Trigger change!
Innovative sustainable agriculture solutions for land restoration

Course manual

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G20 GLOBAL LAND INITIATIVE

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Acronyms

AEZ	Agro-ecological zone
AI	Artificial intelligence
ASM	Artisanal and small-scale mining
CASA	Centre for Applied Systems Analysis
CBA	Cost-benefit analysis
CDE	Centre for Development and Environment
CIFOR-ICRAF	Center for International Forestry Research and World Agroforestry
CSBL	Case study-based learning
DLDD	Desertification/land degradation and drought
DP	Demonstration project
DPSIR	Driver-Pressure-State-Impact-Response Framework
DSF	Decision support framework
ESS	Ecosystem services
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FERM	Framework for Ecosystem Restoration Monitoring
G20 GLI	Group of Twenty Global Land Initiative
GJU	German Jordanian University
GLASOD	Global Assessment of Human-induced Soil Degradation
GLF	Global Landscapes Forum
ICM	Inverted classroom model
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
ITT	Institute for Technology and Resources Management in the Tropics and Subtropics
LADA	Land Degradation Assessment in Drylands
LD	Land degradation
LDN	Land degradation neutrality
LMS	Learning management system
LPFN	Landscapes for People, Food, Nature
LUANAR	Lilongwe University of Agriculture and Natural Resources
LUF	Land-use function framework
MCA	Multi-criteria assessment
MDG	Millennium Development Goal
MSP	Multi-stakeholder collaboration
NGO	Non-governmental organization
NPV	Net present value
NRW	North Rhine-Westphalia
PBL	Problem-based learning
PIA	Participatory impact assessment
PLE	Personal learning environment
PPT	PowerPoint
PRAIS	Performance review and assessment of implementation system
PRIMA	Partnership for Research and Innovation in the Mediterranean Area
QGIS	Quantum Geographic Information System
QM	Questionnaire for Mapping Land Degradation and Sustainable Land Management
QSWAT	QGIS Interface for Soil and Water Assessment Tool
SCBA	Social cost-benefit analysis
SD	Sustainable development
SDG	Sustainable Development Goal
SLM	Sustainable land management
SOLAW	State of Land and Water Resources
TBL	Triple bottom line
TL	Transformative learning
ToC	Theory of change
UAV	Unmanned aerial vehicle
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNEP	United Nations Environment Programme
USD	United States Dollars
WAD	World Atlas of Desertification
WEFE Nexus	Water-Energy-Food-Ecosystem Nexus
WOCAT	World Overview of Conservation Approaches and Technologies

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1. Background

People under 25 years old currently constitute 60 per cent of the population in many developing countries (United Nations Convention to Combat Desertification, Group of 20 Global Land Initiative (UNCCD, G20 GLI, 2023a).), with millions of young people entering the job market each year. In many cultures and countries, young people have lost their connection to the land. Despite young people's desire to make a positive contribution to the world, land restoration and/or land-based jobs in sustainable agriculture/sustainable pastoralism are seen as hard labour with little obvious reward (UNCCD, G20 GLI, 2023a). Young people around the world are abandoning traditional agricultural practices and seeking exciting new opportunities in urban areas, while land is under even more pressure to produce in more uncertain climate conditions. At the same time, land restoration provides opportunity (Fig. 1). According to Forbes (Ferwerda, 2024), "studies reveal that the financial benefits of restoration are, on average, eight to ten times greater than initial investment costs across all types of ecosystems". In the United States of America, a 2015 study estimated that the restoration economy in the United States employed 126,000 persons, generated USD 9.5 billion in annual economic output and created an additional USD 15 billion in indirect and induced output (BenDor *et al*., 2015). Examples of such businesses in the context of agriculture include:

- Companies that develop and deploy technology to facilitate restoration, often by improving efficiency and lowering costs;
- Companies that sell products to the end consumer, often using materials from their restoration activities or sponsoring restoration projects;
- Companies that aggregate supplies of high-value produce, trees or non-forest timber products grown by smallholder farmers on the farmers' land (modified from Faruqi *et al*., 2018).

One third of agricultural landscapes were degraded in 2010 (FAO, 2011), and one billion hectares of land are up for restoration by 2030 (UNCCD, G20 GLI, 2023a; Sewell *et al.,* 2020). Achieving such an ambitious target will require countries to restore degraded land on an industrial scale and to jump-start a land-restoration economy. The G20, through its Global Land Initiative, anticipates that the private sector, youth and women can lead the charge and reap the benefits from this action, such as jobs, healthy and nutritious foods, fertile soils and climate–change-resilient homes. More available resources in this area would help create more jobs. The land restoration industry is growing, however **the current educational system is lagging behind and must step up** to provide modern

Figure 1. A Land of Opportunities and the G20 Global Land Initiative's targets

educational tools and training to cater to this new and often multidisciplinary industry. The course has been designed to target this shortage of **extension agents, supervisors and technicians to undertake land restoration**. Civil engineers often design nature-based solutions with no training in the subject. Mining engineers supervise the ecological restoration of mining with no training in ecology (UNCCD, G20-GLI, 2023b).

Poor agricultural practices can trigger land degradation while innovative agriculture can contribute to land restoration. Building on this premise, a global course was developed in 2023-2024 by university partners and sustainable agriculture experts worldwide to foster a new generation of students in agriculture programmes with knowledge and skills to transform agriculture practices from being sources of land degradation to contributors to land restoration.

The "Trigger change! Innovative Sustainable Agriculture Solutions for Land Restoration" course is available to any higher education institution that teaches agriculture, land restoration and sustainable land management (SLM) and covers topics such as:

- Introduction to land degradation
- Agriculture and land degradation
- Introduction to land restoration
- Introduction to SLM
- SLM through agriculture
- Innovative sustainable agriculture solutions for land restoration
- Tools and technologies for land restoration
- Enabling factors, trade-offs and governance for land restoration
- Linking stakeholders in the landscape for more sustainable restoration
- Entrepreneurship and start-ups for restoration businesses

1.2 Course developers

The mandate of G20 GLI is to enable the G20 countries to achieve their ambition to reduce land degradation by 50 per cent by 2040 (UNCCD, G20-GLI, 2023b). The G20 GLI, with oversight from UNCCD, will focus on capacity-building, engaging the private sector and civil society, and showcasing success. The Convention seeks to support countries in addressing desertification/land degradation and drought (DLDD) (www.unccd.int).

The G20 GLI is comprised of four pillars:

1. Showcase success stories that benefit nature and safeguard people's lives, jobs and incomes;
2. Engage the private sector in SLM, land restoration and habitat conservation;
3. Empower civil society and the public on land stewardship for sustainable development;
4. Build capacity and share knowledge between G20 members, non-member countries and stakeholders to collectively deliver on land conservation and restoration outcomes (UNCCD,G20-GLI, 2023a).

One of the main facets of pillar 4 (Fig. 2) is to build capacity by developing university curricula on land restoration to be included in agriculture, forestry and mining programmes, globally, with a target of 1,000 universities and extension programmes worldwide. The goal is to "hardwire land restoration into the curriculum of agriculture/forestry and mining programmes so that future generations of agricultural scientists and experts are fully familiar with the science, technology and economics of land restoration and habitat conservation" (UNCCD, G20-GLI, 2023a: 23)

Under the leadership of the G20 GLI, this course has been drafted by a core group of academics with broad geographic representation and a track record of cutting-edge research and education related to sustainable agriculture, SLM, innovation and teaching methods.

The partners involved in developing the course include:

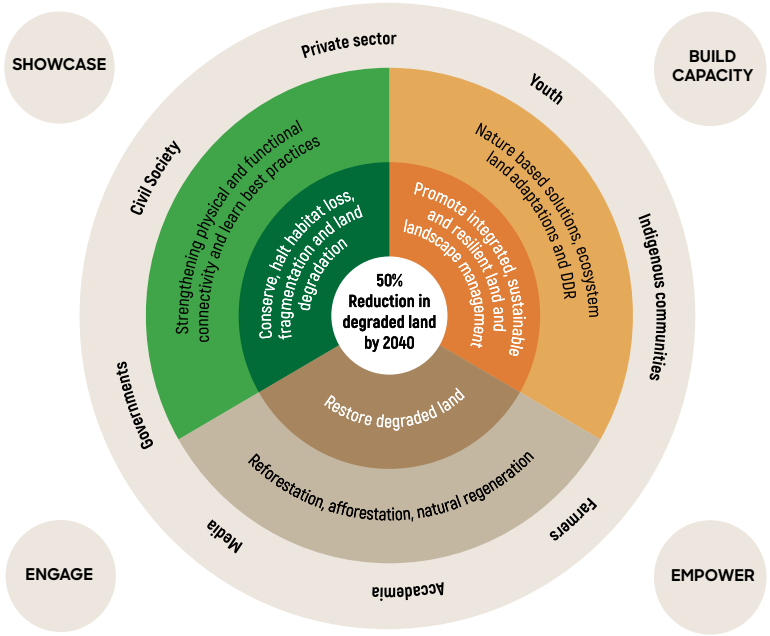
Main developers:

- Center for International Forestry Research and World Agroforestry (CIFOR-ICRAF) & Global Landscapes Forum;
- The University of Bern, Center for Development and Environment (CDE) and World Overview of Conservation Approaches and Technologies (WOCAT), Switzerland;
- TH Köln, Cologne University of Applied Sciences, Germany, through the Centers for Natural Resources and Development;
- Azim Premji University, India.

