AQUAVET

INTRODUCING AQUAPONIC IN VET:
TOOLS, TEACHING UNITS AND TEACHER TRAINING

Result 6

Module guide for AQUACULTURE teaching material

Lifelong Learning Programme

Cross borders
Gather experience
Enhance knowledge

Stiftung für eidgenössische Zusammenarbeit
Fondation pour la collaboration confédérale
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Fundaziun per la collavuraziun federala

Didactical Guideline

Introduction

Overfishing of our oceans is a widely discussed topic in science, the media and in politics. In the European Union 23.1 kg fish and seafood are consumed per inhabitant per year (worldwide 18.9 kg, Switzerland 17.8 kg, Slovenia 10.9 kg and Italy 25.9 kg).[1] Around 80% of the fish and seafood that comes from Europe is from ocean catches.[2] But that only covers 45% of EU consumption, the rest is imported.[3] This puts pressure on certain fish species and ocean ecosystems, but also on our climate. Since the fish that is imported from outside Europe is transported for long distances, there are considerable CO_2 emissions.

One solution to these problems is aquaculture (farming) of fish. This takes away the pressure from marine ecosystems and because it is possible to operate aquaculture farms in every country, transport routes from producer to consumer can be shortened considerably. With the development of fish farms, new jobs can be created in countries that do not traditionally have large fisheries. Thus, aquaculture can positively contribute to ecological, social and economic aspects of sustainable development.

To achieve this, there is a need to educate professionals in the field of aquaculture. This module is divided into two levels. There are four units on a basic level, with presentations on fish, facility basics and water parameters, aquaculture systems and on fish diseases. They suit all VET levels. If more time is available or the level is too low, additional advanced level material is provided with the same thematic focus as the basic presentations; only more extensive. Additionally there are work sheets with exercises. They may be the same for both levels. In some cases the same content will be in a different presentation in the basic level compared to the advanced level. Therefore the same worksheet number might be found in a different unit number in the basic or advanced level. The goal is to give students the knowledge to be able to work in the field of aquaculture or even start their own production system.

Audience

VET students, VET teachers, VET schools and other institutions

Overview

This package contains the presentations for the lectures of the module “Aquaculture” as well as some work sheets with exercises. Below you will find a description of the units that are part of the lectures. The units and the corresponding presentations are divided into a basic and an advanced level. For each lecture learning outcomes are identified and teaching methods proposed. Each description mentions all the material that corresponds to the particular unit.

[1] European Commission (2014): *Facts and figures on the Common Fisheries Policy – Basic statistical data – 2014 Edition*. Luxembourg: Publications Office of the European Union.
[2] Ibid.: 20.
[3] Ibid.: 33.

Overview of available material in R6

R6: Teaching material for AQUACULTURE	Languages			
	EN	DE	SL	IT
BASIC UNITS				
Basic Unit 1 presentation: Fish	✓	✓	✓	✓
work sheet 1	✓	✓	✓	✓
work sheet 2	✓	✓	✓	✓
work sheet 3	✓	✓	✓	✓
work sheet 4	✓	✓	✓	✓
work sheet 9	✓	✓	✓	✓
Basic Unit 2 presentation: Facility Basics Water	✓	✓	✓	✓
work sheet 8	✓	✓	✓	✓
Basic Unit 3 presentation: Aquaculture Systems	✓	✓	✓	✓
Basic Unit 4 presentation: Fish Diseases	✓	✓	✓	✓
work sheet 5	✓	✓	✓	✓
work sheet 6	✓	✓	✓	✓
Handout: Fish Monitoring Manual	✓	✓	✓	✓
ADVANCED UNITS				
Advanced Unit 1 presentation: Fish Biology	✓			
work sheet 1	✓	✓		
work sheet 2	✓	✓		
work sheet 3	✓	✓		
work sheet 4	✓	✓		
Advanced Unit 2 presentation: Facility Basics	✓			
work sheet 7	✓	✓		
work sheet 8	✓	✓		
work sheet 9	✓	✓		
work sheet 10	✓	✓		
Advanced Unit 3 presentation: Aquaculture Systems	✓			
Advanced Unit 4 presentation: Fish Diseases	✓			
work sheet 5	✓	✓		
work sheet 6	✓	✓		
Handout: Fish Monitoring Manual	✓	✓		

General objectives

Students will:

- know the vocabulary of aquaculture.
- obtain and demonstrate technological knowledge and understanding of aquaculture systems.
- be able to deal with all aspects of aquaculture production.
- assess the value of aquaculture in terms of ecological, social and economic importance.

