedicated to concluding the internship, analyzing the results obtained, and discussing any identified issues. Participants presented their results, shared difficulties encountered during the analysis process, and received feedback. The instructor provided recommendations for addressing key problems and improving water quality monitoring methods. Strategies for implementing the knowledge gained in practical work were discussed. The training ended with an evaluation of the internship's success and the awarding of certificates to participants.
The 10-day training covered essential topics in aquaculture and water quality management, starting with an introduction to key water parameters such as pH, temperature, and salinity, and progressing to the importance of oxygen levels, chemical compounds like ammonia and nitrites, and methods of water analysis. Participants also gained hands-on experience with laboratory equipment, sample collection, and practical water quality tests, while learning about biological indicators and the health assessment of aquatic organisms. The training concluded with a final session analyzing results,

discussing challenges, and presenting solutions, followed by an evaluation and certification of the participants.

3.3. National University of Water and Environmental Engineering (NUWEE)

Training of the non-teaching staff

The main goal of the training is to prepare qualified personnel to work in the laboratory of integrated multi-trophic aquaculture (IMTA) created under this project at NUWEE.

Trainers: *Anastasia Horetska, Oleksiy Lemeshko, Ivan Targonii*

The trainers are experts in the field of aquaculture and fish farming: Anastasia Horetska and Oleksiy Lemeshko from "Laursen Aquaculture" LLC - maintaining water quality and servicing laboratory equipment; I.M. Targony, individual entrepreneur – training on setting up and operating production processes on the fish feed production line.

Trainees: *Roman Muzyka, Oksana Ryzhenko*

Those teachers and non-teaching staff who will be involved in the activities of the IMTA laboratory also attended the classes. Students of the specialty "Aquatic Bioresources and Aquaculture" joined the class in the drilling pavilion.

On October 21, 2024, an introductory class was held, dedicated to the main aspects of the technical equipment of fish farms operating according to the principle of recirculation systems, and the analysis of the main parameters of the water environment, which must be controlled and maintained within a given range. Classes at the IMTA laboratory were conducted by Anastasia Horetska, who is a representative of Laursen Aquaculture LLC. The enterprise specializes in the cultivation of clary catfish and has experience in the cultivation of tilapia and pangasius. Anastasiya Goretska talked in detail about which indicators of the water environment are constantly monitored at the "Laursen Aquaculture" and the most common problems with water quality and diseases that occur during the reproduction and incubation of catfish eggs.

On the second day of the training, the trainees were familiarized with automated fish feeding systems and dispensers for applying fertilizers and reagents to the aquaponics system integrated into the RAS. In addition to the supporting staff present, the responsible executor of the project, a professor of the Department of Water Bioresources, Serhii Konontsev, joined the training. In the IMTA laboratory, trainees got acquainted with the equipment for automated fish feeding and acquired the skills of programming automatic feeders and the correct selection of feed for them. Using the example of auto-feeders for fish of various designs, skills were acquired in setting up automated fish feeding in different conditions. The requirements for the mechanical characteristics of feed used in automated feeders were analyzed. The listeners were also introduced to automated dispensers for adding fertilizers and reagents to the aquaponics system integrated into the RAS.

The third day of the training program was devoted to the processes of thermoregulation and aeration in the water circuit of the RAS and ensuring water circulation. The trainees got acquainted with the structure of the main pumping equipment and recommendations for their selection, installation, and frequency of service. In addition to the equipment purchased within the scope of the grant project (pumps, blowers, heating elements, and an electronic water temperature controller), technicians also were familiarized with the designs of aquarium pumps, compressors, and electric heaters available in the laboratory of the Department of Water Bioresources.

The next day, in the laboratory of the Department of Water Bioresources, the participants of the training got acquainted with the water quality analyzers purchased within the project. To carry out practical and laboratory work at a high level, the auxiliary staff must be well-versed in the physical and

chemical parameters of the aquatic environment for fish and other hydrobionts. For this purpose, special attention was paid to the study of the relationship between indicators of the main water pollution of RAS and the efficiency of the recycling water treatment units. Obtaining reliable results of water quality analysis requires not only careful adherence to the measurement methodology but also knowledge of the specifics of RAS circulating water contaminants. Therefore, before starting work with the universal analyzer, the training participants were familiarized with the main polluting components of circulating water of fish farms, the most dangerous types of pollution, and methods of their removal. Anastasiya Horetska demonstrated the process of measuring dissolved pollutants using a universal water analyzer purchased within the AFISHE project. Trainees gained experience in measuring pH, the content of dissolved oxygen, total Fe, and nitrogen compounds (nitrates, nitrites, and ammonium ions) in water.

