SWAP

Sustainable solid WAste management and Policies

Courses to be developed for TVET

Project Acronym	**SWAP**
Work Package	3
Deliverable	3.1
Deliverable Lead	RUA
Type	Report
Dissemination Level	Confidential
Contractual delivery date	M5-M15 (15/03/2021 – 15/11/2023)
Actual submission date	06/02/2023
Author(s)	Mr. Kim Soben, RUA Ms. Yutha Nida, RUA

HAMBURG UNIVERSITY OF TECHNOLOGY

Versions

Version	Date	Main Author	Summary of updates
V.1	20.12.2022	Mr. Kim Soben	First draft
V.2	06.02.2023	Mrs. Yutha Nida	Submitted
V.3	06.07.2023	Mr. Kim Soben and Mrs. Yutha Nida	Checked and re-submitted

ABSTRACT

Deliverable 3.1 of Work Package 3 of the SWAP project is to develop vocational education and training (TVET) courses following didactive approach from the respective ASEAN partners, including Cambodia (RUA and UHST), Thailand (CMU and MJU), and Vietnam (TUAF and HUAF).

KEYWORDS

TVET, waste management, didactive approach

DISCLAIMER

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

ACKNOWLEDGEMENT

This document is a deliverable of the SWAP project. This project is co-funded by the Erasmus+ Programme of the European Union under the call for proposals EAC/A02/2019 and carries the project n° 618723-EPP-1-2020-1-DE-EPPKA2-CBHE-JP.

Table of Contents

1 TVET Products for Waste Management

TVET, The Technical and Vocational Education and Training of SWAP was starting training on September 7th until 10th the SWAP consortium met for the first time in a hybrid format - with physical participation at the Polytechnic University of Bari and virtual participation via Zoom. One of the goals of WP3 is to develop TVET products for waste management domain. In order to do so, the information and results provided by WP1 were evaluated and processed in order to identify the optimum structure and expertise level of the TVET products. Two workshops for defining TVET educational products were implemented at POLIBA and EUROTRAINING in order to define the details of the TVET products. During the workshops, it presented successful TVET products in EU and how they correlated with industrial needs in waste management. In the workshop, the consortium discussed and decided which was the best approach taking into consideration the main problems which exist in Asia countries in this field.

The main aim of this WP3 is to build the capacities of Partner Countries HEIs with regard to practitioners training to provide better and practice-oriented education in the field of sustainable solid waste management and valorisation (contribution to objective 5 and 6). In addition, linking HEIs delivering TVET and Universities, since it will strengthen exchange and cooperation within as well as outside the region. Therefore, WP3 will run in synergy with WP2 with the aim to building capacity of HEIs currently offering TVET programmes, not still addressing sustainable solid waste management.

2 Selected TVET products

Based on the results of the deliverable D1.1 from the WP1, and following a conducted survey of Universities and Stakeholders in the Asian partner countries (Cambodia, Thailand, Vietnam), by Thai Nguyen University of Agriculture and Forestry (TUAF). The results indicated that the numbers of course need to fill in the gaps by providing the courses related and linked to the curriculums. Also, TVET program should include gaps in training and teaching such as Innovation technologies for waste management, national and international research collaboration among HEIs in the field of solid waste management, R&D National Capacity and roles of private sectors, and financial and resources for research in waste management at HEIs.

For the gaps in training and teaching capacities and possible improvement options of TVET program where all ASEAN HEIs would need to improve the capacity their students through providing internship programme at private sector or NGOs related fields. Finally, the highlighted courses to fill in the gaps in training and teaching will support and improve more for TVET program.

The Sustainable Solid WAste Management and Policies (SWAP) project aims to increase the capacity for employees by improving the quality of training in this field within vocational training institutions.

To achieve this goal, the project is to design and develop new modules for TVET program. Creating modules requires a lot of work, time and must be carefully planned to cover all the topics and provide appropriate information to students.

Here, it presents the educational products developed are ccountry-specific, taking into consideration the local specificities of each University involved.

During the workshop in Vietnam and Cambodia, the partners from Asian and EU discssed the strucuture of these TVET materials and the level of their exertise to support curriculum. They also took into accounts the needs and gaps identified throught the results of the survey in D1.1. The course strucutre of the modules were created with the support from partners. Considering the need for each university, TVET program was difined during the meeting in Bari, Italy. All relevant tops were combined to exchange know-how, practice example, and best practices applied in EU partners for development of new models on sustianable waste management and policies in Asian parnters.

