



Module No4: Sustainability and consumption. The limits of the planet.



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



Living well, within the limits of our planet



Overview

Sustainable lifestyles	Responsible consumption and production (SDG12)
 Modern European lifestyles are unsustainable in many ways More efforts are required to enable further behaviour change and lifestyle options that support a sustainable future 	 This goal aims to ensure sustainable consumption and production patterns Sustainable consumption and production is about doing more and better with less
 Circular economy places resource efficiency at the centre of economic decision-making and practice Agriculture is a key sector to achieve the goals of circular bio-economy 	 The need for rational use of energy in agriculture is an important issue There are techniques available, the application of which can contribute to the reduction of energy consumption
The role of agriculture in the circular bio-economy	Energy control in greenhouse cultivations





Topics







01

Sustainable lifestyles





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Overview

Sustainable consumption is related to the purchase, use, and disposal of products and services.

Sustainability in lifestyles is a broader concept and includes activities such as interpersonal relationships, leisure activities, sports, and education, and of course consumption of materials.



Modern European lifestyles are unsustainable in many ways and are based on overproduction and overconsumption, putting too much pressure on natural resources and inducing negative environmental, economic, social, and health impacts.

Key challenges and impacts can be identified in four lifestyle impact areas:

- (1) Consuming (food, household and leisure consumer products)
- (2) Living (the built environment and homes)
- (3) Moving (individual mobility and transport)
- (4) Health and society (health, well-being, ageing, and equity)



SUSTAINABLELIFESTYLES







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Main lifestyle choices that drive consumption's impacts include:

- *Consumption of food and drink, private transportation and housing* are the source of 70 80% of Europe's environmental impacts
 - *Meat and dairy consumption* alone account for almost one quarter (24%) of all final consumption impacts,

having by far the largest share in the food and drink sector

- Domestic heating, water consumption, appliances, and electronics account for 40% of Europe's total energy

consumption (with space heating alone accounting for 67% of household energy consumption in the EU-27)





Main lifestyle choices that drive consumption's impacts include:

- *Car ownership* in the EU-27 increased by more than one third (35%) between 1990 and 2007. Over one third of the world's 750 million automobiles are owned by drivers in the EU.
- In the EU-27, approximately 60% of adults and over 20% of school-age children are *overweight or obese*. Coronary heart diseases, which are often associated with fatty foods and smoking, remain the single most common
- cause of death in the EU.







A growing number of people are aspiring toward **lifestyle changes that support increased sustainability** for themselves and for the societies in which they live. Some examples include:

- Shifts towards *efficient consumption* (wasting less), *different consumption* (shifts to high quality goods and services), and *sufficient consumption* (reducing material consumption) demonstrate opportunities for sustainable ways of utilising products and services

- *Collaborative consumption* (sharing, swapping, trading, etc.) reveals a shift in preferences away from ownership of goods to access to goods and services and from being passive consumers to becoming co-producers of goods and services (e.g. urban farming: growing your own food).





A growing number of people are aspiring toward **lifestyle changes that support increased sustainability** for themselves and for the societies in which they live. Some examples include:

- *Household behaviour change* to conserve energy and make investments in energy efficiency signals an increasing awareness and readiness to shift to more sustainable ways of living.
- Cities and municipalities are supporting *modal shifts in transportation* toward walking, cycling, and public transit, as well as new technologies, such as electric vehicles.
- Promising *synergies are emerging for health, equity, and well-being* through a re-examination of the way we live, eat, and move.





One Planet Living Framework



A world where we can live happy, healthy lives within our fair share of the worlds resources, leaving sufficient space for wildlife and wilderness.





Sustainable action strategies have to acknowledge the diverse needs, desires, and motivations of individual people. Strategies and approaches often focus on technological innovation or policy solutions in isolation. Successfully changing behaviour depends on understanding people and the diversity of lifestyles and access to sustainable lifestyle options. Key success factors include:

- Changes toward sustainable lifestyles have to involve *behaviour changes* across age and socio-economic groups and across population segments with varying levels of knowledge, awareness, and interests. Successful sustainability initiatives are those that try to understand how to motivate and enable change among different groups.





