

**1. INFORMATION OF COURSE AND LECTURER**

- 1.1. Course name and code: Aquaculture Wetland Ecosystem Services
- 1.2. Course specification: 3 Cred. (Theory: 2; Assignment: 0; Practice: 1), 60 hours (T: 30; A: 0; P: 30)
- 1.3. Prerequisites courses: Water quality management in tropical aquaculture systems – **AQ...**, Aquatic resources management – **AQ...**
- 1.4. Responsible Department: Department of Aquaculture, Faculty of Agriculture and Natural Resources,
- 1.5. Information of lecturer:
  - Name: CHAU THI DA, Ph.D
  - Email: [ctda@agu.edu.vn](mailto:ctda@agu.edu.vn)
  - Co-teaching lecturer: (College of Aquaculture and Fisheries, Can Tho University)
  - Name : Assoc. Prof. Vũ Ngọc Út
  - Email: [vnut@ctu.edu.vn](mailto:vnut@ctu.edu.vn)

**2. COURSE DESCRIPTION**

Aquaculture wetland ecosystem services are to analyse how different aquaculture systems could be developed to maximize the benefits that society receives from both aquaculture production and the services provided by wetland ecosystems. It will illustrate that the integration and harmonization of aquaculture activity within the wider natural wetland ecosystems could be one of the main strategies to promote aquaculture production development through sustainable management of wetland ecosystem services to maximize food security and safety, and poverty reduction as well as strengthening the resilience of interlinked social systems by adapting to climate change situation. This can only be accomplished by good governance, policy, regulation, human resources development and capacity building, and improving livelihoods.

**3. COURSE EXPECTED LEARNING OUTCOMES**

The expected outcomes of this course will provide basic scientific knowledge to develop and implement an approach for enhanced use of ecosystem services for sustainable aquaculture production and wetland management.

*Theoretically:*

*This course will help both students, policy makers and managers to:*

- Understand the contexts of sustainable management of wetland, ecosystem services, and aquaculture production.
- Recognise the links between nature and development, it considers between environmental, wetland, aquaculture development and economic trade-off associated with development measures. To systematically incorporate ecosystem services opportunities and risk into planning and the development of strategies
- Provide methods and approaches for building aquaculture wetland ecosystem services.
- Develop scenarios for aquaculture production and sustainable wetland ecosystem services management
- Implement the integrating ecosystem services into development planning

*Practically:*

- Students will have at least 2 individual exercises and/or case study and they will present their report by using PowerPoint presentation in class during this course. Students have to submit their final report to lecturer. The topics of practice and exercise will be given by lecturer.

- Students will also be practiced by using GIS model and InVest model to develop scenarios of aquaculture production and wetland ecosystem services.

#### 4. COURSE CONTENTS

Chapters	Hours (T/A/P)
<p><b>Chapter 1: INTRODUCTION</b></p> <p><i>This chapter will provide scientific knowledge what are ecosystems and ecosystem services. This chapter will introduce ecosystem services as the link between ecosystem and human well-being and as the link aquaculture - wetland ecosystem services.</i></p> <p>1.1. Denification and classification of ecosystem, ecosystem services and ecosystem assessment</p> <p>1.2. Denification and classification of aquaculture wetland ecosystem services approach</p> <p>1.3. Key principles for ecosystem approach to aquaculture (EAA)</p> <p><i>In order to understand well this chapter, students should read the references <sup>(1)</sup>, <sup>(2)</sup>, <sup>(3)</sup></i></p>	2/0/2
<p><b>Chapter 2: Aquaculture wetland ecosystem services approach (AWESA).</b></p> <p><i>From the beginning of civilization, human existence has been dependent on Earth's ecosystems benefiting from the products of nature to nourish and shelter from harsh climates. Recognition of how ecosystems could provide more complex services to mankind dates back to more than 1600 years ago. Ecosystem services are defined as the "the benefits people obtain from ecosystems" (Millennium Ecosystem Assessment (MA, 2006), and these benefits may be substantial. Many wetlands in Southeast Asia region are now under increasing pressure to meet human food demand and food security and tend to be the most vulnerable to the damages caused by rapid population growth, climate change impacts, water and environmental pollution, degradation of wetland ecosystem services and upstream basin development activities such as dam construction.</i></p> <p><i>This chapter will provide scientific knowledge for students about aquaculture wetland ecosystem services approach (AWESA) that the</i></p>	6/0/6