The first week of training for the non-teaching staff ended with the systems of mechanical and biological treatment of circulating water of the laboratory installation. Anastasia Horetska outlined the main aspects of maintenance of such mechanical cleaning facilities as mesh prefilters and shared her experience of operating a drum mesh filter. The circulating water purification unit in the laboratory is the author's development of Serhii Konontsev, which has already passed approval at the RAS for the cultivation of clary catfish. During the training, trainees had the opportunity to see the implementation of this biotechnology in the cultivation of Australian crayfish. It is symbolic that young Australian crayfish, launched during the opening of the IMTA laboratory in June 2024, at that moment had already reached marketable weight and showed good growth rates.

The second week of the AFISHE training for the non-teaching staff (October 28, the 6th day of the training) started with the revision of the power units of the fish feed production line. At the moment, the line has not yet been put into operation, so NUWEE employees, together with Ivan Targonii, the leader of the training on automation and adjustment of production processes on the feed line, discussed the main points of connecting the line to the power supply network, the mutual location of the main production elements. The line for the production of extruded compound feed, purchased as part of the implementation of the AFISHE project, will expand the park of technological machines of the NUWEE and will allow the achievement of various goals. In addition to providing practical training for students majoring in "Aquatic Bioresources and Aquaculture" and creating conditions for fruitful research work in the field of aquaculture and biotechnology, its equipment can be used in training students in other majors, for example, "Automation and computer-integrated technologies."

The second session (on the 7th day of the training), dedicated to the work of the feed line, was attended by students of the specialty "Aquatic Bioresources and Aquaculture", in addition to teachers and support staff. Since this line is a full-fledged production complex, in the future, it is foreseen that the support staff will provide not only the educational process but also participate in research work on the justification of new feed recipes in accordance with the concept of integrated multitrophic aquaculture. There are also prospects for the production of feed from local raw materials to ensure the feeding of aquaculture facilities in a laboratory complex.

The training participants were most impressed by the visit to the enterprise "Laursen Aquaculture" https://www.laursen-aqua.com.ua/ on the 8th day of the training. This enterprise is a leader in the region in growing fish in RAS. Although the main task of the visit was only to get acquainted with the processes of breeding and feeding young clary catfish, the participants were told and shown the entire production process. The tour was conducted by company employees Anastasia Horetska and Oleksiy Lemeshko, who at a high professional level ensure the functioning of all technological blocks of a complex recirculating water system, and have knowledge and experience in breeding and growing clary catfish. The adherence to European production standards by the enterprise, the use of modern technological equipment, and the provision of strict product quality control pleasantly impressed the

trainees, because "Laursen Aquaculture" is a bright example of a modern intensive aquaculture enterprise, where future graduates can realize their knowledge and skills.

The next day, Ivan Targonii gave a short briefing to the staff on the organization of production operations on the feed line. The trainees were familiarized with the automatic systems of starting and adjusting the main units (mixer, grinder, extruder, and drying cabinet), together with colleagues and teachers, they analyzed the experience regarding the features of fish feed recipes. The set of matrices for different types of feed, present in the feed line, was reviewed, and the peculiarities of their selection when using different formulations of extruded feed were determined.

In the final stage, the trainees gained experience in preventive cleaning of the working parts of the pumps and their installation in the RAS of the IMTA laboratory. In practice, they mastered the technology of multi-stage biological treatment of recycled water, developed according to the IMTA concept. This biotechnology makes it possible to grow food organisms on the substrate of fish metabolism products. The biomass can be consumed by various aquaculture objects (from catfish to freshwater shrimp and crayfish), and the circle of hydrobionts cultivation will be completed without waste.

The knowledge and skills of working with laboratory equipment and hydrobionts acquired during training are already used or soon be used by university employees to ensure the educational process under the updated master's training program in the specialty "Aquatic Bioresources and Aquaculture".

4. Summary

Non-teaching staff were taught the usage of lab equipment, purchased during the project. The training facilities included not only university laboratories but also scientific institutions and (or) operational facilities of aquaculture enterprises. This allowed the trainees to gain practical skills in conditions of real functioning aqua systems and laboratories. In addition, some teachers participated in the training on how to operate in newly established laboratories. It will have an great impact for the future and will ensure the sustainability of the AFISHE project. Thanks to this training the participants can use the purchased equipment on purpose and implement research in aquaculture and fishery fields.

During the training sessions, the trainers thoroughly explained the theoretical and practical aspects of equipment construction and functioning. The training provided the participants with knowledge that allowed them to know and understand key aspects of maintaining laboratory equipment and using it in the educational process.