Sustainable action strategies have to acknowledge the diverse needs, desires, and motivations of individual people. Strategies and approaches often focus on technological innovation or policy solutions in isolation. Successfully changing behaviour depends on understanding people and the diversity of lifestyles and access to sustainable lifestyle options. Key success factors include:

- Long-term change toward sustainable lifestyles can be achieved by making it *easier, cheaper, and more enjoyable to make sustainable choices* by developing appropriate infrastructure and devising context-specific solutions

- Integrated multi-level and multi-stakeholder approaches have to be followed in order to create enabling environments that facilitate sustainable lifestyles and long lasting change





TIPS TO SUSTAINABLE LIVING

- Be a minimalist
- Limit waste
- Conserve energy and water
- Stay away from toxic chemicals
- When traveling, be responsible

marcuslemonis.com/lifestyle/sustainable-living

- Go meatless one day of the week
- Go an hour a week with no technology
- Borrow, borrow, borrow







Enabling behaviour change and lifestyle options that will support a sustainable future will require research, innovation, cooperation and participation at all levels of society's policy, production and consumption systems to create the necessary infrastructure and change in the way that people perceive progress and individual success.





02

Responsible consumption and production (SDG 12)



Worldwide consumption and production rest on **the use of natural environment and resources** in a way that continues to have a destructive impact on the planet.

Overview

Economic and social progress over the last century has been accompanied by **environmental degradation** that is endangering the systems on which our future development depends.





Sustainable Development Goals (SDGs)

The **2030** Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the **17** Sustainable Development Goals (SDGs), which are an urgent call for action by all countries – developed and developing – in a global partnership.

The SDGs recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests.













Responsible consumption and production (SDG12)

People are currently consuming more resources than ever, *exceeding the planet's capacity for generation*. In the meantime, waste and pollution grows, and the gap between rich and poor is widening. Health, education, equity, and empowerment are all adversely affected.

Sustainable consumption and production refers to

"the use of services and related products, which respond to basic needs" and bring a better quality of life while minimising the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize the needs of future generations".





the European Union



Responsible consumption and production (SDG12)

The COVID-19 pandemic offers to countries an opportunity *to build recovery plans* that will reverse current trends and change our consumption and production patterns towards a more sustainable future.







12 RESPONSIBILE CONSUMPTION AND PRODUCTION

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ACCESS MORE DATA AND INFORMATION ON THE INDICATORS AT HTTPS://UNSTATS.UN.ORG/SDGS/REPORT/2020/



Responsible consumption and production (SDG12)

Some facts and figures:

- Each year, an estimated one third of all food produced, equivalent to 1.3 billion tonnes, worth around \$1 trillion, ends up rotting in the bins of consumers and retailers, or spoiling due to poor transportation and harvesting practices.

- If people worldwide switched to energy efficient light bulbs, the world would save US \$120 billion annually.
- Should the global population reach 9.6 billion by 2050, the equivalent of almost three planets could be

required to provide the natural resources needed to sustain current lifestyles.

- Less than 3% of the world's water is fresh (drinkable), of which 2.5% is frozen in the Antarctica, Arctic, and

glaciers. Humanity must therefore rely on 0.5% for all of man's ecosystem's and freshwater needs.









Overview

Circular economy places resource efficiency at the centre of economic decision making and practice, ensuring added value and making sure that resources are maintained as long as possible so that they can be reused again and again.

Avoidable waste is eliminated, demands on resources are minimised, efficiency is improved, and costs are reduced.





Farmers can take a leading role in developing the bio-economy and make it more sustainable by integrating circular activities and natural cycles into existing and new practices. In agriculture this means, among others:

- Preserving and enhancing natural capital by balancing renewable resource flows
- Optimising natural resource yields by circulating products, components, and materials
- Turning wastes and residuals into a "resource", linking the end of one process to the beginning of another,

creating feedback loops





Circular agrofood system

In 2050, the global population will have risen to 9.5 billion people. This means that the world would need 70% more food. A circular agrofood system can use the currently available agricultural land to meet this requirement. An essential part of this system is in establishing smart connections between plant-based and animal products, in order to create an integral agrofood system.

www.wur.eu/circularfood

CROPS

Only 30% of the crops are suitable for human consumption. We can use the other parts and residual flows from agriculture and the food industry to produce animal feed.

N

LAND Manure from the animals contributes to a fertile healthy soil and improves crop yields.

CATTLE

Cattle and sheep can consume grass and herbs in pastures that are unsuitable for growing food, such as the peat grasslands in the Netherlands.