Contributing partners:

- Wageningen University and Research, Kingdom of the Netherlands
- University of Cape Coast, Ghana
- Universidad de Cuenca, Ecuador

Figure 2. G20 Global Land Initiative's four pillars of action



- Universitas Gadjah Mada, Indonesia
- German-Jordanian University, Jordan
- University of Ibadan, Nigeria
- Lilongwe University of Agriculture and Natural Resources and Centre for Applied Systems Analysis, Malawi
- University of Antananarivo and Landev, Madagascar
- University of Ljubljana, Slovenia
- United Nations Decade on Ecosystem Restoration (UNDER), Food and Agriculture Organization of the United Nations (FAO) and the United Nations Environment Programme (UNEP)

1.3 Target audience

The United Nations Decade on Ecosystem Restoration's global needs assessment in 2022 (UNDER, 2023) and other desk studies concluded that there was a shortage of transdisciplinary courses available to agricultural universities to bridge innovation and new sustainable agriculture business models that contribute to land restoration. **This global course "Trigger change! Innovative Sustainable Agriculture Solutions for Land Restoration" is intended to bridge this gap while promoting innovative teaching practices that can be adapted to various university settings worldwide.**

The course is intended for university professors teaching agriculture or related topics to Bachelor's or Master's students at any university worldwide. It was developed to foster a systems approach to promoting innovation in agriculture through SLM with the potential to foster land restoration. Graduates are expected to find employment as extension agents, land managers, public servants, finance experts and restoration entrepreneurs who can connect the dots in order to embrace innovation and solutions through SLM for land restoration.

1.4 Guiding principles of the course development:

- **Course mission:** The course leads to a new generation of actors of change who embrace innovation in sustainable agriculture and land restoration and contribute to increasing the percentage of restored lands and livelihoods globally;
- **Course philosophy**: The course aims to provide an interactive learning environment which emphasizes active learning while providing a teaching foundation for professors who may not be familiar with all topics;
- **Course learning objectives:** The course is integrated into most agriculture programmes worldwide, supporting a significant increase in SLM through sustainable agriculture, land restoration and innovative practices. Students should be able to name the benefits of *innovative sustainable agriculture solutions for land restoration,* while also acquiring critical thinking skills to recognize trade-offs, barriers (e.g. policies which create disincentives for innovation in sustainable agriculture) and factors that enable land restoration (e.g. subsidies and tax breaks promoting sustainable agriculture for land restoration).

  More specifically, by the end of this course, students should be able to:

  - Understand the main concepts related to land degradation, land restoration, sustainable agriculture, innovation, SLM and landscapes;
  - Evaluate various tools and technologies for a variety of uses and contexts;
  - Learn about a variety of benefits and trade-offs in land restoration through sustainable agriculture;
  - Create their own business plan for an innovative agriculture-related land restoration business for a farm or at the landscape level; or develop a project proposal for a non-profit organization or government institution.
- **Course level:** The course materials are appropriate as an elective course for students enrolled in upper-level agricultural programmes (Bachelor's or Master's level);
- **Course length:** Each submodule corresponds to roughly one hour of teaching (or contact hour with students) (equivalent to 48 hours of teaching materials); however, this can be shortened or lengthened depending on the requirements of each university;
- **Course content:** Each PowerPoint lecture is around 30 minutes long and supplemented by suggested student exercises, suggested readings and supplementary materials, such as short instructional videos, adding up to 60 minutes per sub-module. Depending on the length of each lesson at your university, lectures can be shortened or lengthened;
- **Assignments:** There are short quizzes, student discussion questions, short optional assignments and a proposed final assignment at the end of Module 5. Professors thus need to modify the assignments based on their university's requirements;
- **Course materials:** Materials are freely available to university professors or other institutions teaching agriculture programmes and keen to be at the forefront of teaching innovative sustainable agriculture solutions for land restoration;
- **Credits:** The course is intended to be equivalent to three credits in the European Credit Transfer System (3 ECTS)**,** however professors are free to shorten or lengthen the course according to their university requirements;
- **Modular**: The course is organized into five modules (and 48 submodules, 60 minutes each) which can be taught individually or as a package, together with a didactic note encouraging interactive teaching methods. As each module may be used separately, there may be some repetition to ensure that each module has a coherent narrative;
- **Target audience:** Students in this course are enrolled in an agriculture programme or related topic and better equipped to seek employment opportunities with government agencies as extension agents, in non-profit organizations or as restoration entrepreneurs, with a broader perspective on agriculture as a vehicle for land restoration rather than land degradation;

- **Transdisciplinary:** This course covers a variety of topics, such as monitoring land degradation and restoration, tools for decision-making on sustainable agriculture options for land restoration, enabling factors and governance for land restoration, multiple scales for land restoration in particular landscape restoration and, finally, innovation and the business canvas model for creating start-ups in land restoration. These are not topics that every agriculture professor will be comfortable teaching alone. This course thus encourages collaborations across university departments or together with colleagues from partner universities. Such exchanges are well-known catalysts for fostering innovative and creative teaching experiences, which is to be encouraged.

1.5 Purpose of this manual:

This manual will help you to design your own transdisciplinary course. It offers brief overviews of each module and submodule units to promote innovation in teaching for sustainable agriculture and innovation with the aim of achieving land restoration at scale. The manual also provides pedagogical guidance for more interactive and engaging teaching methods, which are now recognized as more effective in promoting learning that is long-lasting and sustainable as compared to the more classic lecture-only style.

1.6 Terminology

Agroecology: "Agroecology is a holistic and integrated approach that simultaneously applies ecological and social concepts and principles to the design and management of sustainable agriculture and food systems. It seeks to optimize the interactions between plants, animals, humans and the environment while also addressing the need for socially equitable food systems within which people can exercise choice over what they eat and how and where it is produced" (FAO, 2023a).

Climate-smart agriculture: "Climate-smart agriculture (CSA) is an approach that helps guide actions to transform agri-food systems into green and climate-resilient practices. CSA supports reaching internationally agreed goals such as the Sustainable Development Goals (SDGs) and the Paris Agreement. It aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas emissions, where possible" (FAO, 2024).

Course module and submodule: We use the term "module" to express the five main units of this course while "submodule" corresponds to the 48 subunits of the course. Each sub-module was designed to be taught in 60 minutes. The course is modular, meaning that instructors may incorporate individual modules or submodules, or sections of submodules into their curricula, as deemed appropriate by the instructor.

Ecosystem restoration: "The process of halting and reversing degradation, resulting in improved ecosystem services and recovered biodiversity. It encompasses a wide continuum of activities, depending on local conditions and societal choice" (UNEP, 2021:7). Furthermore, land restoration focuses on land, while ecosystem restoration goes beyond land and encompasses entire ecosystems, which can include marine ecosystems as well.

Ecosystem services: The benefits that people obtain from ecosystems (Millennium Ecosystem Assessment, 2005).

Innovation: The United Nations Innovation Network defines "innovation" as doing something new and different, whether solving an old problem in a new way, addressing a new problem with a proven solution, or bringing a new solution to a new problem (FAO, (no date (n.d.)).

Innovative sustainable agricultural solutions: Undertaking new and different sustainable agriculture practices, whether solving an old problem in a new way, addressing a new problem with a proven solution, or bringing a new solution to a new problem that is profitable throughout (economic sustainability), has broad-based benefits for society (social sustainability), and a positive or neutral impact on the natural environment (environmental sustainability) to address land degradation and other problems in agriculture (UNCCD, G20 GLI definition).

Land degradation neutrality: "A state whereby the amount and quality of land resources necessary to support ecosystem functions and services to enhance food security remain stable, or increase, within specified temporal and spatial scales and ecosystems" (UNCCD, 2022).

Land degradation: "Land degradation is the reduction or loss of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from a combination of pressures, including land use and management practices" (UNCCD, 2022).

Land restoration:

- "An ecological process to restore a natural and safe landscape for humans, wildlife, and plant communities" (UNCCD. n.d.);
- In the context of agriculture, land restoration is a process to restore degraded lands into safe landscapes for humans, wildlife, and plant communities through innovative sustainable agriculture solutions (UNCCD, G20 GLI definition).

Landscape: "A social-ecological system consisting of a mosaic of natural and/or human-modified ecosystems, often with a characteristic configuration of topography, vegetation, land use, and settlements that is influenced by the ecological, historical, economic and cultural processes and activities of the area" (Landscapes for People, Food, Nature, 2016).

Nature-based solutions: "Actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems, which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services and resilience and biodiversity benefits" (UNEP/EA.5/Res.5, 2022).

Regenerative agriculture: "Regenerative agriculture is an inclusive agroecosystems approach for conserving land, soil and biodiversity, and improving ecosystem services within farming systems. It focuses on the regeneration of living soil, improved micro hydrology, and the conservation of biodiversity at all levels while enhancing inputs use efficiency and ecosystem system services. This approach helps to achieve food and nutritional security with economically viable and ecologically sustainable options" (FAO, 2023b).