The curriculum was planned to implement in students at TVET program, aiming to improve students' skills on Advanced Waste Management Aspects in a Circular Economy, in order to create a strong connection between the TVET students and the industrial sector, and enable them distribute their knowledge in the working field.

Following the Annex with the 3 modules, in order to illustrate their structure and learn more information about the content.

3 Proposed topics for TVET modules

MODULE TITLE	Introduction to Sustainable Solid Waste Management and cirucular economy	**MODULE LEVEL/ECTS**	TVET
MODULE DESCRIPTION			
LECTURER			
PRE- REQUISITES			
DURATION	Lecture time in total: hours		
TOTAL STUDENT STUDY TIME	NA		
DIDACTICAL APPROACH	In person or remotely with the support of power point presentations		
AIMS	NA		
LEARNING CONTENTS	1. Introduction to Waste Management and Circular Economy 2. Waste management and treatment technologies 3. Green business models and entrepreneurship in the SWM sector 4. Practical course: biowaste treatment operation 5. Practical course: recycling E-Waste 6. Practical course: SW characterization and sorting		
LEARNING OUTCOMES			
TARGET GROUP			

SWAP

Sustainable solid WAste management and Policies

COURSE TO BE DEVELOPED FOR TVET

RUA

Project Acronym	**SWAP**
Work Package	WP3
Deliverable	D3.1
Deliverable Lead	RUA
Type	Report
Dissemination Level	Confidential
Contractual delivery date	M8 (15/08/2021)
Actual submission date	07/06/2023
Author(s)	Kim Soben, Yutha Nida

HAMBURG UNIVERSITY OF TECHNOLOGY

Versions

Version	Date	Main Author	Summary of updates
1	29/12/2022	Yutha Nida	First draft
2	07/06/2023	Kim Soben and Yutha Nida	Verified and submitted

ABSTRACT

This report is intended to support to the deliverable 3.1 of Work Package 3, which led by RUA to develop a TVET course under the SWAP's project. It covers content such as 1. introduction, 2. prerequisites, 3. learning outcomes, 4. learning content, delivery methods, duration of the training and assessment. This module, designed for the TVET program's level, aims to profound understand of waste management including management and technical issues, and guide to practice waste management implementation. This is a creative course for students to think about solving waste problems. It also attempts to build the basic knowledge on solid waste management, with the lectures focusing on definitions and key terms. It is included several lectures with a wide range of topics which related to solid waste management in terms of reuse, reduction, recycling and upcycling, etc.

KEYWORDS

TVET courses, RUA, compost

ACKNOWLEDGEMENT

This document is a deliverable of the SWAP project. This project is co-funded by the Erasmus+ Programme of the European Union under the call for proposals EAC/A02/2019 and carries the project n° 618723-EPP-1-2020-1-DE-EPPKA2-CBHE-JP.

Table of Contents

1.1 Prerequisites

There is no prerequisite required.

1.2 Course Objectives

- To enhance participants' knowledge and skills in sustainable waste management; introduce them to the concept of waste management, waste characterisation and sorting, minimising landfill and recycling options;
- Demonstrate practical exercises on compost making and visit a recycling company near the university;

1.3 Learning outcomes

After completion of the course, trainee will be able to:

- General knowledge of waste management in Cambodia and the recycling of waste for profit;
- Be able to characterize and short waste at household level in order to minimise the amount of waste and prolong the landfill age
- Be able to produce good quality of compost from the decomposed waste in households and farms;

1.4 Learning contents

- General situation of waste management
- Law and regulation related to waste management
- Waste management issues
- Technical issue in waste management
- Available best options for waste management; including compost making
- Study visit

1.5 Delivery method and duration of the teaching

This TVET is required 2 days which detail schedule will be shown as below:

Day	Time	Deliverable Methods	Duration (hour)
1	8:00-12:00	• General situation of waste management • Law and regulation related to waste management	4h
	14:00-17:00	• Waste management issues • Technical issue in waste management	3h
2	8:00-12:00	• Available best options for waste management • Practical on compost making	4h
	14:00-17:00	• Study visit	3h

1.6 Assessments

Trainees will be evaluated through pre- and post-test. At least 80% of knowledge and skill improve with the very satisfaction to be pass and receive certificate of completion.