Employees of AM and UKR universities already use or will soon use the knowledge and skills of working with laboratory equipment and hydrobionts acquired during training to ensure the educational process under the new and updated master's training programs developed with the project AFISHE and other activities (joint research and projects, lab services for the public sector, etc).

APPENDIX A

Training program

Armenian National Agrarian University (ANAU)

International Scientific-Educational Center of NAS RA

Scientific Centre of Zoology and Hydroecology (SCZHE)

A. 1. 1. TRAINING of the non-teaching staff on how to operate in the new established laboratories

Day 1: Introduction to Laboratory Work and Water Quality Assessment
Date: 11.11.24
Time: 13:30 - 15:30
Topic:

- Overview of Laboratory Safety Management and Protocols
- Key Parameters of Water Quality Control and Their Importance
- Acceptable and Residual Limits for Various Water Quality Parameters (Ions, Dissolved Oxygen, Organic Compounds, etc.)

Day 2: Water Quality Analysis Training
Date: 12.11.24
Time: 13:30 - 15:30
Topic:

- Calibration Procedures for pH, Conductivity, and Dissolved Oxygen Measurements
- Maintenance of Sensors: Cleaning and Storage Best Practices
- Hands-on Real-Time Water Sample Analysis Techniques

Day 3: Chemical Oxygen Demand (COD) Testing Training
Date: 13.11.24
Time: 13:30 - 15:30
Topic:

- Safe Operation and Reagent Handling for the Thermoreactor COD165
- Step-by-Step COD Testing: Sample Preparation and Digestion
- Accurate Reading and Interpretation of COD Results Using Photometers

Day 4: Turbidity Measurement Training
Date: 14.11.24
Time: 13:30 - 15:30
Topic:

- Device Setup and Operation for Precise Turbidity Measurements
- Calibration Using Standard Solutions for Accuracy
- Water Sample Analysis and Result Interpretation in Compliance with Regulatory Standards

Day 5: Dissolved Oxygen Analysis
Date: 15.11.24
Time: 13:30 - 15:30

Topic:

- Understanding Dissolved Oxygen Measurement Principles
- Calibration Methods for Accurate Oxygen Readings
- Ensuring Long-Term Reliability Through Sensor Maintenance and Storage

Day 6: Advanced Microscopy and Cell Counting Techniques
Date: 18.11.24
Time: 13:30 - 15:30
Topic:

- Assembling and Operating the Stereo Microscope with Digital Camera SZ8 10T
- High-Resolution Imaging and Specimen Analysis with Digital Camera
- Maintenance and Calibration of the Stereo Microscope for Optimal Performance
- Precise Cell and Microorganism Counting with the Nageotte Camera and Counting Chamber
- Sample Preparation, Chamber Loading, and Result Interpretation for Manual Counting

Day 7: Trinocular Microscope and Digital Imaging
Date: 19.11.24
Time: 13:30 - 15:30
Topic:

- Assembly and Setup of the Trinocular Microscope with Digital Camera BM36T
- Focusing Techniques for High-Resolution Imaging
- Observing and Documenting Samples with Clarity and Precision
- Cleaning and Maintenance Protocols for Long-Term Durability and Performance

Day 8: Spectrophotometer Operation and Calibration
Date: 20.11.24
Time: 13:30 - 15:30
Topic:

- Introduction to the Spectrophotometer AquaMate 7100Vis
- Calibration Techniques for Accurate Absorbance Measurements
- Sample Preparation and Proper Handling for Reliable Results

Day 9: Data Analysis and Wavelength Optimization
Date: 21.11.24
Time: 13:30 - 15:30
Topic:

- Wavelength Selection for Accurate Concentration Analysis
- Operating the Spectrophotometer for Precise Data Collection
- Interpreting Spectrophotometric Data for Various Solutions
- Troubleshooting Common Issues in Spectrophotometric Measurements

Day 10: Future Applications and Research Integration
Date: 22.11.24
Time: 13:30 - 15:30
Topic:

- Summarizing Gained Knowledge and Skills from Equipment Training
- Discussion on the Future Implementation of Purchased Equipment
- Presenting Preliminary Ideas for Using Equipment in Current Research
- Exploring Potential Applications of Equipment in Future Research Projects

SUMY NATIONAL AGRARIAN UNIVERSITY (SNAU)

A. 2. 1. TRAINING of the non-teaching staff on how to operate in the new established laboratories

Day 1: Introduction to Aquaculture and Water Quality
Date: 18.11.24
Time: 10:00 - 12:00
Topic:

- Introduction to Aquaculture and Water Quality. Key Water Parameters (pH, Temperature, Salinity).
- Overview of aquaculture systems and their importance to aquatic ecosystems. Key water parameters affecting aquaculture: pH, temperature, and salinity, and their impact on the health and growth of aquatic organisms.
- Methods for measuring and controlling these parameters.
- Interactive Methods:
- Mini-Lecture
- Group Discussion
- Practical Exercise: Measuring pH, temperature, and salinity

Day 2: Monitoring Oxygen Levels in Water
Date: 19.11.24
Time: 10:00 - 12:00
Topic:

- Monitoring Oxygen Levels in Water and Its Impact on Organisms.
- The role of dissolved oxygen in aquaculture and aquatic ecosystems. Methods for measuring oxygen levels.
- The effects of low oxygen levels on fish health and stress.
- Techniques for maintaining optimal oxygen levels in aquaculture systems.
- Interactive Methods:
- Brainstorming
- Group Work
- Case Study Analysis

Day 3: Study of Ammonia, Nitrites, and Nitrates
Date: 20.11.24
Time: 10:00 - 12:00
Topic:

- Study of Ammonia, Nitrites, and Nitrates: Measurement Methods and Their Effects on Aquaculture.
- Understanding the nitrogen cycle in aquaculture. The impact of ammonia, nitrites, and nitrates on aquatic organisms.
- Methods for measuring these compounds in water and managing their levels.
- Interactive Methods:
- Group Work
- Practical Demonstration
- Role Play: Dealing with high nitrogen levels in an aquaculture system

Day 4: Physicochemical Water Analysis
Date: 21.11.24
Time: 10:00 - 12:00
Topic:

- Methods of Physicochemical Water Analysis: Conductivity, Hardness, Metal Content.

- The importance of conductivity, water hardness, and metal content in aquaculture.
- Techniques for measuring these parameters and their impact on aquatic organisms.
- Practical tips for water quality control.
- Interactive Methods:
- Demonstration
- Hands-on Practice with Measuring Equipment
- Group Discussion on Water Quality Control

Day 5: Biological Indicators of Water Quality
Date: 22.11.24
Time: 10:00 - 12:00
Topic:

- Biological Indicators of Water Quality: Microbiological Analysis.
- The role of microorganisms in determining water quality.
- Methods for detecting and analyzing bacterial and viral contamination in water.
- The impact of microbiological contamination on aquaculture health.
- Interactive Methods:
- Case Study
- Practical Lab Exercise: Collecting and Analyzing Microbiological Samples
- Group Discussion

Day 6: Assessment of Aquatic Organism Health
Date: 23.11.24
Time: 10:00 - 12:00
Topic:

- Assessment of Aquatic Organism Health: Fish Health and Stress Factors.
- Identifying signs of stress and disease in aquatic organisms.
- Factors contributing to stress, including poor water quality, overcrowding, and improper nutrition.
- Methods for assessing fish health and managing stress.
- Interactive Methods:
- Group Work: Identifying Stress in Fish
- Role Play: Dealing with Disease Outbreaks
- Practical Tips for Stress Reduction

Day 7: Methods for Collecting and Processing Water Samples
Date: 24.11.24
Time: 10:00 - 12:00
Topic:

- Methods for Collecting and Processing Water Samples for Laboratory Testing.
- The importance of proper sample collection for accurate water testing.
- Procedures for collecting water samples and preparing them for analysis.
- Best practices for storing and transporting samples.
- Interactive Methods:
- Demonstration: Collecting Water Samples
- Hands-on Practice: Processing Water Samples
- Group Discussion: Ensuring Sample Integrity

Day 8: Use of Laboratory Equipment for Water Quality Monitoring
Date: 25.11.24
Time: 10:00 - 12:00

Topic:

- Use of Laboratory Equipment for Water Quality Monitoring (Spectrophotometer, pH Meter, Oximeter).
- Introduction to laboratory equipment used in water quality testing.
- How to use a spectrophotometer, pH meter, and oximeter for accurate readings.
- Troubleshooting common errors in equipment use.
- Interactive Methods:
- Hands-on Practice with Equipment
- Group Work: Solving Equipment Issues
- Practical Tips for Ensuring Accurate Measurements

Day 9: Practical Water Quality Analysis
Date: 26.11.24
Time: 10:00 - 12:00
Topic:

- Practical Water Quality Analysis: Conducting Comprehensive Water Sample Tests.
- Comprehensive testing of water samples for pH, dissolved oxygen, ammonia, nitrates, and other key parameters.
- Interpreting test results and determining the necessary corrective actions.
- Interactive Methods:
- Group Work: Analyzing Water Samples
- Hands-on Lab Work
- Discussion on Best Practices for Water Quality Management

Day 10: Internship Conclusion
Date: 28.11.24
Time: 10:00 - 12:00
Topic:

- Internship Conclusion: Analysis of Results, Discussion of Issues and Solutions.
- Reviewing key takeaways from the training.
- Discussing challenges faced during water quality monitoring and ways to address them.
- Presenting results of water quality tests and proposing solutions.
- Final recommendations for improving water quality in aquaculture systems.
- Interactive Methods:
- Group Presentations
- Open Discussion
- Conclusion and Feedback

NATIONAL UNIVERSITY OF WATER AND ENVIRONMENTAL ENGINEERING (NUWEE)

A.3.1. TRAINING of the non-teaching staff on how to operate in the new established laboratories

1. Introductory lecture on the features of RAS systems. Analysis of the main parameters of the water environment.

Time: October 21, 2024, 10:00 a.m.
Place: The Department of Water Bioresources, room 750. NUWEE

2. Organization of automated feeding of aquaculture facilities. Automation of fertilizer application processes in the IMTA aquaponics system.

Time: October 22, 2024, 1:00 p.m.
Place: IMTA laboratory, room 504(a), NUWEE

3. Thermoregulation in a closed circuit of a laboratory installation. Setting up and ensuring the operation of pumping and blower equipment.

Time: October 23, 2024, 1:00 p.m.
Place: IMTA laboratory, room 504(a), NUWEE

4. Measurement of the value of dissolved oxygen, the concentration of total ferrum and pollution by dissolved compounds of nitrogen and phosphorus.

Time: October 24, 2024, 10:00 a.m.
Place: The Department of Water Bioresources, room 725(a), NUWEE

5. Facilities for mechanical and biological treatment of circulating water.

Time: October 25, 2024, 1:00 p.m.
Place: IMTA laboratory, room 504(a), NUWEE

6. Revision of power units. Preparation of equipment and main feed ingredients

Time: October 28, 2024, 11:00 a.m.
Place: Drilling pavilion of NUWEE.

7. Briefing on the main operations in the production of extruded compound feed. Sequence of the process of starting up the feed line. Sequence of introducing feed components.

Time: October 29, 2024, 1:00 p.m.
Place: Drilling pavilion of NUWEE.

8. Introductory visit. Incubation of young fish and rearing at early stages of development

Time: October 30, 2024, 9:00 a.m.
Place: enterprise "Laursen Aquaculture".

9. Chopper and mixer settings. Extruder settings and matrix selection. Setting the parameters of the drying cabinet.

Time: October 31, 2024, 1:00 p.m.
Place: Drilling pavilion of NUWEE.

10. Maintenance work after feed production. Preventive maintenance work on laboratory electrical equipment. Automation of phytoreactor lighting processes.

Time: November 1, 2024, 1:00 p.m.

Place: IMTA laboratory, room 504(a), NUWEE

APPENDIX B

LIST OF PARTICIPANTS (TRAINEES)

AFISHE

Co-funded by the European Union

Training on lab equipment, 11-22.11.2024

Participants' list

Place: Armenian National Agrarian University, AFISHE laboratory

N	Name	Contact Details	11.11	12.11	13.11	14.11	15.11	18.11	19.11	20.11	21.11	22.11
1.	Nara Rshtuni	nararshtuni@mail.ru										
2.	Gohar Tovmasyan	gohartovmasyan74@mail.ru										
3.	Armine Ghazaryan	ghazaryan.armine2018@gmail.com										
4.	Siranush Altunyan	altunyan.siranush@gmail.com										
5.	Naira Barseghyan	barseghyannaira74@yahoo.com										
6.	Margarit Harutyunyan	margarit.harutyunyan81@mail.ru										
7.	Liana Grigoryan	lianagrigoryan7878@mail.ru										
8.	Zarine Tamrazyan	[illegible]@gmail.com										
9.	Artur Alaverdyan	arthuralaverdyan@gmail.com										
10.	Nara Chatinyan	narachat@mail.ru										
11.	Azevik Aboryan	azevaboryan@yahoo.com										

12.	Kristine Gharibyan	kristinegharibyan@gmail.com											
13.	Arpine Aghababyan	Kayazyan87@gmail.com											
14.	Naira Aloyan	nairaloyan@gmail.com											
15.	Gevorgyan Hamlet	afisteron@gmail.com											
16.													
17.													
18.													
19.													
20.													
21.													
22.													
23.													
24.													