Sustainable agriculture: To be sustainable, agriculture must meet the needs of present and future generations, while ensuring profitability, environmental health, and social and economic equity (FAO, n.d.).

Sustainable food system: "A sustainable food system (SFS) is a food system that delivers food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised. This means that:

- "It is profitable throughout (economic sustainability);
- "It has broad-based benefits for society (social sustainability); and
- "It has a positive or neutral impact on the natural environment (environmental sustainability)" (Nguyen, 2018).

Sustainable land management approach: An SLM approach defines the ways and means used to implement one or several SLM technologies. It includes technical and material support as well as the involvement and roles of different stakeholders (WOCAT, 2019).

Sustainable land management technology: An SLM technology is a physical practice that controls land degradation and enhances productivity and/or other ecosystem services (WOCAT, 2019).

Sustainable land management:

- The use of land resources, including soils, water, animals and plants, for the production of goods to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions (WOCAT, 2007).
- "The adoption of land-use systems that, through appropriate management practices, enable land users to maximize the economic and social benefits from the land while maintaining or enhancing the ecological support functions of the land resources" (FAO, n.d.).

2. From land degradation to land restoration through sustainable land management and innovative sustainable agriculture practices

2.1 Introduction

According to Ding *et al.* (2017), restoring 150 million hectares of degraded agricultural land could generate USD 85 billion in net benefits to national and local economies, provide USD 30–40 billion a year in extra income for smallholder farmers, and additional food for approximately 200 million people (Global Commission on the Economy and Climate, 2014). However, despite the promising economic returns from land restoration and the conservation of terrestrial ecosystems (in addition to the environmental and social benefits), the shortfall in appropriate financing is estimated at USD 2.5 trillion per year in developing countries alone. If the world is to meet its land degradation, climate change and biodiversity targets, investment in land-based solutions must at least triple by 2030 and increase four-fold by 2050 (UNCCD, G20-GLI, 2023a).

In order to achieve such targets, a new generation of extension agents, land managers, public servants, finance experts and restoration entrepreneurs must be educated to connect the dots and embrace SLM-based innovation and solutions for land restoration. In the context of agriculture, land restoration is a process to restore degraded lands into safe landscapes for humans, wildlife, and plant communities through innovative sustainable agriculture solutions.

Students in agriculture programmes worldwide must be better versed in working with land users and producers in order to move value chains towards greater sustainability and profitability, and from industrial agriculture systems to diversified agro-ecological systems (IPES-Food, 2016). They should be encouraged to work with private sector actors to create enabling conditions for profitable innovative sustainable agriculture solutions, or themselves gain the knowledge and confidence to launch new private sector initiatives. They need to understand the importance of bringing stakeholders together at the landscape level to achieve ecological connectivity for land restoration, even in highly managed agricultural or mosaic landscapes (UNCCD, G20-GLI, 2023a).

The social and environmental dimensions of SLM and land stewardship converge and are linked in complex ways (Sanz *et al.* 2017). Participatory community management is a proven way to achieve land restoration outcomes, secure livelihoods, enhance social and environmental resilience, and protect natural ecosystems. Land governance, including land tenure and land rights, is key to achieving these objectives, particularly for vulnerable, marginalized and poor people. Awareness about the importance of secured rights – including those of Indigenous peoples and women – is increasing among stakeholders. However, the limited integration of rights-related issues in land restoration programmes, initiatives and policies remains a key challenge (Sanz *et al.*, 2017).

Integrating gender-responsive actions to promote equality and female empowerment is critical to achieving land degradation neutrality (LDN). Women in particular, play critical roles in natural resource management, agriculture and related sustainable agricultural value chains (UNCCD, G20-GLI 2023b). Current students in agriculture programmes must be sensitized to the importance of social inclusion and civil society empowerment in order to bring about win-win SLM agriculture solutions with the potential to foster long-term land stewardship.

There are however considerable challenges and trade-offs in converting monoculture cropland to sustainable agriculture through regenerative agriculture practices, such as agroforestry, which promote land restoration (King *et al*. 2023; FSIN and Global Network Against Food Crises, 2023). King *et al.* (2023) questions whether we will be able to feed the world's population while converting land to sustainable agriculture practices without a paradigm shift toward plant-based diets. As discussed above, when done correctly, land restoration is a social good, bringing considerable benefits to communities, landscapes and societies through cleaner air and water, while contributing to human well-being. However, farmers must make decisions about their bottom line: will the benefits outweigh the costs of transitioning to sustainable agriculture? Will society be willing to compensate for transition costs to ensure livelihood security? And finally, how should stakeholders be linked in a landscape for a coherent approach and to achieve win-win solutions for food security, sustainability and socio-cultural considerations (Dudley, *et al.* 2021)? These are the types of questions students in agriculture and related programmes should be asking on their journey to becoming 'agents of sustainable change'.

Therefore, this course takes a systems approach by encouraging students to trigger change by developing innovative sustainable agricultural solutions for land restoration, hence our course title: *"Trigger change! Innovative Sustainable Agriculture Solutions to Land Restoration"*.

2.2 Course conceptual framework

This course is anchored in the conceptual underpinnings of SLM as designed by Liniger & Mekdaschi Studer, (2019) and modified for our course (Fig 3.). Here, global drivers, such as market forces and policies, lead to negative and positive impacts on national and local land management. Consider how demand for biofuels led to the conversion of land for a carbon-intensive sugarcane monoculture, or on the contrary, how the Global Biodiversity Framework has led to national policies promoting land restoration, which require governance at the national and local levels. SLM can thus be achieved through a variety of practices (referred to as approaches and technologies), involving agriculture, forestry or restoration of mining areas, accelerated by sustainable value chains. This course focuses on the subset of SLM related to **agriculture,** that is the transdisciplinary topic: *"innovative sustainable agriculture solutions for land restoration"*.

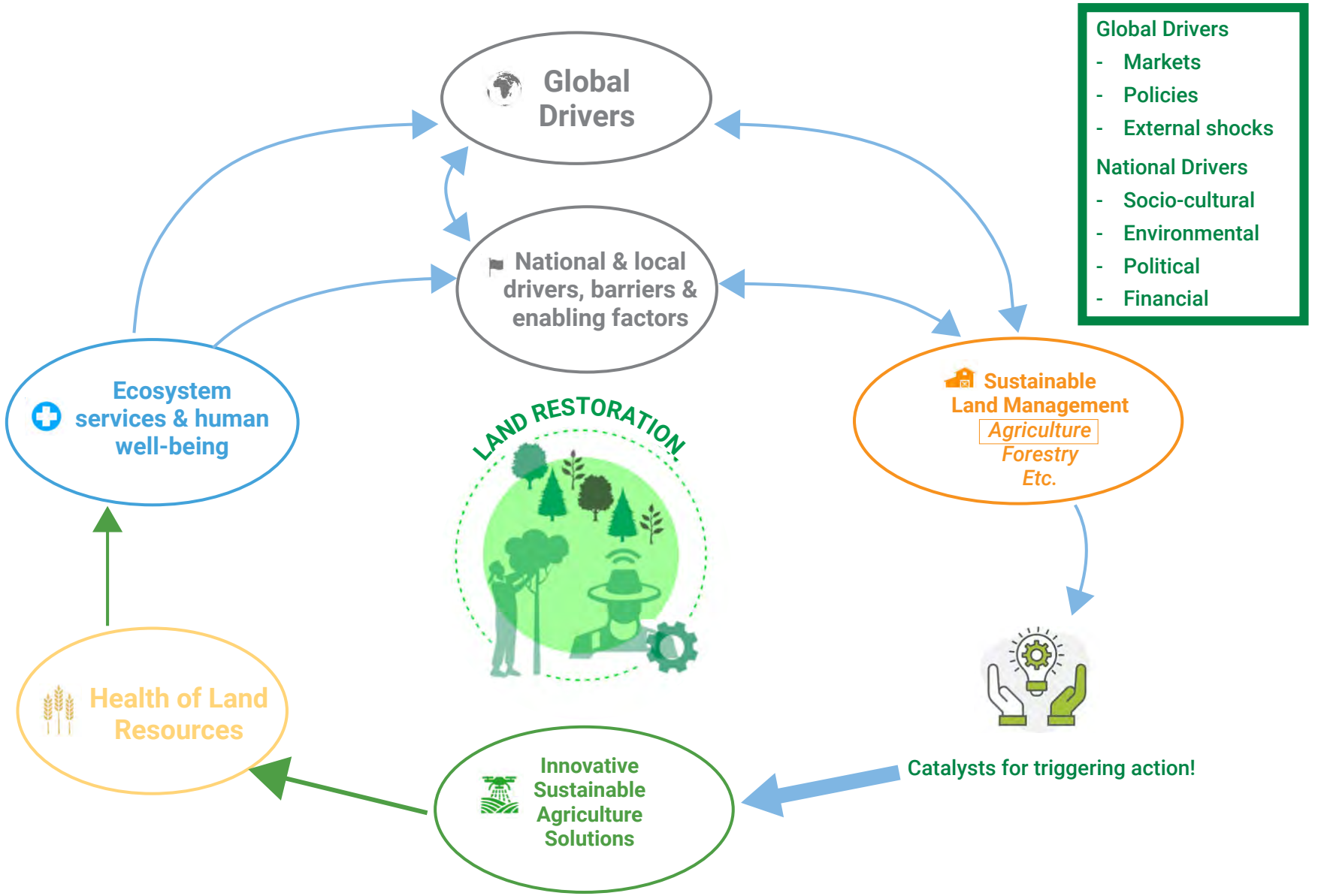
Examples of innovative sustainable agriculture solutions:

- SLM, which is a broad concept (agriculture, forestry, urban) → module 1;
- Tangible practices on the ground at farm or landscape level → module 2;
- Methods or tools that are used/applied in the sustainable agriculture context → module 3;
- Decision- making tools, participatory tools for valuation, governance and enabling factors for land restoration, including sustainable value & supply chains → module 4;
- The development of a business (plan) or project proposal in the context of sustainable agriculture for land restoration → module 5.