Basic Units and Objectives

Basic Unit 1:	**Fish**
Learning Outcome	Students will • be able to describe relevant aspects of fish biology (breathing, osmotic regulation, organs of perception, nutrition, behaviour and reproduction) • can illustrate different fish regions and their predominant species • know which aspects to consider when handling or harvesting the fish • (demonstrate the ability to handle and harvest fish)
Teaching methods	Teacher-centred instruction, exercises
Teaching material	Presentation 'Fish', work sheets 1 to 4 on fish biology and work sheet 9 on fish handling

Basic Unit 2:	**Facility basics and water parameters**
Learning Outcome	Students will • be able to explain which water parameters are essential for fish and need to be monitored • be able to design a protocol to measure important parameters • be able to use the measuring equipment
Teaching methods	Teacher-centred instruction, exercise
Teaching material	Presentation 'Facility Basics Water', work sheet 8 on facility basics

Basic Unit 3:	**Aquaculture production technology – a systems overview**
Learning Outcome	Students will • be able to give reasons for farming fish • recognize the ecological, social and economic value of fish farming • know about different aquaculture production systems • can discuss advantages and disadvantages of these systems
Teaching methods	Teacher-centred instruction, *exercise – specifications of fish species and location to let students plan their own system, excursion to an existing fish farm*
Teaching material	Presentation 'Aquaculture Systems'

Basic Unit 4:	Fish Diseases
Learning Outcome	Students will • know which factors influence the health of fish • be able to propose a treatment plan for diseased fish
Teaching methods	Teacher-centred instruction, exercises, *monitoring of fish*
Teaching material	Presentation 'Fish Diseases', work sheet 5 and 6 on prevention and treatment of diseases, Fish Monitoring Manual (handout)

Italic: suggestions for possible teaching methods.

Advanced Units and Objectives

Advanced Unit 1:	Fish Biology and Ecology
Learning Outcome	Students will • be able to describe relevant aspects of fish biology (breathing, osmotic regulation, organs of perception, nutrition, behaviour and reproduction) • be able to explain which water parameters are essential for fish • can plan the feeding regime • can illustrate different fish regions and their predominant species • be able to distinguish between potential fish species and their advantages and disadvantages
Teaching methods	Teacher-centred instruction, exercises
Teaching material	Presentation 'Fish Biology', work sheets 1 to 4 on fish biology

Advanced Unit 2:	Facility Basics
Learning Outcome	Students will • know what is needed to run a fish farm • identify the parameters that need to be monitored • to design a protocol to measure important parameters • be able to use the measuring equipment • know which aspects to consider when handling or harvesting the fish • (demonstrate the ability to handle and harvest fish)
Teaching methods	Teacher-centred instruction, exercises, group work - practical task (protocol keeping), *exercise fish handling, excursion to an existing fish farm*
Teaching material	Presentation 'Facility Basics', work sheets 7 to 9 on facility basics, exercise ammonia removal calculator (work sheet 10) (incl. excel sheet)

Advanced Unit 3:	**Aquaculture production technology – a systems overview**
Learning Outcome	Students will • know about different aquaculture production systems • can discuss advantages and disadvantages of these systems • be able to plan a system with given requirements and limitations
Teaching methods	Teacher-centred instruction, *exercise – specifications of fish species and location to let students plan their own system, excursion to an existing fish farm*
Teaching material	Presentation 'Aquaculture Systems'

Advanced Unit 4:	**Fish Diseases**
Learning Outcome	Students will • know which factors influence the health of fish and play a part in fish disease outbreaks • know about different fish diseases • can propose steps to take after a fish is diagnosed as ill • know whom to contact in case of disease
Teaching methods	Teacher-centred instruction, exercise, *practical task – organisation of fish farm or diagnosis of live/dead fish, practical examination of fish, monitoring of fish*
Teaching material	Presentation 'Fish Diseases', work sheets 5 and 6 on fish diseases, Fish Monitoring Manual (handout)

Italic: suggestions for possible teaching methods.

Basic Units

Teaching Material Basic Unit 1

Presentation 1 – Fish

Work sheet 1 – Fish biology – Gills

Work sheet 2 – Fish biology – Potential fish for aquaculture

Work sheet 3 – Fish biology – Organs of perception

Work sheet 4 – Fish biology – Habitat and Fish regions

Work sheet 9 – Facility basics – Fish handling

Teaching Material Basic Unit 2

Presentation 2 – Facility Basics Water

Work sheet 8 – Facility basics – System parameters

Teaching Material Basic Unit 3

Presentation 3 – Aquaculture Systems

Teaching Material Basic Unit 4

Presentation 4 – Fish Diseases

Work sheet 5 – Prevention and treatment of diseases – dealing with diseased fish

Work sheet 6 – Fish Diseases

Handout – Fish Monitoring Manual

Advanced Units

Teaching Material Advanced Unit 1

Presentation 1 – Fish Biology

Work sheet 1 – Fish biology – Gills

Work sheet 2 – Fish biology – Potential fish for aquaculture

Work sheet 3 – Fish biology – Organs of perception

Work sheet 4 – Fish biology – Habitat and Fish regions

Teaching Material Advanced Unit 2

Presentation 2 – Facility Basics

Work sheet 7 – Facility basics – The Aquaculture System

Work sheet 8 – Facility basics – System parameters

Work sheet 9 – Facility basics – Fish handling

Work sheet 10 – Facility basics – Ammonia Removal Calculator

Teaching Material Advanced Unit 3

Presentation 3 – Aquaculture Systems

Teaching Material Advanced Unit 4

Presentation 4 – Fish Diseases

Work sheet 5 – Prevention and treatment of diseases – dealing with diseased fish

Work sheet 6 – Fish Diseases

Handout – Fish Monitoring Manual