SWAP

Sustainable solid WAste management and Policies

D3.1: UHST's courses to be developed for TVET

Project Acronym	**SWAP**
Work Package	WP3
Deliverable	D3.1
Deliverable Lead	RUA
Type	Report
Dissemination Level	Confidential
Contractual delivery date	M8 (15/08/2021)
Actual submission date	25/04/2023
Author(s)	MEAS SREYLEN&TIM SAMNANG, UHST

Versions

Version	Date	Main Author	Summary of updates
1	20/11/2022	MEAS SREYLEN&TIM SAMNANG, UHST	Meeting with team work with designed TVET Course Syllabus
2	02/02/2023	MEAS SREYLEN&TIM SAMNANG, UHST	Meeting with TVET for integrated SWM Course and updated TVET Course Outline.
3	29/04/2023	MEAS SREYLEN&TIM SAMNANG, UHST	Rechecked & Submitted

ABSTRACT

This report is to provide information and details of TVET courses that have been planned to be organized by UHST. All important information, i.e., prerequisites, learning outcomes, learning contents, delivery methods, and duration of the teaching and assessments, are described.

KEYWORDS

UHST; TVET courses

DISCLAIMER

ACKNOWLEDGEMENT

This document is a deliverable of the SWAP project. This project is co-funded by the Erasmus+ Programme of the European Union under the call for proposals EAC/A02/2019 and carries the project n° 618723-EPP-1-2020-1-DE-EPPKA2-CBHE-JP.

Table of Contents

1 Introduction

Regarding the developed TVET materials, UHST team members have considered and decided to utilize 1 Course (Sustainable Solid Waste Management) integrated into the TVET Program Year 2 Semester 2 with a total of 16 hours (Theory 50% and Practical 50%).

The purpose of this Sustainable Solid Waste Management lesson is to help students develop a decision support system for sustainable municipal solid waste management, applied to solving the problem, including cost minimization, landfill minimization, emission minimization, and capacity-building resources for keeping disposal facilities to determined incineration, anaerobic digestion, sanitary landfill, and recycling activities.

1.1 Prerequisites

There is no prerequisite required. The course is considered the fundamental knowledge for solid waste management.

1.2 Course Objectives

- To develop a decision support system for sustainable municipal solid waste management
- To apply for solving the problem, including cost minimization, landfill minimization, and emission minimization
- To capacity building resources for keeping disposal facilities to determined incineration, anaerobic digestion, sanitary landfill, and recycling activities

1.3 Learning outcomes

After completion of the course, students are expected to be able to:

- Identify, quantify, verify, and coordinate waste to comply with legislative requirements for waste management services, systems, and facilities.
- Plan, design, implement and advance waste management projects, following legislative requirements, standard procedures, and best practices.
- Utilizing the principles of the circular economy, investigate the life cycle of consumable products and packaging to recommend options that assist businesses and industry to meet or exceed legislation, including waste minimization, product reuse, and enhanced recycling.
- Collect data and apply appropriate statistical tools and methodologies to interpret and process information effectively.
- Research, present, and produce reports that successfully communicate and engage various stakeholders in constructive discussions to address waste management prospects.
- Apply financial methods and procedures to substantiate costs and solicit support for environmental compliance and waste management initiatives.

- Educate and inform various audiences in areas of waste diversion and management using appropriate educational strategies and techniques.
- Collect, classify, and preserve field samples using appropriate air, water, and soil quality testing equipment.

1.4 Learning contents

- Introduction to waste management
- Current Status of Solid Waste Management Practices
- Integrated Solid Waste Management Based on the 3R Approach
- Types of Waste and Municipal Waste Composition
- Waste Recycling Technology (Organic Waste, Plastic Waste, Paper Waste…)
- Solid Waste Management Infrastructures (tools and equipment, transfer station, …)
- Current Law and Regulation Relating to Solid Waste Management

1.5 Delivery method and duration of the teaching

The presentation of each item will be based on real cases. The teaching is based on the student center approach, which combines theoretical and practical learning of students. The training requires 16 hours. The schedule of the teaching is shown in Table 1.