Innovative sustainable agriculture solutions lead to:

- Land restoration for healthier land resources: soils, water and biodiversity;
- Ecosystem services, which provide 'nature-positive food', fibres, carbon storage and promote human well-being;
- Confidence that the innovative sustainable agriculture solutions work, which then encourages more enabling factors at global, national and local levels.

Figure 3. Course conceptual framework



2.3 Course journey

Our course is structured around five modules, which correspond to all aspects of the course conceptual framework (Fig. 4):

Course modules include:

1. Land, landscapes and society
Introduces the core concepts of land restoration, looking into landscapes, good practices, trends in land degradation and historical perspectives;

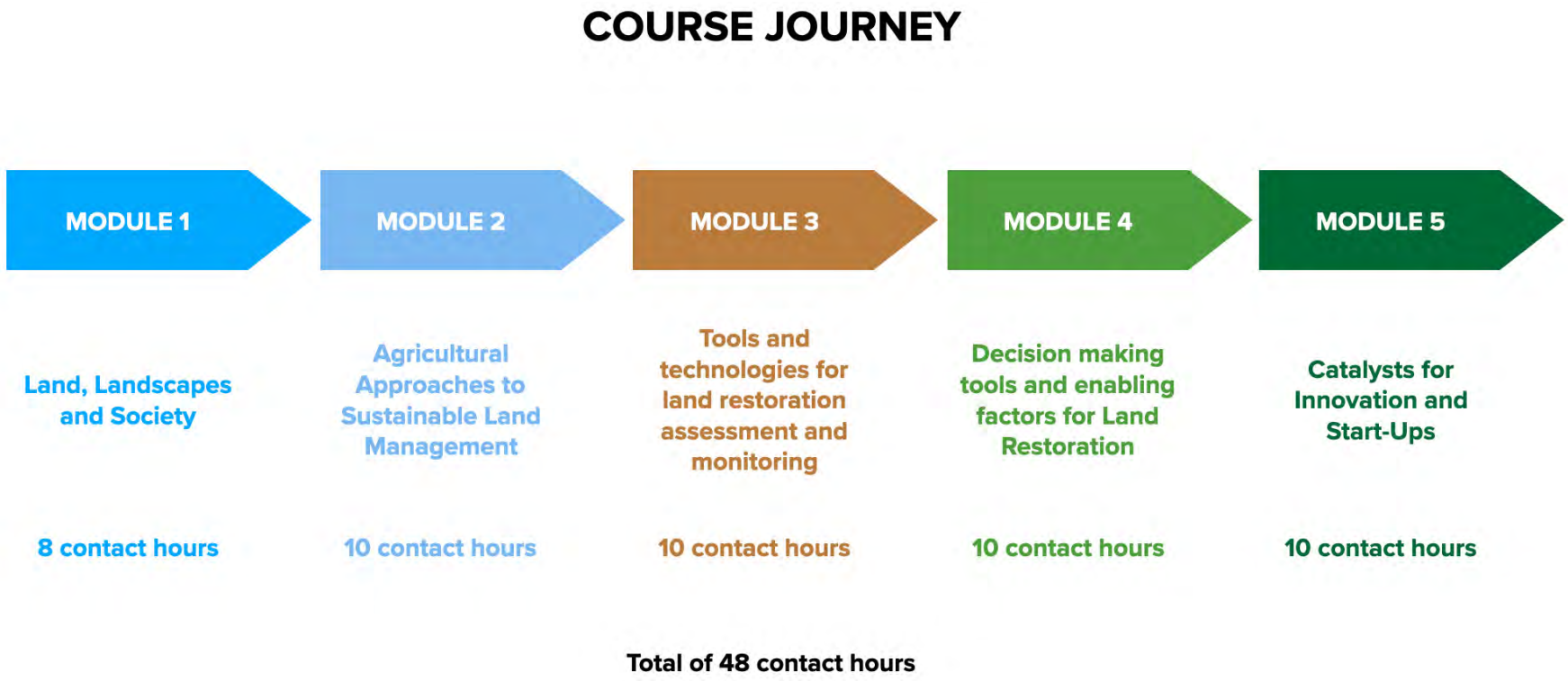
2. Agricultural approaches to SLM for land restoration
Explains the role of SLM in sustainable agriculture, introduces innovative sustainable agriculture solutions and explains how these contribute to land restoration;

3. Tools and technologies for land restoration assessment and monitoring
Describes the various tools and technologies for SLM and land restoration by applying data analysis to specific cases;

4. Decision-making tools and enabling factors for land restoration
Articulates economic and social rationale for land restoration and applies tools, such as social cost-benefit analyses for decision-making, to enable land restoration;

5. Catalysts for innovation and start-ups
Reflects on SLM for land restoration as an agricultural innovation and co-designs inclusive and scalable innovations for agriculture and land restoration.

Figure 4. Course journey by module



3. Innovative didactics and competencies for “Triggering Change!”[1]

[1] Section 3 is largely inspired by Herweg et al. (2021) Creative Commons Attribution-NonCommercial 4.0 International License. See http://creativecommons.org/licenses/by-nc/4.0/deed.de

3.1 Introduction – a transdisciplinary approach to trigger change!

Teaching new combinations of topics (sustainable agriculture as a subset of SLM, land degradation, eco-entrepreneurship and innovation for land restoration) and their interactions (through flows of energy, matter, information, money, etc.) can be complex. This requires a systems approach to teaching which goes beyond interdisciplinarity, i.e. transdisciplinarity. The underlying message of this course is that unsustainable practices must be changed, which is only possible if scientists and practitioners (policymakers, decision-makers, resource users, farmers, etc.) cooperate closely and transcend traditional disciplinary boundaries. The transdisciplinary approach is synonymous with "knowledge co-production" or "social learning". This requires methodological and social skills as well as a positive attitude towards transformation (Herweg *et al.,* 2021: 20-21).

According to Pohl and Hirsch Hadorn (2007), transdisciplinary research – in which different disciplines work from practice with the participation of various stakeholders – is appropriate for addressing:

- **Ill-defined problems**, i.e. problems that are difficult to define clearly, also

referred to as ill-designed or ill-structured problems; and

- **Wicked problems**, which are so complex that they are difficult or impossible to solve.

Transdisciplinary research is applied with a four-fold purpose:

1. To capture the complexity of the problems;
2. To consider the diversity of scientific and societal perspectives on the problems;
3. To integrate abstract scientific knowledge and case-specific practical knowledge;
4. To ensure that knowledge contributes to a practical solution that is oriented towards the common good.

So, how can we design curricula and courses that can help solve complex real-world problems? Such courses would enable students to learn how to analyse complex systems and work and communicate in transdisciplinary teams together with practitioners. In this context, the debate about "transformative learning" (TL) is highly relevant. TL is a process by which we transform our problematic and accepted mindsets, paradigms, frames of reference, behaviours and habits (Mezirow 2000, in Herweg *et al.,* 2021:24).

A **problem- and solution-oriented learning approach** offers multiple opportunities for transformative moments to arise. Experiential learning under real-life conditions enables deep-level learning to occur (Herweg *et al.,* 2021: 25):

- Work on a real-world issue, with complex, current problem settings;
- Be solution-oriented in your approach to this issue;
- Bring together students from various disciplines;
- Allow students to interact with actors in the field (experiential learning), outside the classroom.

Transdisciplinary learning prepares students to cooperate and communicate with scientific disciplines other than their own, as well as with other societal actors, in order to develop solutions for ill-defined and wicked problems.

Of particular interest is "case study-based learning" (CSBL), a blend of "problem-based learning" and transdisciplinary aspects, such as encounters with societal actors. CSBL focuses on a real-world situation, with real actors, real problems, and real solutions – and is thus more likely to create spaces and opportunities for transformative moments to arise than by using a theoretical situation.

CSBL is a key component of transdisciplinary learning, because a real-world setting offers a much broader array of opportunities than classroom teaching to develop sustainable development-related knowledge, skills, and critical awareness (Herweg *et al.* 2021: 27).

Information is not yet knowledge, and knowledge alone is not yet competence. However, knowledge is a central resource in almost all competence models. All elements of the classic triad – knowledge (knowing about), skills (ability to) and critical awareness (i.e. values, attitude, willingness to consider) – are essential for a holistic education that prepares people to solve complex, real-world problems (Herweg *et al.,* 2021:32).