Manure is also a valuable source of organic material that **replenishes the soil** and completes the circular agrofood system.

MANURE





A circular economy can be achieved at a variety of scales, whether on a farm or through connecting a variety of individuals, businesses, and sectors to make efficient use of resources over broader geographical areas.







Protected Horticulture (growing in greenhouses) can ensure high quality production and contribute to global food security. Furthermore, protected horticulture provides significant opportunities for circular production to use resources more efficiently. This includes recycling, across different levels, from individual farms to regional level.









Greenhouses can help support circularity because they have:

- Potential for high productivity with reduced water and agrochemicals use per unit of production
- A production capacity per ha up to 10 15 times higher than open field farming
- Great potential for the recycling of water and nutrients





4 Benefits of Smart Greenhouses



Maintain Ideal Micro-Climate



Enhance Irrigation & Fertilization Practices



Control Infection & Avoid Disease



Operational Values



Optimize Yields

Enhance Chemical & Resource-Use Efficiency



Minimize Manual Intervention





Main challenges:

- Increasing availability of resources, both in quality and quantity, and in particular water, at both farm and regional scale. Secondary water sources like drainage water, condensation water from roofs, can increase water availability at farm level. Water can be reused according to a cascading principle and can feed different processes (horticultural or other) closely located to each other, even without the need for further treatment.

- Fostering the association of stakeholders to form clusters to increase circularity in protected cultivation systems. These include greenhouse design and construction companies, horticultural farm input suppliers, ICT companies, greenhouse advisers, horticultural associations, agri-food processing and marketing chains, retailers, supermarkets, consumers, researchers, policy makers, governments and non-governmental organisations.





Main challenges:

- Assessing the level of technology in existing greenhouses and support technology transfer from experimental to commercial farms, bearing in mind tradeoffs between technology and workforce. Hi-tech greenhouses may reach high levels of circularity but their investment costs are high too, while in low-tech (low investment cost) greenhouses, it is more labour intensive to reach a certain level of circularity.







04

Energy control in greenhouse cultivations



Overview

There are many technologies for greenhouse systems which can be adopted by farmers **enabling better**, **more efficient**, **and sustainable energy use**. However, **many issues have to be solved** related to the high technology cost compared to the investment capacity of farmers and also to the adaptation of technology to the variety of problems that farmers encounter in different geographical areas.





The need for rational use of energy in greenhouse cultivations is critical since energy forms a substantial fraction of total production costs. Heating is more and more commonly used to obtain early production and a constant quantitative-qualitative yield, leading to a higher energy use. Improved environmental control (e.g. more CO₂ supply, additional lighting), intensified production schemes, and use of cooling systems all cause an increase in energy consumption.

On average, the energy use ranges from 10 - 30% of the total production costs, depending on the different regions.





The goal of the application of techniques and technologies to control the energy that is consumed by a greenhouse is to increase the energy efficiency in the greenhouse combining it with a reduction of the overall energy consumption and related CO_2 emissions.

The major processes of energy loss in naturally ventilated greenhouses are convection and radiation from the greenhouse cover, and thermal and latent heat transfer through ventilation.













Indicative actions to control energy consumption in a greenhouse are:

- Frequent checks of infrastructure and equipment, maintenance of insulation
- Efficient temperature and humidity control
- Exploitation of shading systems





Some **difficulties** to control energy consumption in a greenhouse are:

- Transferability of technology and know-how developed in Northern Europe countries to Mediterranean

countries, mainly due to high costs but also due to different challenges

- Climate control is related to specific characteristics of each crop but also to fungal disease outbreaks
- Specific characteristics of insulating covering materials (e.g. reduction in light transmission, increase in humidity levels)







Some **benefits** of controlling energy consumption in a greenhouse are:

- Reduction of 1°C in heating temperature saves roughly 10% energy
- Implementation of temperature integration strategy results in up to 20% energy saving
- Different types of greenhouse covering materials can trigger 25 51% reduction on annual energy use





Highlights of the Module

- Modern European lifestyles are unsustainable in many ways due to preferences related to consumption of products, living environment and homes, ways of moving, health and social issues.
 - Promising practices that minimise unsustainable lifestyle impacts while improving health and well-being

have been proposed, involving a variety of stakeholders.