Table 1. Teaching Schedule

Week	Time	Content	Duration
1	8:00-10:00 AM	**Lesson 1: Introduction Waste Management and Circular Economy (important for VN: Eco-industrial parks, see report in the literature folder*)** 1.1 Definition of Waste and solid waste 1.2 How material becomes waste? 1.3 The 7 Facts about MSW 1.4 Source of Waste **Lesson 2: Waste types, streams, characterization, and waste analysis** 1.1 Types of solid waste by sector 1.2 Types of waste by Physical characteristic 1.3 Why use waste? 1.4 Type of Municipal solid waste	2hours
2	8:00-10:00	**Lesson 3: Waste collection, transportation, and transfer** 1.1 Waste collection	2hours

		- Waste collection Role - Waste collection systems 1.2 Waste collection system classification - State of the art - Waste collection system types **Lesson 5: Overview of recyclable waste treatment technologies** 1.1 Separate wastes 1.2 3Rs Tips on reducing waste and conserving resources 1.3 How to recycle wastes	
	2:00-4:00	Practice How to separate wastes	2hours
3		**Lesson6: Biomass** 1.1 Definition and characterization of biomass 1.2 Types of biomass 1.3 How to make biomass from solid waste 1.4 Advantages and disadvantages of biomass **Lesson 7: Residual waste treatment and Recovery** 1.1 Waste Hierarchy Principle 1.2 Preparing for reuse 1.3 Recycling 1.4 Another recovery 1.5 Compost (types and how to make compost) **Lesson 8: Landfill** 1.1 Definition of landfill 1.2 Construction of Landfill 1.3 Landfill gas 1.4 Advantages and disadvantages of Landfill	2hours
	2:00-5:00	Practice to do compost	3 hours
4	8:00-9:00	**Lesson 9: Economic aspects in waste management** 1.1 Waste collection costs (investment costs and operating and maintenance costs) 1.2 Financial Concerns about waste management systems and Instruments of waste policy	2 hours

		1.3 Public and Private sector financing **Lesson10: Environment, safety, and health in solid waste management, occupational health** 1.1 Environmental Context of Twenty-First Century 1.2 Climate change 1.3 Globalization and economic growth 1.4 Adaptive management strategies for waste collection	
	2:00-5:00	Check and observe the compost from the plant	3

1.6 Assessments

Students will be evaluated resorting to:

1. Assessment for Learning: Quiz, Homework, Assignment, Presentation, Group work, Pair work, Individual work and e-Portfolio, Reflection.
2. Assessment of Learning: Final exam, Proficiency Test, and Exit Test.
3. Assessment as Learning: Self-study, self-reflection, teacher feedback

SWAP

Sustainable solid WAste management and Policies

D3.1: CMU's courses to be developed for TVET

Project Acronym	**SWAP**
Work Package	WP3
Deliverable	D3.1
Deliverable Lead	RUA
Type	Report
Dissemination Level	Confidential
Contractual delivery date	M8 (15/08/2021)
Actual submission date	23/02/2023
Author(s)	PATIROOP PHOLCHAN, CMU

Versions

Version	Date	Main Author	Summary of updates
1	23/02/2023	PATIROOP PHOLCHAN, CMU	

ABSTRACT

This report is to provide information and details of TVET courses that have been planned to organised by CMU. All important information, i.e. prerequisites, learning outcomes, learning contents, delivery methods and duration of the training and assessments, are described.

KEYWORDS

CMU; TVET courses

DISCLAIMER

ACKNOWLEDGEMENT

This document is a deliverable of the SWAP project. This project is co-funded by the Erasmus+ Programme of the European Union under the call for proposals EAC/A02/2019 and carries the project n° 618723-EPP-1-2020-1-DE-EPPKA2-CBHE-JP.

Table of Contents

1 Introduction

Regarding to the developed TVET materials, CMU team members have considered and come up with the decision to utilise 2 topics as follows:

- Solid Waste Characterization and Sorting
- Bio-waste Treatment

Solid Waste Characterization and Sorting is chosen as it is the most important basis for solid waste management. For those who wish to be in solid waste management business, characterization and sorting are the way to know the potential raw material to do the economic analysis or to make investments in new technologies. Moreover, trainees can also have a site visit at CMU's Solid Waste Management Centre, where the sorting activities, both manually and mechanically, and utilisations can be observed and learnt. As the main component of Thailand's solid waste is organic wastes, Bio-waste treatment can be a very important method to make use of the sorted organic fractions. Products, i.e. compost and/or biogas, obtained from bio-waste treatment have considerable added values which would make the system more feasible. Each topic will be taught individually, making two separately available courses. Details of each course can be shown as follows:

1.1 Solid Waste Characterization and Sorting

The course will give trainees general knowledges of solid waste compositions. Examples of solid waste collection and sorting in Germany and Thailand are then explained along with the sorting results. Activities and possible site visits are also included.