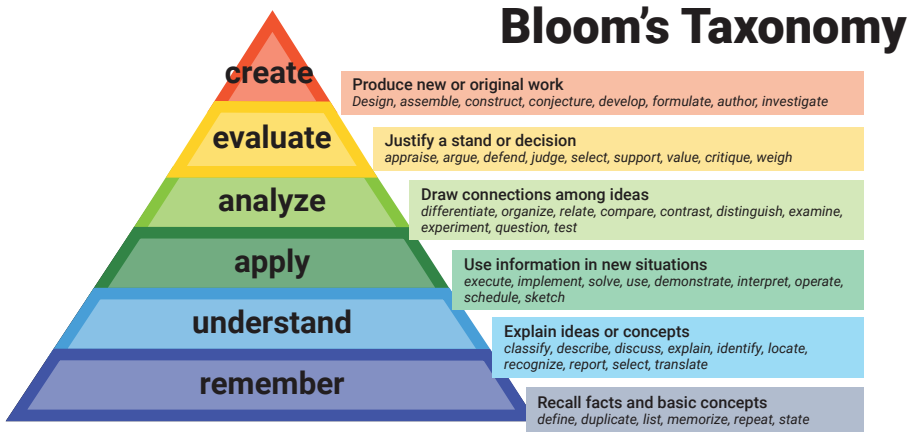
This is consistent with "Bloom's taxonomy" of learning outcomes, which has been revised from the original emphasis on two learning domains: cognitive (knowledge) and affective (attitude) (Bloom 1956, in Herweg *et al.* 2021). The revised taxonomy focuses on six levels: remember, understand, apply, analyse, evaluate and create (Anderson and Krathworth, 2001, in Herweg *et al.*, 2021) (Fig. 5). This revised version uses action verbs rather than nouns and incorporates the abilities to apply, analyse, evaluate and create.

Thus, teaching can also be understood as empowerment. Our course, "*Trigger change! Innovative sustainable agriculture solutions to land restoration*", was developed by pedagogic specialists with the aim of assisting course instructors in promoting more active learning and ensuring that students are better equipped and able to "think outside the box", re-evaluate traditions and systems, analyse systems as they evolve and create innovative outcomes.

Teaching for change may include any of the following teaching tips:

- Working within a real-world context with complex problem settings; being solution-oriented;
- Bringing together students from various disciplines;
- Allowing students to interact with actors in the field, e.g. through experiential learning outside the classroom;
- Building on participation and cooperation;
- Meeting practitioners;
- Adopting a long-term perspective;
- Having students play a more active role;
- Focusing on jointly developed solutions;
- Using emotions as a lever of change – do not ignore them!

Figure 5. Bloom's taxonomy



The following sections provide additional guidance to instructors looking to deliver high-quality education that moves their students into this more active realm.

This section covers:

- Constructive alignment;
- More detailed teaching tips and tools:
  - Cognitive activation and the 20-minute rule;
  - Cooperative learning;
  - Condensing content;
  - Guidelines for designing learning scenarios with high self-direction;
  - Field trips for active learning.

3.2 Importance of constructive alignment

In the mid-1990s, John Biggs presented "constructive alignment", a guiding idea for the design of study programmes. Constructive alignment stipulates that three core elements must be aligned (Fig. 7). At course level, for example, these are: "learning outcomes" (specifying the competences to be developed), "learning activities" (teaching–learning arrangements), and "assessment" (of competences) (Biggs, 1996, in Herweg *et al.*,2021).

The term *constructive* implies that the learners themselves make content meaningful through relevant learning activities. Relevant activities are primarily linked to the goals of the course (i.e. the learning outcomes), which describe what learners are expected to know (knowledge) and be able to do (skills), as well as the character of their attitudes and values (critical awareness). This makes teaching a catalyst for learning.

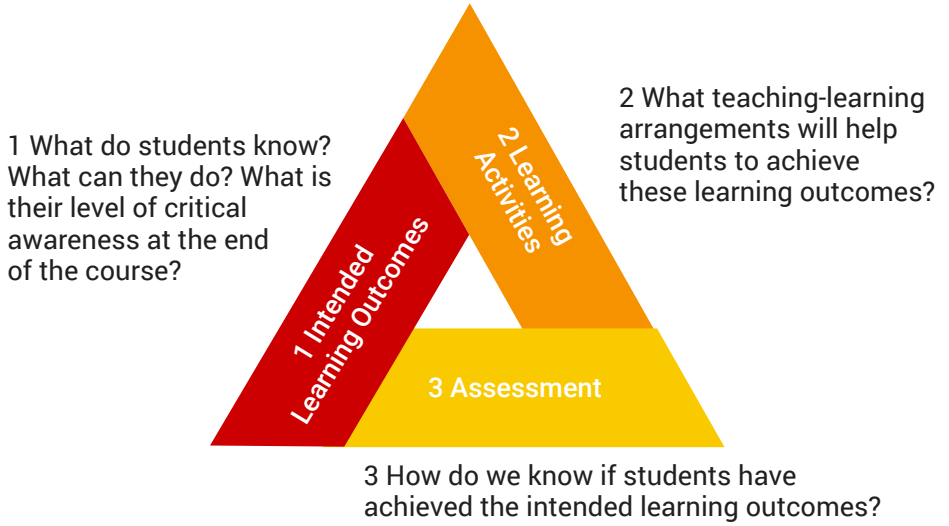
The appropriate teaching–learning arrangements support learners in achieving – and demonstrating – the competences that have been formulated as learning outcomes. A teaching–learning arrangement includes time for individual study and must be coherent, in that it enables the student to achieve and demonstrate the intended outcomes through the assessment. This constitutes *alignment* (Herweg *et al.,* 2021: 36).

The following central questions serve as a proof of coherence when designing courses and study programmes:

- Is the form of assessment suitable to verify that the learning outcomes were achieved?
- Do the learning activities truly prepare students to achieve the learning outcomes?
- Do the learning activities (teaching–learning arrangements and learning processes) of all courses in a study programme complement each other in order to foster overall competence development (qualification profile)?

If the answers to all three questions are a clear "yes", then the study programme, module, and courses are likely to be constructively aligned.

Figure 6. Constructive alignment



Constructive alignment is a guiding principle of high-quality educational programmes. It requires coherence between the three core elements – learning outcomes (competences), learning activities (teaching–learning arrangements), and assessment (of competences) (Herweg *et al.,* 2021: 38).

Formative evaluation

It is beneficial for students and teachers to hold periodic evaluations during the course. Known as formative evaluation, they provide information on whether the teaching strategies are having the desired effects on learning. Successful teachers use different methods to obtain a picture of the effect their teaching is having on the current learning of students. They use the evaluations to draw conclusions about their teaching strategies and adapt them accordingly. The advantage of formative evaluations is that teachers still can use them to improve an ongoing course.

Summative evaluation

Once a course is completed, its quality is reviewed in a summative evaluation. This type of review is more productive if an evaluation concept is already in place

at the start of the course. This way, data can be collected during the course and processed at the end.

In high-quality teaching–learning arrangements, measures are implemented for both formative (continuous mutual feedback between lecturers and learners) and summative evaluation (at the end of the course). Adaptive teaching involves constantly reviewing the impact of teaching strategies in order to adapt them, if necessary (Herweg *et al*. 2021:59).

3.3 Teaching tips and tools

a. Cognitive activation and the 20-minute rule

The human working memory has a naturally limited attention span, usually leading to much of the audience becoming at some point restless or tired. The point at which this occurs will vary and may at least partly depend on the quality of a lecture. Decades ago, research led to the *20-minute rule*, which is still widely observed today. German didactics describe this as *"rhythmizing"*, meaning varying activities within a teaching sequence after an average of twenty minutes (Fig. 7).

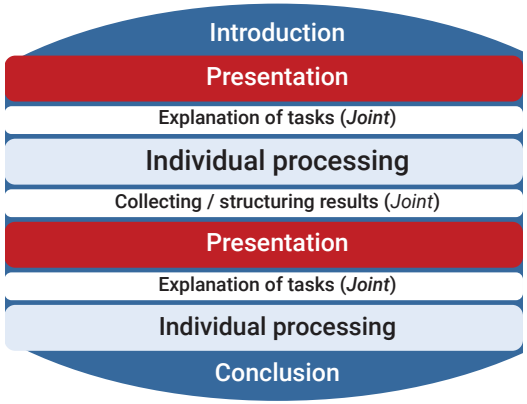
b. Activating a large audience

A wide range of teaching methods trigger cognitive activation. Try to keep students as engaged as possible: they learn more when they actively work through content. This is also possible in the lecture theatre. Instead of the usual "Any questions?" at the end (which often goes unanswered), have small groups discuss a question for three minutes ("buzz groups") or let them work on a small task and then discuss the results in the plenary. Other options include having students come up with advantages and disadvantages of an issue and comparing them afterwards, or asking learners for their opinions, assumptions, or prior experiences before presenting a particular topic. Such active breaks work well, even with a large audience.

c. Activating smaller groups

Of course, activating smaller groups in seminars is much easier than motivating a larger audience.