2. LIST OF PARTICIPANTS on the training for the non-teaching staff on how to operate in the newly established laboratory (10 days, face-to-face classes)

21.10.- 25.10. 2024

National University of Water and Environmental Engineering

AFISHE

Co-funded by the European Union

Registration list at the training for the non-teaching staff
Project AFISHE (21.10.- 25.10.2024)

№	Name	Position	Department	Email	21.10	22.10	23.10	24.10	25.10
1	Roman Muzyka	Head of educational laboratories	Department of Land Management, Cadastre, Monitoring and Geoinformatics	r.m.muzyka@nuwm.edu.ua					
2	Oksana Ryzhenko	laboratory assistant	Department of Water Bioresources	o.v.ryzhenko@nuwm.edu.ua					
3	Serhii Konontsev	prof.	Department of Water Bioresources	s.v.konontsev@nuwm.edu.ua					
4	Yuliia Hrokhovska	Prof	Department of Water Bioresources	y.r.grokhovska@nuwm.edu.ua					

28.10.- 01.11. 2024

National University of Water and Environmental Engineering

AFISHE

Co-funded by the European Union

Registration list at the training for the non-teaching staff
Project AFISHE (28.10.- 01.11.2024)

№	Name	Position	Department	Email	28.10	29.10	30.10	31.10	01.11
1	Roman Muzyka	Head of educational laboratories	Department of Land Management, Cadastre, Monitoring and Geoinformatics	r.m.muzyka@nuwm.edu.ua					
2	Oksana Ryzhenko	laboratory assistant	Department of Water Bioresources	o.v.ryzhenko@nuwm.edu.ua					
3	Serhii Konontsev	prof.	Department of Water Bioresources	s.v.konontsev@nuwm.edu.ua					
4	Yuliia Hrokhovska	Prof	Department of Water Bioresources	y.r.grokhovska@nuwm.edu.ua					

AFISHE

Funded by the European Union

Sumy National Agrarian University

AFISHE

Registration List of the non-teaching staff of SNAU, trained how to operate in the new established laboratories

№	Name	Position	Contact details	Signature									
				18.11.24	19.11.24	20.11.24	21.11.24	22.11.24	23.11.24	25.11.24	26.11.24	27.11.24	28.11.24
1.	Petrenko Hanna	Laboratory assistant	anyapetrenko@gmail.com										
2.	Lobachova Iryna	Laboratory assistant	iralobacva70@gmail.com										

APPENDIX C

CERTIFICATES

AFISHE

Co-funded by the European Union

Certificate

This is to certify that

Arevik Abovyan

from the
Armenian National Agrarian University (Armenia)

participated in the training on lab equipment at
Armenian National Agrarian University

within the framework of the
AFISHE
"Development of Aquaculture and Fisheries Education for Green Deal in Armenia and Ukraine: from education to ecology"
Erasmus+ CBHE project on 11.11.2024 – 22.11.2024.

Garegin Hambardzumyan

AFISHE project coordinator
Head of International Relations Department
Armenian National Agrarian University

22 November 2024

AFISHE

Co-funded by the European Union

Certificate

This is to certify that

Armine Ghazaryan

from the
Armenian National Agrarian University (Armenia)

participated in the training on lab equipment at
Armenian National Agrarian University

within the framework of the
AFISHE
"Development of Aquaculture and Fisheries Education for Green Deal in Armenia and Ukraine: from education to ecology"
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Garegin Hambardzumyan

AFISHE project coordinator
Head of International Relations Department
Armenian National Agrarian University

22 November 2024

AFISHE

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Certificate

This is to certify that

Liana Grigoryan

from the
Armenian National Agrarian University (Armenia)

participated in the training on lab equipment at
Armenian National Agrarian University

within the framework of the
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Garegin Hambardzumyan

AFISHE project coordinator
Head of International Relations Department
Armenian National Agrarian University

Ընդհանուր բաժին
Общий отдел
General department

22 November 2024

AFISHE

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the European Union

Certificate

This is to certify that

Arpine Aghababyan

from the
Armenian National Agrarian University (Armenia)

participated in the training on lab equipment at
Armenian National Agrarian University

within the framework of the
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Garegin Hambardzumyan

AFISHE project coordinator
Head of International Relations Department
Armenian National Agrarian University

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Общий отдел
General department

22 November 2024

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Certificate

This is to certify that

Artur Alaverdyan

from the
Armenian National Agrarian University (Armenia)

participated in the training on lab equipment at
Armenian National Agrarian University

within the framework of the
AFISHE
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AFISHE project coordinator
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22 November 2024