1.1.1 Prerequisites

There is no prerequisite required. The course is considered as the fundamental knowledge for solid waste management.

1.1.2 Learning outcomes

After completion of the course trainees will be able to:

- Properly sort the mixed solid waste into each component.
- Assess the potential, e.g. amounts and values, of solid waste component recycling.

1.1.3 Learning contents

- Introduction to solid waste management
- Solid waste compositions
- Mixed solid waste sorting
- Analysis for solid waste component recycling
- Workshop: Mixed solid waste sorting
- Site visit: CMU's solid waste management centre

1.1.4 Delivery method and duration of the training

The training requires 1.5 days. Schedule of the training is shown in Table 1.

Table 1. Training Schedule

Day	Time	Delivery methods
1	09:00-12:00	Lecture: •Introduction to solid waste management •Solid waste compositions •Mixed solid waste sorting •Analysis for solid waste component recycling
	13:30-16:30	Workshop: •Mixed solid waste sorting
2	09:00-12:00	Site visit: •CMU's solid waste management centre

1.1.5 Assessments

Results of the course will be assessed using the pre- and post-tests. At least 60% improvement in the score of the post-test compared to that of the pre-test or the attainment of 80% or more of the full score is required for a trainee to be considered as "satisfaction" and will receive a certificate.

1.2 Bio-waste Treatment

Principles of organic wastes and options for utilization are explained in this course. Details, both in theory and practice, of organic waste composting and anaerobic digestion are elucidated. Also, a practical task for composting is included.

1.2.1 Prerequisites

It is recommended that trainees should have taken the TVET course "Solid Waste Characterization and Sorting " before taking this course. However, the fundamental knowledge of solid waste management can be offered, if required, for those who wish to take this course straightaway.

1.2.2 Learning outcomes

After completion of the course trainees will be able to:

- Perform the necessary calculations for composting and anaerobic digestion of organic fraction of solid waste.
- Conduct the composting process for the household organic waste.

1.2.3 Learning contents

- Principle of organic waste
- Organic waste utilisation

- Composting
- Anaerobic digestion
- Workshop: Composting of household organic waste

1.2.4 Delivery method and duration of the training

The training requires 1.5 days. Schedule of the training is shown in Table 1.

Table 2. Training Schedule

Day	Time	Delivery methods
1	09:00-12:00	Lecture: • Principle of organic waste • Organic waste utilisation •Composting
	13:30-16:30	Lecture: • Anaerobic digestion Workshop: •Preparation of the composting bin
2	09:00-12:00	Workshop: •Composting of household organic waste

1.2.5 Assessments

Results of the course will be assessed using the pre- and post-tests. At least 60% improvement in the score of the post-test compared to that of the pre-test or the attainment of 80% or more of the full score is required for a trainee to be considered as “satisfaction” and will receive a certificate.

SWAP

Sustainable solid WAste management and Policies

D3.1: MJU's courses to be developed for TVET

Project Acronym	**SWAP**
Work Package	WP3
Deliverable	D3.1
Deliverable Lead	RUA
Type	Report
Dissemination Level	Confidential
Contractual delivery date	M8 (15/08/2021)
Actual submission date	24/02/2023
Author(s)	MUJALIN PHOLCHAN, MJU

Versions

Version	Date	Main Author	Summary of updates
1	24/02/2023	MUJALIN PHOLCHAN,MJU	

ABSTRACT

This report is to provide information and details of TVET courses that have been planned to organised by MJU. All important information, i.e. prerequisites, learning outcomes, learning contents, delivery methods and duration of the training and assessments, are described.

KEYWORDS

MJU; TVET courses

DISCLAIMER

ACKNOWLEDGEMENT

This document is a deliverable of the SWAP project. This project is co-funded by the Erasmus+ Programme of the European Union under the call for proposals EAC/A02/2019 and carries the project n° 618723-EPP-1-2020-1-DE-EPPKA2-CBHE-JP.