Figure 7. Wahl's sandwich principle of varying teaching and learning



- Alternate a 20-minute presentation with an equally long sequence allowing students to process the information;
- Limit working groups to four people;
- Write down assignments based on the learning outcomes; project the assignments onto the wall in larger groups;
- Some ideas for assignments:
  - Write a short synopsis on the topic;
  - Set an examination task for other students;
  - Draw an overview graphic.

d. Strategies for cognitive activation

- Use pre-testing, which has the added effect of reactivating prior knowledge;
- Before your lecture, let your students brainstorm on the question: "What do I already know about the topic?";
- Have participants formulate questions about the material in advance;
- Follow the 20-minute rule in lecturing scenarios. Consider the sandwich principle, particularly in seminars;

- Use buzz groups, i.e. small-group discussions of simple questions in-between two presentations;
- Have learners answer "why?" as often as possible; let them research causes, reasons and origins in small discussion groups';
- Let them find differences and similarities between new content or old and new content (sameness analysis) (Fig. 8) (Herweg *et al.* 2021: 67).

Cognitive activation is essential for learning gain. Successful learning can only be achieved through active engagement with content. Therefore: **less teaching; more learning**.

e. Cooperative Learning

Although many people may remember group work as being unsatisfactory for various reasons, statistical meta-analyses have found cooperative learning to have a considerable impact on learning. Moreover, it strengthens other factors such as self-confidence and social integration, and reduces the likelihood of dropping out of the course altogether. Cooperative learning is clearly better than its reputation would suggest (see Hattie, 2015; Johnson and Johnson, 2013; Prince 2004).

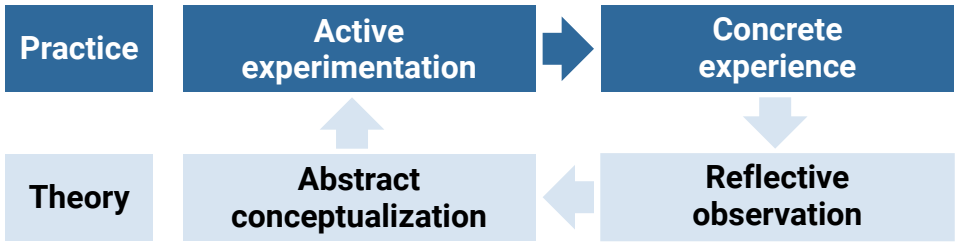
Think – Pair – Share

Teaching can take place in various social settings, primarily the following four: *individual work – partner work – group work – plenary.* Not every subject can be covered in all settings. The social setting and choice of teaching strategy are closely related. The "*think – pair – share*" phase model is a simple sequence starting at the individual level, then moving to small groups, and finally to the plenary. This is the basic pattern of many cooperative learning scenarios.

- **Think** = individually analyse a topic;
- **Pair** = draw individual conclusions and discuss with a partner;
- **Share** = present the results of *think* and *pair* to the plenary.

Tip: Present the working tasks before announcing the altered social setting, otherwise they can easily get lost as learners search for partners when preparing for group work (Herweg *et al.,* 2021: 69).

Figure 8. Kolb's learning cycle



f. Infrastructure for successful cooperative learning

Mundane factors such as infrastructure are also important. Furniture that cannot be moved and a lack of space strongly hinder cooperative learning. If necessary, request another classroom. However, discussions of a few minutes between three people are also possible in the lecture theatre, and technology can also be used to expand the scope. For group work to be effective, certain conditions and strategies for effective group work must be taken into account:

- Clear assignments and tasks;
- Defined roles and positive interdependence;
- Suitable infrastructure;
- Appropriate group size;
- Clear process and open learning scenarios.

g. Condensing content

Varying your learning sequences and adding student activation windows automatically reduces your own inputs. But even without this, experience shows that you always have too much material and too little time.

Avoid "PowerPoint tsunamis". The onion principle *(must – should – could)* helps to strip your content down to the essential: What are the bare bones? What information is essential for learners to master the given situation (defined by the learning outcomes)? What information is nice-to-have and can be added if there is more time (which is unlikely)? What information is unnecessary, burdensome and can be delegated (to self-study or to another course)? If learners work on an assignment instead of just listening to a lecture, they learn considerably more,

but they also need more time. This makes it even more important to focus on key information only.

Use your learning outcomes as filters for selecting content:

- Students must be able to cope with situation X (specify formulation of learning outcome).
- What is the minimum information they need to do this (condense content)?

In short – **The 4Rs**: The following four steps can be used to select the learning content:

1. **R**esearch: Find content in relevant and valid sources.
2. **R**eflect: What information does this particular group of learners need as starting points to complete the assignments (i.e. to master the situations)?
3. **R**educe: Filter content based on what is exemplary and relevant *(must – should – could)*.
4. **R**epresent: Decide how to best represent your content: through a direct encounter (field excursion, discussion with practitioners, etc.), audiovisual aids (videos, photos, sound, etc.) or text (Herweg *et al*. 2021: p. 70).

h. Guidelines for designing learning scenarios with high self-direction

The main goal of "self-directed learning" is the ability to act autonomously, an important feature for future agents of change and innovators!

- Define action-oriented goals;
- Ensure appropriate workloads;
- Balance self-learning periods and contact phases;
- Manage expectations and responsibility;
- Discuss how to manage "free riders" by establishing guidelines for "good group work";
- Establish clear rules on how group work (and individual contributions) will be assessed;
- Provide constructive criticism with feedback that leads to greater responsibility and empowerment (Herweg *et al*. 2021).

i. Field visits

The field visit requires adequate advance preparation, both in terms of logistics and participant preparation. It is better to omit the field visit altogether than to use module time to undertake a touristic outing without clear links to module content. In the event that community groups or other stakeholders are consulted during the visit, it is important to ensure that they are invited to actively participate in discussions and are met with respect, considering their own traditions, norms and values. When planning the overall training module programme, organizers need to assess the feasibility of including a field visit and identify an appropriate objective and context for the visit as the availability of appropriate field visit sites depends very much on the national and local context. It may be difficult to identify field visit locations, or field visits may not be possible or even too costly. Instead, instructors can substitute with case studies, or videos included in the course materials and engage students in a discussion on the pros and cons to each.

General criteria for choosing a field visit site include:

- Demonstration of a practical example of SLM/agricultural innovation (i.e. visit to an agroforestry site, with an innovative eco-entrepreneurship approach);
- Practicing of a tool, method or approach presented during a module;
- Relevance of the field visit site for the module content and participants' previous experience (what can participants gain from the visit?);
- Logistical feasibility (distance, accessibility, security, cost).

Conducting a field visit

1. Preparation session

A short session where essential information relating to the field visit (content, aims and logistics) is provided to participants (i.e. the day prior to the visit). If practical work will be undertaken during the visit, instructions are provided and clarified as appropriate;

2. Field visit

The duration of the visit varies depending on the context and organizers should identify an appropriate time in the module (i.e. last module day or in the middle of the module);

3. Reflection session

Upon completion of the field visit, a feedback and reflection session should be held to analyse the visit, and/or allow groups to report back on their results (if practical work was included).

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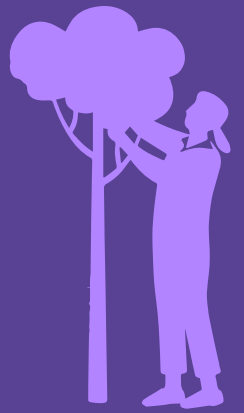

4. Course module descriptions

Module 1: Land, landscapes and society

Core competencies:

Academic knowledge:

- Multifunctional landscapes, plural valuation, ecosystem services;
- Agriculture and its complex interactions with land, biodiversity, climate and livelihoods;
- Schools of thought for sustainable agriculture and land restoration (definitions, key concepts, histories, examples);
- States, trends, drivers and projections of land degradation (regionally and globally);
- Core ideas and objectives of sustainable land management, including a conceptual framework
- Power, gender, and justice in relation to land restoration

Practical skills:

- Systems thinking;
- Context-sensitivity.

Attitudes and values:

- Optimistic outlook for how sustainable land management (SLM) could combat land degradation/support land restoration;
- Awareness and concern for sustainability, power, gender, and justice

Module 1.1 Landscapes, ecosystem services and value

Learning objectives

- Differentiate between different landscapes, land uses and the role of agriculture;
- Understand how our own worldviews shape what we see and value, and develop the ability to find perspective.

Overview of session

Introduction slides 2 mins

Part 1: Landscapes, land use and ecosystem services – 35 mins

- Landscapes and land use
- Student activity: discuss landscape pictures – 5 mins
- How to relate landscapes to sustainability
- Facilitate classroom discussion – 10 mins
- Ecosystem services
- Short classroom activity – 5 mins

Part 2: Valuation of nature – 20 mins

- Plural valuation of nature
- Student activity: 5–10 mins

Lessons learned – 3 min

Summary

- Part 1: Landscapes, land use and ecosystem services:
  - Students focus on viewing landscapes and recognizing their elements, including land uses, problems and challenges as well as the roles of agriculture;
  - Definitions of 'landscape' and examples of land uses are provided, and students compare sustainable vs. unsustainable landscapes;
  - Concepts of sustainability are introduced;
  - Ecosystem services are defined and illustrated
- Part 2: Valuation of nature:

- Plural valuations (instrumental, relational, intrinsic) are introduced;
- The concept of worldview is briefly introduced to encourage students to be mindful of how they experience the world and reinforce lessons from part 1.