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Certificate

This is to certify that

Gohar Tovmasyan

from the
Armenian National Agrarian University (Armenia)

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AFISHE project coordinator
Head of International Relations Department
Armenian National Agrarian University

22 November 2024

AFISHE

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Certificate

This is to certify that

Hripsime Kobelyan

from the
Scientific Center of Zoology and Hydroecology (Armenia)

participated in the training on lab equipment at
Scientific Center of Zoology and Hydroecology

within the framework of the
AFISHE
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Certificate

This is to certify that

Kristine Gharibyan

from the
Armenian National Agrarian University (Armenia)

participated in the training on lab equipment at
Armenian National Agrarian University

within the framework of the
AFISHE
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22 November 2024

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Certificate

This is to certify that

Margarit Harutyunyan

from the
Armenian National Agrarian University (Armenia)

participated in the training on lab equipment at
Armenian National Agrarian University

within the framework of the
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Garegin Hambardzumyan

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Head of International Relations Department
Armenian National Agrarian University

22 November 2024

AFISHE

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Certificate

This is to certify that

Naira Aloyan

from the
Armenian National Agrarian University (Armenia)

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22 November 2024

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Certificate

This is to certify that

Naira Barseghyan

from the
Armenian National Agrarian University (Armenia)

participated in the training on lab equipment at
Armenian National Agrarian University

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AFISHE project coordinator
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Общий отдел
General department

22 November 2024

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Certificate

This is to certify that

Nara Chatinyan

from the
Armenian National Agrarian University (Armenia)

participated in the training on lab equipment at
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22 November 2024

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Nara Rshtuni

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Garegin Hambardzumyan

AFISHE project coordinator
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22 November 2024

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Certificate

This is to certify that

Siranush Altunyan

from the
Armenian National Agrarian University (Armenia)

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AFISHE project coordinator
Head of International Relations Department
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Общий отдел
General department

22 November 2024

AFISHE

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Certificate

This is to certify that

Zarine Tarkhanyan

from the
Armenian National Agrarian University (Armenia)

participated in the training on lab equipment at
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Garegin Hambardzumyan

AFISHE project coordinator
Head of International Relations Department
Armenian National Agrarian University

22 November 2024

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Nelli Barseghyan

from the
Scientific Center of Zoology and Hydroecology (Armenia)

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Garegin Hambardzumyan

AFISHE project researcher

Armenian National Agrarian University

22 November 2024

AFISHE

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Garegin Hambardzumyan

AFISHE project coordinator
Head of International Relations Department
Armenian National Agrarian University

Ընդհանուր բաժին
Общий отдел
General department

22 November 2024

The list of equipment of the training

1. *Water quality testing device MultiLab/4010-2W/YSI*
2. *Spectrophotometer AquaMate 7100Vis/AQ7 100/Thermo Fisher Scientific*
3. *Thermoreactor for determination COD AQUAfast/COD165/Thermo Fisher Scientific*
4. *Turbidimeter/AQ4500/ Thermo Fisher Scientific*
5. *Stereo Microscope with Digital Camera/SZ8 10T, ULOiS-14PA/Ningbo Icoe Commodity Co., Ltd*
6. *Nageotte camera 40446002/ Counting chamber Nageotte/Glaswarenfabrik Karl Hecht GmbH and C. KG*
7. *Trinocular Microscope, Digital Camera/BM36T*
8. *Oxygen meter*

AFISHE

Co-funded by the European Union

National University of Water and Environmental Engineering

Сертифікат

виданий

Оксані Риженко

учасниці тренінгу
забезпечення навчального процесу в лабораторії IMTA
за проєктом Erasmus+ CBHE

AFISHE

"Розвиток освіти в галузі аквакультури та рибальства для Зеленого курсу у Вірменії та Україні: від освіти до екології"

18.10.2024 - 01.11.2024

1,5 кредити ЄКТС (45 годин)

Віктор Мошинський

Ректор
Національний університет водного господарства та природокористування

Гарегін Гамбарцумян

Координатор проєкту AFISHE
Начальник департаменту міжнародних зв'язків
Вірменський національний аграрний університет