Table of Contents

1 Introduction

Regarding to the developed TVET materials, Two topics which are 1) Solid Waste Characterization and Sorting, and 2) Bio-waste Treatment will be used for MJU TVET course. The first subject is a crucial step for solid waste management and the data obtained can be further applied for the evaluation of the effectiveness of the collection waste system, the design for waste recycling and waste treatment process and also the economic and investment for waste management business. The second subject, biotreatment, is also another important issue for Thailand, where having wide variety of organic waste and food waste. By products, i.e. compost and/or biogas, obtained from bio-waste treatment process have gained a lot of interest and economic benefit. However, each topic will be taught individually, making two separately available courses. Details of each course can be shown as follows:

1.1 Solid Waste Characterization and Sorting

This course aims to provide both basic knowledges of solid waste compositions and practical tasks on waste sorting. Examples of solid waste collection and sorting in Thailand and Germany are then explained along with the sorting results. Activities and possible site visits are also included.

1.1.1 Prerequisites

There is no prerequisite required. The course is considered as the fundamental knowledge for solid waste management.

1.1.2 Learning outcomes

After completion of the course trainees will be able to:

- Properly sort the mixed solid waste into each component.
- Calculate important parameters, e.g. weight, bulk density, volume, waste fraction.
- Assess waste components for recycling and waste management strategy.

1.1.3 Learning contents

- Introduction to solid waste management
- Solid waste compositions
- Mixed solid waste sorting
- Analysis for solid waste component recycling
- Workshop: Mixed solid waste sorting

1.1.4 Delivery method and duration of the training

The training requires 1.5 days. Schedule of the training is shown in Table 1.

Table 1. Training Schedule

Day	Time	Delivery methods
1	8.30-9.00	Pre-test
	09:00-12:00	Lecture: •Introduction to solid waste management

		•Solid waste compositions •Mixed solid waste sorting •Analysis for solid waste component recycling
	13:30-16:30	Workshop: •Mixed solid waste sorting
2	09:00-11:00	Group discussion
	11.00-12.00	Post-test

1.1.5 Assessments

Results of the course will be assessed using the pre- and post-tests. At least 80% improvement in the score of the post-test compared to that of the pre-test is required for a trainee to be considered as "satisfaction" and will receive a certificate.

1.2 Bio-waste Treatment

Principles of organic wastes and bio-waste utilization technology are explained in this course. Details, both in theory and practice, of organic waste composting, anaerobic digestion and biochar are described and discussed. Also, a practical task for composting is included.

1.2.1 Prerequisites

It is recommended that trainees should have taken the TVET course "Solid Waste Characterization and Sorting " before taking this course. However, the fundamental knowledge of solid waste management can be offered, if required, for those who wish to take this course straightaway.

1.2.2 Learning outcomes

After completion of the course trainees will be able to:

- Explain and discuss basic theory of bio-waste characteristics and bio-waste treatment
- Perform the necessary calculations for composting and anaerobic digestion of organic fraction of solid waste.
- Conduct the composting process for the household organic waste.

1.2.3 Learning contents

- Principle of organic waste
- Organic waste utilisation
- Composting
- Anaerobic digestion
- Workshop: Composting of household organic waste

1.2.4 Delivery method and duration of the training

The training requires 2 days. Schedule of the training is shown in Table 1.

Table 2. Training Schedule

Day	Time	Delivery methods
1	08.30-09.00	Pre-test
	09:00-12:00	Lecture: • Principle of organic waste • Organic waste utilisation
	13:30-16:30	Lecture: • Principle of Anaerobic digestion • Principle of Composting • Principle of Biochar
2	09:00-12:00	Workshop: •Preparation of the composting bin
	13.00-16.00	•Composting of household organic waste
	16.00-16.30	Post-test

1.2.5 Assessments

Results of the course will be assessed using the pre- and post-tests. At least 80% improvement in the score of the post-test compared to that of the pre-test is required for a trainee to be considered as "satisfaction" and will receive a certificate.