<sup>1</sup> Ecosystems and human well-being, Millennium Ecosystem Assessment Board, ©World Health Organization 2005.

<sup>2</sup> Measuring and monitoring ecosystem services at site scale

<sup>3</sup> Building an ecosystem services approach to aquaculture, FAO Fisheries and Aquaculture Department 2007

*integration and harmonization of aquaculture activity within the wider natural wetland ecosystems could be one of the main strategies to promote aquaculture production development through sustainable management of wetland ecosystem services to maximize food security and safety, and poverty reduction as well as strengthening the resilience of interlinked social systems by adapting to climate change.*

2.1. Management of wetland ecosystem services for aquaculture production development

2.2. Water resources, water quality and environmental pollution management

2.3. Sustainable aquaculture farming for food production, security and safety

2.4. Capacity building through education, training and technology transfer

2.5. Social development and poverty reduction

*In order to understand well this chapter, students should read the references <sup>(3)(4)</sup>*

**Chapter 3: Integrating ecosystem services (IESS) into aquaculture development planning**

5/0/5

*People all over the world obtain numerous benefits from nature such as – for instance – fresh water, nutrition (animal, livestock, fish and other foods), or a great variety of raw materials. Without these ecosystem services social and economic development, and ultimately human progress and survival, would not be possible. Most individuals, households, businesses depend on some way on nature for their well-being and economic growth. However, if ecosystem services are overused and destroyed that eventually governments and societies will not be able to bear long-term economic and social costs and damage associated with the degradation of ecosystem and the loss of biodiversity. This chapter will provide knowledge and guide students on integrating ecosystem services into development planning and the aims of chapter are to assist students, project advisors, development planners, government in recognising the links between nature and development it considers between environmental, wetland, aquaculture development and economic trade-off associated with development measures and helps to systematically incorporated ecosystem services opportunities and risk into planning and the development of strategies*

3.1. Introduction and orientation how to use of stepwise guides

3.2. Understanding ecosystem services in a development context

3.3. Applying a stepwise approach ecosystem services into

<sup>4</sup> FAO (2010) Aquaculture Development Ecosystem approach to aquaculture. FAO, *Technical Guidelines for Responsible Fisheries* (ISSN 1020-5292), Rome

<p>development planning</p> <p>3.3. Glossary and references</p> <p>3.4. Useful information and tools for each stepwise approach</p> <p><b><i>Practic and exercise</i></b></p> <p><i>In order to understand well this chapter, students should read the references <sup>(5)</sup></i></p>	
<p><b>Chapter 4: Building ecosystem services approach to aquaculture</b></p> <p><i>An Ecosystem Services Approach to Aquaculture is a strategy for the integration of the activity within the wider ecosystem such that it promotes sustainable development, equity, and resilience of interlinked social-ecological systems</i></p> <p><i>This chapter will provide knowledge for student key guidelines and principles for the Implementation of an Ecosystem Services Approach to Aquaculture (EAA) that should ensure the contribution of aquaculture to sustainable development: i) aquaculture should be developed in the context of ecosystem functions and services with no degradation of these beyond their resilience capacity; ii) aquaculture should improve human well-being and equity for all relevant stakeholders; and iii) aquaculture should be developed in the context of (and integrated to) other relevant sectors.</i></p> <p>4.1. The Ecosystem Services Approach to Aquaculture (EAA) in practice: preparation and initiation</p> <p>4.2. Applying an ecosystem-based approach to aquaculture: principles, scales and some management measures</p> <p>4.3. Human dimensions of an ecosystem approach to aquaculture</p> <p>4.4. Economic implications of an ecosystem approach to aquaculture</p> <p>4.5. Legal implications of an ecosystem approach to aquaculture</p> <p>4.6. An ecosystem approach to marine aquaculture</p> <p>4.7. An ecosystem approach to freshwater aquaculture</p> <p>4.8. Ecosystem services generated by fish population</p> <p>4.9. Implementing the EAA: the plan</p> <p><b><i>Practic and exercise</i></b></p> <p><i>In order to understand well this chapter, students should read the references <sup>(3), (4)</sup></i></p>	6/0/6
<p><b>Chapter 5: Sanario aquaculture development and analysis for forward looking ecosystem assessments</b></p>	6/0/6