- Sustainable consumption and production is about decoupling economic growth from environmental degradation, increasing resource efficiency and promoting sustainable lifestyles.
- Sustainable consumption and production can also contribute substantially to poverty alleviation and the transition towards low-carbon and green economies.





Highlights of the Module

- Agriculture can contribute to the long-term sustainability of circular bio-economy in practice
- Protected Horticulture (greenhouses) can ensure high quality production and contribute to global food security and conservation of natural resources
- Active and passive methods are available to reduce energy use, without affecting the yield amount and quality.







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Glossary

TERM	DEFINITION
SDG	Sustainable Development Goal
ICTs	Information and Communication Technologies





Practical Recommendations

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Learning outcomes

Knowledge

- □ To identify the patterns of modern lifestyles
- To relate modern lifestyles to the use of natural resources and to the emissions of waste and pollutants to the environment
- □ To describe the majority of SDG 12 targets
- □ To analyze the principles and challenges of circular economy in general and specifically in agriculture
- To recommend methods and good practices that can be applied in order to improve energy efficiency and reduce energy use in a greenhouse

Skills

□ To quantify socioeconomic and environmental benefits of circular economy in agriculture

□ To estimate the benefits of efficient energy control in a greenhouse

Attitude

□ To adapt personal lifestyle to sustainability principles

□ To implement actions to support SDG12





Lesson plans





Lesson plan 1



Module Title: Sustainability and consumption. The limits of the planet.	
	Sustainable lifestyles
Lesson Plan 1 Title: Sustainable lifestyles	
Duration: 135 minutes	
Aim Target Group	This lesson plan aims to introduce the impact of lifestyles on sustainability to adults, considering the relation of modern lifestyles with past and current consumption and production patterns. Trainees will become familiar of the components of modern lifestyles and will have the chance to realize their relation to the use of natural resources and to the emissions of waste and pollutants to the environment and therefore their impacts to the environment and people's health. This lesson plan also will highlight the key challenges that people have to handle through their lifestyles. Finally, it aims to make trainees capable of proposing actions that could make their lifestyles (more) sustainable. Adults living in rural areas
Facility/ Equipment	 Classroom / place with tables and chairs Projector Computer Wall board
Main Activity	• Case study 1 The trainer makes an introduction to the topic of the lesson plan based on the information included in the description of the case study in the next slide. She/he divides the trainees in 5-member groups. The trainer assigns a component of lifestyles to each group, e.g. consuming food and drink, consuming energy, living in houses, etc. and asks from each group to write down how the assigned component is related to the use of natural resources and to the pollutants' emissions to the environment. The trainer summarizes the ideas of each group on the wall board. She/he shows some slides on these issues, that she/he has prepared by using the material of the case study. Then, by applying brainstorming techniques, she/he asks the trainees to propose measures to reduce the impacts, concluding that there are initiatives that each person could take in order to make her/his lifestyle more sustainable.
Reflection	Reflection will be focused (a) to identify the components and patterns of modern lifestyles, (b) to link them with consumption and production, (c) to underline their relation to the use of natural resources and to the emissions of waste and pollutants to the environment and therefore their impacts on the environment and people's health, and (d) to emphasize that people could take measures to make their lifestyles (more) sustainable.



Real-life example/case study 1



Module Title: Sustainability and consumption. The limits of the planet.	
Sustainable lifestyles	
Real-life example/case study 1	
	Duration: 45 minutes
Aim	This case study aims to demonstrate the impact of lifestyles on sustainability, considering the relation of modern lifestyles with past and current consumption and production patterns.
Target Group	Adults living in rural areas
Case study description	Lifestyles refer to the way people live their lives that allows them to fulfil their needs and aspirations. They serve as "social conversations", in which people signal their social position and psychological aspirations to others. Since many of the signals are mediated by goods, lifestyles are closely linked to material and resource flows in the society. Therefore, lifestyles refer to patterns of action and consumption, which are related to the use of natural resources and to the emissions of waste and pollutants to the environment, when people try to meet their basic needs and to achieve a better quality of life.
Connection with the topic	Modern lifestyles are a basic factor that drives consumption and consequently affects the sustainability of the planet.
Follow up questions	Please provide some examples that prove that modern lifestyles are not sustainable. Please name some impacts of lifestyles to the environment and health. Please highlight some key challenges that modern lifestyle have to handle. How can we make our lifestyles sustainable?
References	Sustainable Lifestyles: Today's Facts & Tomorrow's Trends <u>https://www.cscp.org/wp-content/uploads/2016/05/64_Sustainable_Lifestyles_Todays_facts</u> _and_Tomorrows_trends.pdf
	Executive Summary, pages 10 – 16