SWAP
Sustainable solid WAste management and Policies

SWAP
Sustainable solid WAste management and Policies

COURSES TO BE DEVELOPED FOR TVET

Project Acronym	**SWAP**
Work Package	WP 3
Deliverable	D 3.1
Deliverable Lead	RUA
Type	Report
Dissemination Level	Department/Faculty
Contractual delivery date	M8 15/03/2022
Actual submission date	20/01/2023
Author(s)	Hoang Thi Thai Hoa and Le Thi Thuy Hang (HUAF)

Versions

Version	Date	Main Author	Summary of updates
V0	20/01/2023	Hoang Thi Thai Hoa	First draft
V2	05/02/2023	Le Thi Thuy Hang	Check

ABSTRACT

Course on Agricultural waste utilization into organic fertilizer for crop production was conducted to provide general and in-depth knowledge about the process to make organic fertilizer from agricultural wastes and use it for crops in a safe and sustainable manner. Each course includes 2 days with 3 chapters on (1) the overview and situation of using agricultural wastes for organic fertilizer in Vietnam, (2) principles and methods how to make agricultural wastes into organic fertilizer, (3) how to use organic fertilizer for crops and practice.

KEYWORDS

Agricultural waste, crop production, organic fertilizer, TVET, Thua Thien Hue province

ACKNOWLEDGEMENT

This document is a deliverable of the SWAP project. This project is co-funded by the Erasmus+ Programme of the European Union under the call for proposals EAC/A02/2019 and carries the project n° 618723-EPP-1-2020-1-DE-EPPKA2-CBHE-JP.

Table of Contents

OUTLINE OF TVET COURSE ON AGRICULTURAL WASTE UTILIZATION INTO ORGANIC FERTILIZER FOR CROP PRODUCTION

1. Prerequisites

Not applied.

2. Learning objective

To provide general and in-depth knowledge about the process to make organic fertilizer from agricultural wastes and use it for crops in a safe and sustainable manner.

3. Learning outcomes

+ Knowledge: on the situation of agricultural wastes in Vietnam, the role of organic fertilizer in agricultural production and environment, how to make agricultural wastes into organic fertilizer and how to use organic fertilizer for crops.

+ Skills: on making organic fertilizer from agricultural wastes, applying organic fertilizer from agricultural wastes for crops, having ability to work independently and in a team.

4. Learning contents

Chapter	Content	Hours
A	**Theory part**	**8.0**
Chapter 1	**The overview and situation of using agricultural wastes for organic fertilizer in Vietnam**	**1.0**
1.1.	The situation of agricultural wastes in Vietnam	0.1
1.2	Using of agricultural wastes for organic agriculture in Vietnam	0.2
1.3	Situation of organic fertilizer production in Vietnam	0.3

1.4	The role of organic fertilizer	0.2
1.5	Group discussion and assignment	0.2
Chapter 2	**Principles and methods how to make agricultural wastes into organic fertilizer**	**5.0**
2.1	Classification of organic fertilizer	0.5
2.2	The physicochemical basis of the composting process	0.5
2.3	Controlling the composting process	0.5
2.4	Traditional organic fertilizer production process	1.5
2.5	Industrial organic organic fertilizer production process	1.0
2.6	Evaluation on quality of organic fertilizer	0.5
2.7	Group discussion and presentation	0.5
Chapter 3	**How to use organic fertilizer for crops**	**2.0**
3.1	Use of organic fertilizers to improve soil properties	0.5
3.2	Use of organic fertilizers in nurseries	0.3
3.3	Use organic fertilizers for crops: food crops, vegetables,…	0.7
3.4	Group discussion and presentation	0.5
B	**Practise part**	**8.0**
1	Preparation, classification of wastes for organic fertilizer	2.0
2	How to make wastes into organic fertilizer	4.0
3	How to apply organic fertilizer from wastes for crops	2.0

5. Duration of the training

2 days/class

6. Methodology of deliverable the TVET

Handout, lecturing, practice, group discussion

7. Assessment

+ Presentation results from group discussion.

+ Report

+ Direct evaluation in practice.