Teaching notes

Part 1: Landscapes, land use and ecosystem services

- Landscapes and land uses: Give students 5–10 minutes to discuss three images of landscapes and related questions in pairs or in small groups. Afterwards, facilitate a classroom discussion. You may exchange pictures of landscapes from your own country;
- Sustainable vs. unsustainable landscapes: Consider asking students about differences between the three pictures. What can they detect? What different impacts do the three landscapes have? Facilitate a classroom discussion for 10 minutes;
- Ecosystem services: Allow a few minutes for this activity;
- Video (On-site and off-site benefits: SLM): The video discusses SLM. Students will be introduced to SLM in a later module. Here, the aim is to watch the video (or lecturers can show an excerpt if it is too long), look at the diverse landscapes in Colombia, Haiti, Iceland and India, and note down the different ecosystem services provided in these landscapes.

Part 2: Valuation of nature

- Plural valuation: Give students 5–10 minutes to discuss the questions in pairs or in small groups. Afterwards, facilitate a classroom discussion.

Key references/resources

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Module 1.2 Agriculture and sustainability

Learning objectives:

- Understand agriculture in the context of food systems;
- Consider interactions among agriculture, land degradation, biodiversity, livelihoods, and climate.

Summary

Part 1 introduces sustainable food and agriculture using the FAO definition and illustrates different ways of measuring the three sustainability dimensions in agriculture. The session further presents the two main groups of agriculture: subsistence agriculture and commercial/industrialized agriculture. All types of agriculture can be sustainable. The session then explores food production and takes a closer look at food systems, particularly at sustainability in food systems.

Part 2 focuses on land degradation and the external drivers/pressures affecting land degradation. Climate change projections for four global warming scenarios are introduced using a series of figures from the Intergovernmental Panel on Climate Change (IPCC). Students are invited to discuss the impacts and what they could mean for agriculture. Sustainable agriculture (i.e. specific land use and management practices) can help adapt to a changing climate. A series of figures from reports by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) illustrate how human activity has changed land with descriptions of biomass, wilderness areas, soil organic carbon and species richness.

Overview of session

Introduction slides - 2 mins

Part 1: Sustainable agriculture and food systems

- Introduction slides – 10 mins
- Short exercise about your food – 10 mins
- What is a food system? - 10 mins
- Short exercise and final slides of part 1 – 10 mins

Part 2: Agriculture and land degradation

- Land degradation and external drivers – 20 mins
- Task for homework

Lessons learned - 3 mins

Teaching notes

Introduction slides - 2 mins

- Introduce the session's outline and learning objectives.

Part 1: Sustainable agriculture and food systems

- Introduction slides – 10 mins

The FAO definition of sustainable food and agriculture is introduced. The definition highlights the interconnectedness of food and agriculture. The lecturer can use the definition for sustainable agriculture from their own country (if applicable) or show different ways of defining and measuring the three pillars of sustainability in agriculture using the examples provided in the slides.

The two main groups of agriculture are illustrated: (1) subsistence agriculture; and (2) commercial/industrial agriculture. The global maps highlight the importance of smallholder agriculture.

The lecturer highlights that this course will mainly focus on cropland: land used for the cultivation of crops (field crops, orchards) with a particular focus on innovative sustainable agricultural solutions. Refer to the slides for the definition of innovative solutions.

- Short exercise about your food – 10 mins

The session moves to the topic of food production. In small groups, students discuss where their food is coming from for 5 to 10 minutes. The lecturer facilitates a classroom discussion and gathers the most important discussion points.

- What is a food system? – 10 mins

The lecturer introduces a food system (the food's journey from the agricultural plot to the table) through a series of slides illustrating different figures by the United Nations Food Systems Summit, the FAO food system wheel and the Center for Development and Environment.

- Short exercise and final slides of part 1 – 10 mins

The lecturer leads a short group work/discussion on what an ideal sustainable food system would look like based on the three dimensions of sustainability.

Part 2: Agriculture and land degradation

- Land degradation and external drivers – 20 mins

The lecturer introduces the UNCCD's definition of land degradation. Various external drivers, such as climate change and climate change projections, are presented and discussed with the students.

Short student exercise: students discuss the climate change projections and how they relate to land degradation. The lecturer facilities a classroom discussion.

The lecturer continues the session by showing various figures from the IPBES report on natural capital. This is followed by a short student exercise.

- Task for homework

The lecturer introduces the homework task as noted on the slide.

The lecturer concludes the session with the lessons learned slide (3 mins).

Key references/resources

- Calvin, K., Dasgupta, D., Krinner, G., et al. (2023). *Intergovernmental Panel on Climate Change (IPCC), 2023: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the IPCC [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland.* (First). IPCC: https://doi.org/10.59327/IPCC/AR6-9789291691647.
- Food and Agriculture Organization of the United Nations (FAO). (2018). *Sustainable food systems: Concept and framework:* https://www.fao.org/3/ca2079en/CA2079EN.pdf.
- Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). (2018). *The IPBES assessment report on land degradation and restoration.* Zenodo. https://doi.org/10.5281/ZENODO.3237393.

Module 1.3 Agriculture, restoration, and the environmental movement

Learning objectives

- Connect sustainable agriculture and land restoration to major global initiatives;
- Understand the essential elements of effective ecosystem restoration by navigating the principles of the United Nations Decade on Ecosystem Restoration (UNDER).

Overview of session

Introduction slides – 2 mins

Part 1: Timeline of the global environmental movement – 30 mins

- Lecture: Key events on the timeline – 15 mins
- Student activity: Your journey through the timeline – 15 mins

Part 2: UNDER – 25 mins

- Lecture: Details of the UNDER -10 mins
- Student activity: The principles (co-benefits and trade-offs) – 15 mins

Lessons learned – 3 mins

Summary

- Part 1: Timeline of the global environmental movement
  - Sustainable agriculture and land restoration are linked to the history of the global environmental movement, starting with the Stockholm Conference in 1972 and covering the Limits to Growth, the Brundtland Commission, the Earth Summit and the Rio conventions, the Millennium Development Goals, the Bonn Challenge, Rio+20, the SDGs, the G20 GLI and the UNDER;
  - Students strengthen their emotional connections to sustainable agriculture and land restoration by linking their personal interests and concerns to the global environmental movement.
- Part 2: United Nations Decade on Ecosystem Restoration
  - Students are taken on a tour of the UNDER, including its mission, pathways, action plan and key concepts (e.g. the continuum of restorative activities);
  - Students will learn that principles sometimes conflict and that resolving those conflicts is not always easy.

Teaching notes

Part 1: Timeline of the global environmental movement, highlights:

- We touch upon some of the key events in the global environmental movement since 1972. However, this is only a set of highlights and, of course, concern for the environment is more than 50 years old. As we discuss some of these highlights, think about events that you would add to this timeline: events in your lifetime, before you were born, and even far in the past;
- Optional student activity 1: Invite students to draw diagrams showing how they see the connections between food production and the other variables (population, industrialization, pollution, and consumption of non-renewable resources). Encourage students to work with a partner or in small groups. Online simulator: The Earth4All project, which has built on the work of the Club of Rome, will be publishing an online simulator. Once available, students could be invited to experiment with the simulator to learn about the complexity of interactions;
- Optional student activity 2: Invite students to discuss their thoughts about the Brundtland definition of sustainable development and how sustainable development relates to agriculture. Encourage students to work with a partner or in small groups;
- Optional student activity 3: Invite students to visit the United Nations data commons and examine the indicators for SDGs 2 and 15 for their country. Encourage students to work in pairs or in small groups. Afterwards, facilitate a classroom discussion;

- Slide 24 (Your journey through the timeline of the global environmental movement): Give students 10 to 15 minutes to discuss in pairs or in small groups. Afterwards, facilitate a classroom discussion.

Part 2: United Nations Decade on Ecosystem Restoration

- Co-benefits and trade-offs among the United Nations Decade principles: Give students 10 to 15 minutes to discuss in pairs or small groups. Afterwards, facilitate a classroom discussion.

Key references/resources

- Food and Agriculture Organization of the United Nations (FAO), International Union for Conservation of Nature Commission on Ecosystem Management and Society for Ecological Restoration. (2021). *Principles for ecosystem restoration to guide the United Nations Decade on Ecosystem Restoration 2021–2030*. Rome, FAO. https://www.fao.org/documents/card/en/c/CB6591EN.
- Nelson, C.R., Hallett, J.G., Romero Montoya, A.E., Andrade, A., Besacier, C., Boerger, V., Bouazza, K., Chazdon, R., Cohen-Shacham, E., Danano, D., Diederichsen, A., Fernandez, Y., Gann, G.D., Gonzales, E.K., Gruca, M., Guariguata, M.R., Gutierrez, V., Hancock, B., Innecken, P., Katz, S.M., McCormick, R., Moraes, L.F.D., Murcia, C., Nagabhatla, N., Pouaty Nzembialela, D., Rosado-May, F.J., Shaw, K., Swiderska, K., Vasseur, L., Venkataraman, R., Walder, B., Wang, Z., & Weidlich, E.W.A. 2024. *Standards of practice to guide ecosystem restoration – A contribution to the United Nations Decade on Ecosystem Restoration 2021 – 2030*. Rome, Food and Agriculture Organization of the United Nations, Washington, DC, Society for Ecological Restoration & Gland, Switzerland, International Union for Conservation of Nature Commission on Ecosystem Management: https://doi.org/10.4060/cc9106en.
- United Nations Environment Programme (UNEP). 2021. *Becoming #GenerationRestoration: Ecosystem restoration for people, nature and climate*. https://wedocs.unep.org/bitstream/handle/20.500.11822/36251/ERPNC.pdf.
- UNEP and FAO. (2023). United Nations Decade on Ecosystem Restoration Action Plan Booklet: https://wedocs.unep.org/bitstream/handle/20.500.11822/42535/Decade_ecosystem_restoration.pdf?sequence=3&isAllowed=y.
- World Commission on Environment and Development (Ed.). (1987). Our common future. Oxford University Press.