reduce recycled natural nuclear change pollute global impact organic planet green recycle carbon reuse environmental waste gases global warming energies carbon footprint sustainable development environmentally friendly wildlife greenhouse effect carbon neutral habitat carbon dioxide earth eco free renewable energy low emissions pollution calculator temperature go green climate change manufacturing conservation energy footprint environment renewable habitat climate save the planet protect intensive recycle sign chemicals industry methane ecology



Lesson plan 2



Module Title: Sustainability and consumption. The limits of the planet.		
Responsible consumption and production (SDG 12)		
Lesson Plan 2 Title: Responsible consumption and production (SDG 12)		
Duration: 90 minutes		
Aim	This lesson plan aims to present to adults the Sustainable Development Goal No12 entitled "Responsible consumption and production" that is included together with 16 more SDGs in the 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015.	
Target Group	Adults living in rural areas	
Facility/ Equipment	 Projector Computer Internet 	
Tools/ Materials	Case study 2	
Main Activity	The trainer shows one by one the videos of case study No2. At the end of each video the trainer discusses the video content with the trainees. In some cases, she/he can stop the video to sum up its content and then continues. After watching all videos, the trainer asks from each trainee to propose an action that she/he could easily implement in her/his everyday life to support SDG12 and also investigates through discussion (questions and answers) the intention of other trainees to implement it.	
Reflection	Reflection will be focused (a) on the reasons for which SDG12 was established, (b) on the measures that could be adopted on global and individual level to achieve SDG12, and (c) on the identification of some key challenges behind the UN's SDG12 (e.g. the role of technology).	





Real-life example/case study 2

Module Title: S	ustainability and consumption. The limits of the planet.	
	Responsible consumption and production (SDG 12)	
	Real-life example/case study 2	
	Duration: 30 minutes	
Aim	This case study aims to present to adults the Sustainable Development Goal No12 entitled "Responsible consumption and production" that is included together with 16 more SDGs in the 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015.	
Target Group	Adults living in rural areas	The Sustainable Consumption Techniques
Case study description	Video No1 underlines that the excessive consumption of natural resources and presents many aspects of consumption that, with simple changes, can have a great impact in our society. Video No2 defines the problem and its real scale and presents solution on global and individual level. The UN has listed 11 targets, or methods, to ensure the achievement of SDG12. Video No3 discusses these issues. Video No4 breaks down some of the key challenges behind the UN's SDG12. Video No5 sums up what we know, what the UN strives to do, what we can do.	and Production Wheel Technology, innovation & design Closed loop Sustainable production Life cycle assessment Customer engagement Resource productivity & efficiency Voluntary
connection with the topic	consumption.	efficiencies Sustainable standards
Follow up questions	Why was SDG12 established? Can you suggest measures that could be adopted on global and individual level? What are some key challenges behind the UN's SDG12?	Costs & Production Legislation, incentives & penalties
References	Video No1: https://www.youtube.com/watch?v=cKIPNGZBrtI Video No2: https://www.youtube.com/watch?v=z9zZQjZz7-U&t=0s Video No3: https://www.youtube.com/watch?v=Ls4dHvfl-Yw Video No4: https://www.youtube.com/watch?v=RX2elsVjY-c Video No5: https://www.youtube.com/watch?v=puEWxGStQrE	Customer demand Markets & Stakeholder engagement