Annexes

Co-funded by the Erasmus+ Programme of the European Union

SWAP
Sustainable solid WAste management and Policies

SWAP
Sustainable solid WAste management and Policies

COURSES TO BE DEVELOPED FOR TVET

Project Acronym	**SWAP**
Work Package	WP 3
Deliverable	D 3.1
Deliverable Lead	RUA
Type	Report
Dissemination Level	Department/Faculty
Contractual delivery date	
Actual submission date	
Author(s)	Nguyen Duy Hai and Truong Thi Anh Tuyet (TUAF)

Versions

Version	Date	Main Author	Summary of updates
V.1	20/02/2023	Nguyen Duy Hai	First draft
V.2	05/03/2023	Truong Thi Anh Tuyet	Check

ABSTRACT

Compost can be produced and used on the farm as a valuable soil amendment, capable of providing not only a source of slow-release nutrients for crops, but also a way to improve soil structure, increase soil moisture-holding capacity, promote biological activity to enhance plant nutrient availability, suppress weeds, and even help combat some plant diseases. The two-day training course presented and developed in this course both theory and practical skills in composting. At the end of this training course, the participants will take away an understanding of composting principles, composting methods, and basic training techniques to effectively transfer this practical skill to others.

KEYWORDS

- Agricultural wastes
- Compost-making
- Crop protection
- Sustainable crop production

DISCLAIMER

ACKNOWLEDGEMENT

This document is a deliverable of the SWAP project. This project is co-funded by the Erasmus+ Programme of the European Union under the call for proposals EAC/A02/2019 and carries the project n° 618723-EPP-1-2020-1-DE-EPPKA2-CBHE-JP.

Table of Contents

OUTLINE

TVET Course on Utilizing Agricultural Waste-Derived Compost to Boost Crop Productivity

1. Prerequisites

Not applied.

2. Learning objective

To provide general and in-depth knowledge about the process to make compost derived from agricultural wastes and use it for crops in safety and sustainability.

In detail:

- *Understand what compost is and what the benefits are*
- *Select appropriate materials for composting*
- *Build a compost heap*
- *Agricultural wastes-derived compost application*

3. Learning outcomes

+ Knowledge: on the situation of agricultural wastes in Vietnam, the role of decomposers in agricultural waste management and environment, how to make compost sourced form agricultural wastes and how to use it for crops.

+ Skills: on making and applying agricultural wastes-derived compost for crops, having the ability to work independently and in a team.

4. Learning contents

Chapter	Content	Hours
A	**Theory part**	**8.0**
Chapter 1	**The overview of using agricultural wastes-derived compost in Vietnam**	**1.0**
1.1.	The situation of agricultural wastes in Vietnam	0.1
1.2	Definition of composting	0.2
1.3	Type and situation of compost products in Vietnam	0.3
1.4	Using of compost for crop in Vietnam *(How compost is used?).*	0.2
1.5	Group discussion and assignment	0.2
Chapter 2	**Principles and methods how to build up compost**	**5.0**
2.1	Classification of agricultural waste and others	0.5
2.2	The physicochemical basis of the composting process	0.5
2.3	Controlling the composting process	0.5
2.4	Building a compost heap	2.5
2.5	Evaluation on quality of agricultural wastes-derived compost *(pH, OM, NPK)*	0.5
2.6	Group discussion and presentation	0.5
Chapter 3	**How to use agricultural wastes-derived compost for crops**	**2.0**
3.1	Use of agricultural wastes-derived compost to improve soil quality *(nutrients and organic matter).*	0.5
3.2	Using compost to help combat some plant diseases and suppress weeds	0.3
3.3	Practical tips for on-farm production and farmers	0.7
3.4	Group discussion and presentation	0.5

B	**Practise part**	**8.0**
1	Preparation, classification of agricultural wastes for compost-making	2.0
2	How to build a compost heap	4.0
3	How to apply agricultural wastes-derived compost for crops	2.0

5. Duration of the training

2 days/class

6. Methodology of deliverable the TVET

- Handout, lecturing, practice, group discussion
- Crop-modelling, imaging, and video clip

7. Assessment

+ Presentation results from each group discussion.
+ Report
+ Direct evaluation in practicing.

Annexes: FEEDBACK / EVALUATION

FEEDBACK / EVALUATION

Training Course: Compost – Train the Trainer/Student/Farmer

Date:

Trainer:

Location:

1. Was the level of material presented *(circle one answer)*

Too simple About right Too complicated Other (please specify)

Comments: _____

2. Was the length of the training course (circle one answer)

Too short About right Too long Other (please specify)

Comments: _____

3. Overall how would you rate the trainer (circle one answer)

Poor OK Good Excellent Other (please specify)

Comments: _____

4. What did you enjoy most about the training?

_____

5. What would you suggest could be improved?

_____

6. Please make any other comments/suggestions:

_____

Thank you for your time and input!