<sup>5</sup> Integrating ecosystem services into aquaculture development planning. A stepwise approach for practitioners based on the TEEB approach

<p><i>This chapter offers guidance on how to set up a scenarios exercise and how to develop, analysis, and use scenarios within ecosystem services assessment. It sets out to provide a detailed overview of all the important steps that need to be kept in mind when embarking on a scenario exercise, provide in-depth analysis and indispensable background material on all key decisions that need to be taken.</i></p> <p>5.1. Exploring the future with a scenario exercise of aquaculture production development</p> <p>5.2. Setting up a scenario exercise of aquaculture production development</p> <p>5.3. Scenarios development of aquaculture production development</p> <p>5.4. Aquaculture development scenarios analysis</p> <p>5.5. Use and communicate scenarios</p> <p><b><i>Practic and exercise</i></b></p> <p><i>In order to understand well this chapter, students should read the references <sup>(6)</sup></i></p>	
<p><b>Chapter 6: Assessing Intervention Strategies</b></p> <p><i>This chapter looks at the effectiveness of strategies that respond to the degradation of ecosystems that provide services to society. This section will provide knowledge that the choice among strategies inevitably involves trade-offs between competing objectives. The chapter offers at some techniques practitioners may use in evaluating such trade-offs. Then we consider several strategies that have already been used to address the gradation of ecosystems.</i></p> <p>6.1. How to choose from a menu of possible strategies</p> <p>6.2. How to resolve trade-offs</p> <p>6.3. How to confirm that the right strategy was chosen</p> <p>6.4. How to link assessment of responses to decision making</p> <p><b><i>Practic and exercise</i></b></p> <p><i>In order to understand well this chapter, students should read references <sup>(6)</sup></i></p>	5/0/5

## 6. TEACHING METHODS AND ASSESSMENT

### 6.1. Teaching methods:

Students have to learn equivalently about 30 hours for theory and including 30 hours for practice. Students will do at least 2 individual exercises and/or case study and will present their report in class during this course.

<sup>6</sup> Ecosystem and human well-being. A manual for assessment practitioners © 2010 Neville Ash, Hernán Blanco, Chaire Brown

## **6.2. Assessment methods:**

Student will be evaluated by 20% score from presentation, 30% score from practice and exercise; 50% score from final exam.

## **7. READING REFERENCES**

[1] Ecosystems and human well-being, Millennium Ecosystem Assessment Board, ©World Health Organization 2005.

[2] Measuring and monitoring ecosystem services at site scale

[3] Building an ecosystem services approach to aquaculture, FAO Fisheries and Aquaculture Department 2007

[4] FAO (2010) Aquaculture Development Ecosystem approach to aquaculture. FAO, Technical Guidelines for Responsible Fisheries (ISSN 1020-5292), Rome

[5] Integrating ecosystem services into aquaculture development planning. A stepwise approach for practitioners based on the TEEB approach

[6] Ecosystem and human well-being. A manual for assessment practitioners © 2010 Neville Ash, Hernán Blanco, Chaire Brown

*Date: 06<sup>th</sup> July 2015*

**Lecturer**

**CHAU THI DA Ph.D**