Lesson plan 3



Module T	itle: Sustainability and consumption. The limits of the planet.	
Lesson Plan 4 Title: The role of agriculture in the circular bio-economy		
Duration: 135 minutes		
Aim	This lesson plan aims to raise the awareness of adults on the policy context and the principles of circular economy and to introduce good practices to adults which support the transition of agriculture towards a circular economy. Good practices include nutrients recycling, use of manure as a fertilizer, aquaponics, integrated management of agroindustrial wastes and residues, etc.	
Target Group	Adults living in rural areas	
Facility/ Equipment	 Classroom / place with tables and chairs Projector Computer Wall board 	
Tools/ Materials	Case study 3	
Main Activity	The trainer chooses and exploits some of the presentations of case study 3 in order to support the aims of this lesson plan. Then, she/he divides the trainees into 5-member groups and asks them to select a specific agricultural facility in their region (open field, greenhouse, livestock unit, etc). She/he asks the trainees to take the role of the manager of this facility and to make plans about the practices that could be applied in order to support circular economy. Then, each group presents its ideas and the trainer sums them up on the wall board.	
Reflection	Reflection will be focused (a) on the principles, benefits, and challenges of circular economy in general and specifically in agriculture, (b) on actions that promote the transition of agriculture towards a circular economy.	



Real-life example/case study 3

Module Title: Sustainability and consumption. The limits of the planet.

The role of agriculture in the circular bio-economy

Real-life example/case study 3	
Duration: 45 minutes	
Aim	This case study aims to raise the awareness of adults on concrete ways to support the transition of agriculture towards a circular economy.
Target Group	Adults living in rural areas
Case study description	Papers presented in the EIP-AGRI Workshop entitled 'Opportunities for Agriculture and Forestry in the Circular Economy' are exploited in order to describe the role of agriculture in the circular bio-economy and discuss relevant challenges. Several good practices are presented that have been implemented across Europe, which can be transferred to other locations.
Connection with the topic	The European Innovation Partnership for Agricultural productivity and Sustainability (EIP- AGRI) was launched in 2012 and is working to foster competitive and sustainable farming under the principles of circular economy.
Follow up questions	Discuss the role of agriculture in the circular economy. Identify challenges and opportunities in the transition of agriculture towards a circular economy. Define concrete actions to boost innovation in the transition of agriculture towards a circular economy.
References	EIP-AGRI Workshop "Opportunities for Agriculture and Forestry in the Circular Economy" <u>https://ec.europa.eu/eip/agriculture/en/event/eip-agri-workshop-opportunities-agriculture-and</u>



RURAL GCE

RAINING MATERI.



Lesson plan 4



	Module Title: Sustainability and consumption. The limits of the planet.	
	Energy control in greenhouse cultivations	
	Lesson Plan 4 Title: Energy control in greenhouse cultivations	
	Duration: 135 minutes	
Aim	This lesson plan aims to raise the awareness of adults about the methods and good practices that are available, which could be applied to improve energy efficiency in Mediterranean greenhouses. These methods and good practices are related to energy-efficient climate control (temperature and humidity control), reduction of the energy requirements of a greenhouse (covering materials, screens, ventilation, shading, cooling), and replacement of fossil fuels by other sustainable sources. A significant objective of this lesson plan is the quantification of the energy benefits that can be gained by the application of these methods and good practices.	
Target Group	Adults living in rural areas	
Facility/ Equipment	 Classroom / place with tables and chairs Projector Computer A3 papers Color markers 	
Tools/ Materials	Case study 4	
Main Activity	The trainer makes an introduction to the topic of the lesson plan based on the information included in the description of the case study in the next slide. She/he divides the trainees in 5-member groups. The trainer assigns a field of interventions to each group, e.g. temperature control, humidity control, covering materials, ventilation, renewable energy, etc, distributes relevant pages of the case study material to each group, asks each group to study these pages, and then asks each group to prepare an A3 poster. She/he explains that each poster must present 2 – 3 good practices related to the assigned field and that it should underline the energy benefits in figures. At the end, each group presents its poster to the other groups and the trainer concludes that it has been proved by the posters that there are methods available that can be applied in order to use the energy in greenhouses in a sustainable way.	
Reflection	Reflection will be focused (a) on the processes in a greenhouse that are related to energy, (b) on the methods and good practices that can be applied in order to improve energy efficiency and reduce energy use in a greenhouse, (c) on the quantification of the energy benefits of the above methods and good practices.	





Real-life example/case study 4

Module Title: Sustainability and consumption. The limits of the planet.