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ ВОДНОГО ГОСПОДАРСТВА ТА ПРИРОДОКОРИСТУВАННЯ
02071116

1 листопада 2024

Теми тренінгу

Аналіз основних параметрів водного середовища

Налагодження та забезпечення роботи насосного та повітродувного обладнання

Автоматизація процесів рослинництва в ІМТА

Організація автоматизованої годівлі об'єктів аквакультури

Терморегуляція в замкнутому контурі лабораторної установки

Споруди механічної та біологічної очистки оборотної води

Інкубація молоді риби і вирощування на ранніх стадіях розвитку

Підготовка одиниць та основних інгредієнтів корму

Послідовність процесу запуску кормової лінії

Послідовність введення компонентів корму

Інструктаж про основні операції при виробництві екструдованих комбікормів

Налаштування подрібнювача і міксера

Налаштування екструдера та вибір матриці

Налаштування параметрів сушильної шафи

Обслуговуючі роботи після завершення виробництва кормів

AFISHE

Co-funded by the European Union

National University of Water and Environmental Engineering

Сертифікат

виданий

Роману Музиці

учаснику тренінгу
забезпечення навчального процесу в лабораторії IMTA
за проєктом Erasmus+ CBHE

AFISHE

"Розвиток освіти в галузі аквакультури та рибальства для Зеленого курсу у Вірменії та Україні: від освіти до екології"

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1,5 кредити ЄКТС (45 годин)

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Гарегін Гамбарцумян

Координатор проєкту AFISHE
Начальник департаменту міжнародних зв'язків
Вірменський національний аграрний університет

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ ВОДНОГО ГОСПОДАРСТВА ТА ПРИРОДОКОРИСТУВАННЯ
02071116

1 листопада 2024

Теми тренінгу

Аналіз основних параметрів водного середовища

Налагодження та забезпечення роботи насосного та повітродувного обладнання

Автоматизація процесів рослинництва в ІМТА

Організація автоматизованої годівлі об'єктів аквакультури

Терморегуляція в замкнутому контурі лабораторної установки

Споруди механічної та біологічної очистки оборотної води

Інкубація молоді риби і вирощування на ранніх стадіях розвитку

Підготовка одиниць та основних інгредієнтів корму

Послідовність процесу запуску кормової лінії

Послідовність введення компонентів корму

Інструктаж про основні операції при виробництві екструдованих комбікормів

Налаштування подрібнювача і міксера

Налаштування екструдера та вибір матриці

Налаштування параметрів сушильної шафи

Обслуговуючі роботи після завершення виробництва кормів

AFISHE

Co-funded by the European Union

National University of Water and Environmental Engineering

Сертифікат

виданий

Сергію Кононцеву

учаснику тренінгу
забезпечення навчального
процесу в лабораторії IMTA
за проєктом Erasmus+ CBHE

AFISHE

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1,5 кредити ЄКТС (45 годин)

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та природокористування

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Координатор проєкту AFISHE
Начальник департаменту
міжнародних зв'язків
Вірменський національний
аграрний університет

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ ВОДНОГО ГОСПОДАРСТВА ТА ПРИРОДОКОРИСТУВАННЯ
02071116

1 листопада 2024

Теми тренінгу

Аналіз основних параметрів водного середовища

Налагодження та забезпечення роботи насосного та повітродувного обладнання

Автоматизація процесів рослинництва в ІМТА

Організація автоматизованої годівлі об'єктів аквакультури

Терморегуляція в замкнутому контурі лабораторної установки

Споруди механічної та біологічної очистки оборотної води

Інкубація молоді риби і вирощування на ранніх стадіях розвитку

Підготовка одиниць та основних інгредієнтів корму

Послідовність процесу запуску кормової лінії

Послідовність введення компонентів корму

Інструктаж про основні операції при виробництві екструдованих комбікормів

Налаштування подрібнювача і міксера

Налаштування екструдера та вибір матриці

Налаштування параметрів сушильної шафи

Обслуговуючі роботи після завершення виробництва кормів

Certificate

This is certify that

Hanna PETRENKO

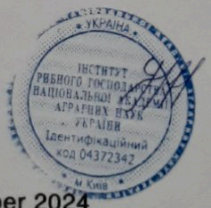
participated in the training at

INSTITUTE OF FISHERIES OF THE NATIONAL ACADEMY OF AGRARIAN SCIENCES OF UKRAINE

Trainings for not teaching staff to improve skills in working with laboratory equipment

Total time: 10 working days from 18.11.2024 - 28.11.24

Director of the institute
Academician of the National Academy
of Agrarian Sciences of Ukraine



Igor Hrytsyniak

November 2024

Certificate

This is certify that

Iryna Lobachova

participated in the training at

INSTITUTE OF FISHERIES OF THE NATIONAL ACADEMY OF AGRARIAN SCIENCES OF UKRAINE

«Trainings for not teaching staff to improve skills in working with laboratory equipment»

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Director of the institute
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Igor Hrytsyniak

November 2024