	Energy control in greenhouse cultivations	
	Real-life example/case study 4	
Duration: 45 minutes		
Aim	This case study aims to introduce to adults the principles of sustainable energy use in Mediterranean greenhouses.	
Target Group	Adults living in rural areas	
Case study description Connection with the topic	This paper reviews methods for achieving rational use of energy in greenhouse cultivations. Issues discussed include energy-efficient climate control, reduction of the energy requirements of a greenhouse, and replacement of fossil fuels by other sustainable sources. Qualitative and quantitative data are presented. Good practices are proposed for the above- mentioned issues. This document refers exactly to the topic of the case study.	
Follow up questions	What are the processes in a greenhouse related to energy use and that require intervention to achieve energy efficiency? Highlight the methods and good practices that can be applied in order to improve energy efficiency and reduce energy use in a greenhouse. Quantify the energy benefits of the above methods and good practices.	
References	Good Agricultural Practices for greenhouse vegetable crops <u>https://www.fao.org/3/i3284e/i3284e.pdf</u> Greenhouse climate control and energy use, pages 63 – 95, with emphasis on pages 84 – 92	





Tips



- Use interactive tools to keep the learners interested
- Ask frequently reflective questions
- Apply experiential learning techniques
- Support the collaboration of trainees by promoting group working
- Support exchange of experiences within the group
- Present and discuss case studies, mainly well known to the trainees
- Avoid long presentations by yourself
- Use as much audio visual material as you can
- Use updated and state of the art material
- Be supportive, explanatory, facilitative



1. Modern European lifestyles are also based on overproduction. They induce negative health impacts; however, they don't put much pressure on natural resources.

True False

- 2. The factor that accounts for more than half of household energy consumption in the EU-27 is:
 - a. Cooling **b. Heating** c. Appliances d. Electronics
- 3. Consumption patterns support sustainability for people and for the societies in which they live. Please match pairs:
 - a. Efficient consumption
 - b. Different consumption
 - c. Sufficient consumption
 - d. Collaborative consumption

- i. shifts to high quality goods and services
- ii. sharing, swapping, trading, co-producing
- iii. wasting less
- iv. reducing material consumption

a-iii b-i c-iv d-ii





- Economic and social progress over the last (a) has been accompanied by environmental (b) that is (c) the 4. systems on which our <u>(d)</u> development depends. Please choose one of the two options per question:
 - decade / century a.
 - **degradation** / improvement b.
- 5. SDG stands for:
 - Sustainable Development Graph a.
 - b. Sustainable Development Goal

- supporting / endangering
- present / future d.

С.

- Strategic Development Goal С.
- Service to Develop Goal d.
- 6. Sustainable consumption and production refers to the use of <u>(a)</u> and related products, which respond to basic <u>(b)</u> and bring a better quality of (c), while minimizing the use of natural (d) and toxic materials, as well as the emissions of (e) and pollutants over the life cycle of the service or (e), so as not to jeopardize the needs of future Please choose: life – waste – services – product – resources – needs generations.
 - life services waste а. С. e. b. needs
 - d. f. product resources





- 7. Circular economy places resource efficiency at the centre of economic decision making and practice, making sure that resources are maintained as long as possible so that they can be reused again and again.
 - True False
- 8. Greenhouses can help support circular economy as:
 - a. High greenhouse productivity is related with increased use of agrochemicals
 - b. Greenhouse production capacity per hectare is 2 times higher than the production capacity of open field farming
 - c. Although the use of water is not reduced, water can be recycled
 - d. Nutrients can be recycled
- 9. Choose the right order in order to develop a circular agrofood system:
 - a. crops [] land [] cattle [] manure [] crops
 - b. cattle I manure I land I crops I cattle
 - c. cattle [] land [] crops [] manure [] cattle
 - d. land I manure I crops I cattle I land





10. Although technology can be easily adapted to the variety of problems that farmers encounter in different geographical areas, farmers in different geographical areas don't have the same capacity to invest in technology.

True False

- 11. Which of the following factors are related to energy control in greenhouses?
 - a. Greenhouse cover b. Climate control c. Shading system d. All
- 12. The goal of the application of techniques to control the <u>(a)</u> that is consumed by a greenhouse is to <u>(b)</u> the energy efficiency in the greenhouse combining it with a reduction of the overall energy <u>(c)</u> and related emissions of <u>(d)</u>. Active and passive methods are available to serve this goal, <u>(e)</u> the yield amount and quality. Please choose one of the two options per question:
 - a. energy / water
 - b. reduce / increase
 - c. production / consumption
 - d. carbon dioxide (CO₂) / nitrogen dioxide (NO₂)
 - e. which all affect / without affecting