Module 1.4 Land degradation – introduction

Learning objectives:

- Reflect on different definitions of land degradation;
- Identify types of land degradation.

Summary

Part 1 introduces different definitions of land degradation and highlights the distinction between soil degradation, soil erosion and land degradation.

Part 2 describes different types of land degradation following the WOCAT definition. In addition, drivers of degradation are further elaborated using different frameworks, including the Driver-Pressure-State-Impact-Response Framework (DPSIR).

Overview of session

Introduction slides – 2 mins

Part 1: Definitions of land degradation – 10 mins

Part 2: Types and drivers of land degradation

- Introduction to land degradation types – 10 mins
- Exercise on land degradation – 10 mins
- Discussion in plenary – 10 mins
- Drivers – 15 mins
- Homework: DPSIR for your country

Lessons learned – 3 mins

Teaching notes

Introduction slides – 2 mins

- Introduce the session's outline and the learning objectives.

Part 1: Definitions of land degradation – 10 mins

The lecturer introduces different definitions of land degradation and highlights the distinction between soil degradation, soil erosion and land degradation.

Part 2: Types and drivers of land degradation

- Introduction to land degradation types – 10 mins

The lecturer introduces the six types of land degradation with different subtypes following the WOCAT definition. Each type is illustrated and explained by pictures.

- Exercise on land degradation – 10 mins

Students need to identify land degradation types on a picture in small groups. They can use handout slides defining the land degradation types and subtypes.

- Discussion in plenary – 10 mins

The lecturer leads a classroom discussion about the group exercise and may show the results slide, indicating different land degradation types on the picture.

- Drivers – 15 mins

The lecturer continues the session by illustrating different drivers of land degradation using different frameworks, including the DPSIR.

The lecturer introduces the homework: Develop a DPSIR for your country.

The lecturer concludes the session with the lessons learned slide (3 mins).

Key references/resources

- Gísladóttir, Guðrún & Stocking, Michael. (2005). Land Degradation Control and Its Global Environmental Benefits. *Land Degradation & Development.* 16. 99 – 112. 10.1002/ldr.687.
- Food and Agriculture Organization of the United Nations. (2021). *The State of the World's Land and Water Resources for Food and Agriculture – Systems at breaking point. Synthesis report* 2021. Rome: https://doi.org/10.4060/cb7654en.
- International Fund for Agricultural Development (IFAD). (1992). *Soil and Water Conservation in Sub-Saharan Africa. Towards sustainable production by the rural poor.* IFAD Rome, Italy.
- Food and Agriculture Organization of the United Nations. (1999). *Poverty Alleviation and Food Security in Asia. Land Resources:* https://www.fao.org/3/x6625e/x6625e00.htm#TopOfPage.
- Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). (2018). *The IPBES assessment report on land degradation and restoration.* Zenodo. https://doi.org/10.5281/ZENODO.3237393.
- Masson-Delmotte, V. (Ed.). (2022). *Climate change and land: An Intergovernmental Panel on Climate Change special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*. Cambridge University Press.
- World Overview of Conservation Approaches and Technologies. (2019). *Questionnaire on Sustainable Land Management (SLM) Technologies.* www.wocat.net/documents/448/Questionnaire_on_SLM_Technologies_-_English_FINAL.pdf.

See case studies from: Ecuador, Ghana, India, Indonesia, Jordan, Madagascar, Malawi, Nigeria and Slovenia.

Module 1.5 Land degradation – continued

Learning objectives:

- Learn about different assessments of land degradation;
- Understand drivers of land degradation and factors enabling restoration.

Summary

Part 1 presents different global assessments of land degradation and restoration such as the Global Assessment of Soil Degradation (GLASOD), the World Atlas

of Desertification (WAD), results from the State of Land and Water Resources (SOLAW) 2021 and the UNDER Framework for Ecosystem Restoration Monitoring (FERM). It ends with an exercise comparing different assessment results.

Part 2 explores drivers of land degradation at global and national level, giving students the opportunity to reflect on and discuss drivers in their own country. It also explores the factors enabling and hindering the adoption of SLM practices. It ends with a student exercise on SDG 2 and 15 and a short video.

Overview of session

Introduction slides – 2 mins

PART 1: Global assessments of land degradation and restoration – 20 mins

PART 2: Drivers of land degradation and enabling factors for restoration – 20 mins

- Student exercise: Progress towards SDG 2 and 15 – 15 mins;
- Optional video for classroom or homework – 10 mins.

The lecturer concludes the session with the lessons learned slide – 3 mins.

Teaching notes

PART 1: The different assessments are introduced by the lecturer with the aim of demonstrating that, depending on which assessment/map we are looking at, we will get a very different picture in terms of the state of land degradation. The lecturer may also reflect on changes over time and trends, e.g. in their own country or region. Additional slides may be included by the lecturer focusing on existing national assessments, if desired.

PART 2: The aim here is to understand the drivers of land degradation: different actors and their competing interests, for instance. A practical exercise will help students to reflect on their country-specific situation and prevailing potential drivers.

Key references/resources

A link to the source of the assessments/maps is provided on each relevant slide. Since most of the assessments can be accessed online, it is suggested that students click on the link and further explore the datasets.

Module 1.6 Sustainable land management – introduction

Learning objectives

- Describe the core ideas and objectives of SLM;
- Describe the SLM conceptual framework;
- Describe sustainable land management practices.

Summary

In this session, core ideas and objectives of SLM are introduced. In part 1, definitions and objectives of SLM are introduced, followed by the SLM conceptual framework.

In part 2, the lecturer highlights that this course will mainly focus on cropland: land used for cultivation of crops (field crops, orchards) with a particular focus on innovative sustainable agricultural solutions. Refer to the slides for the definition of innovative solutions. SLM practices are introduced and the global WOCAT network for SLM presented, including a brief glimpse into the global WOCAT SLM database.

Overview of session

Introduction slides – 2 mins

Part 1: Definitions and objectives of SLM

- Definitions of SLM - 5 mins
- Models and framework – 25 mins
  - 15 mins of group work
  - 10-min plenary discussion
- SLM conceptual framework - 15 mins.

Part 2: Sustainable land management practices

- Sustainable land management practices – 10 mins

Lessons learned – 3 mins.

Teaching notes

Introduction slides – 2 mins

- Introduce the session's outline and the learning objectives.

Part 1: Definitions and objectives of SLM

- Definitions of SLM – 5 mins

The lecturer introduces two definitions of SLM and the related objectives.

- Models and framework – 25 mins

The lecturer introduces a group exercise on developing an SLM model. Students watch a video (6 min) to inspire their thinking and take notes of elements to be included into a SLM model. The students share their results in plenary and the lecturer collects the main elements mentioned by the students.

- SLM conceptual framework – 15 mins

The lecturer introduces the SLM conceptual framework through a series of slides highlighting the different elements.

Part 2: Sustainable land management practices

- Sustainable land management practices – 10 mins

The lecturer shows two examples of SLM practices, and then introduces WOCAT, the global network for SLM. WOCAT supports the compilation, documentation, evaluation, sharing, dissemination and application of SLM knowledge. WOCAT provides a framework for knowledge management and decision support for SLM and provides a series of tools and a global database. The content of the WOCAT database is briefly highlighted.

Module 2 will dive deeper into SLM practices.

The lecturer concludes the session with the lessons learned slide (3 mins).

Key references/resources

- Critchley, W., Harari, N. and Mekdaschi-Studer, R. (2021). *Restoring Life to the Land: The Role of Sustainable Land Management in Ecosystem Restoration*. United Nations Convention to Combat Desertification and World Overview of Conservation Approaches and Technologies (WOCAT).
- Epstein, J. M. (n.d.). Why Model? *Journal of Artificial Societies and Social Simulation*, 11(4), 12.
- Food and Agriculture Organization of the United Nations. (2023). *Sustainable Land Management (SLM):* https://www.fao.org/land-water/land/sustainable-land-management/en/
- Liniger, H. P. & Mekdaschi Studer, R. (2019). *Sustainable rangeland management in Sub-Saharan Africa: Guidelines to good practice*. TerrAfrica; World Bank; World Overview of Conservation Approaches and Technologies; World Bank Group; Centre for Development and Environment: https://www.wocat.net/library/media/174/.
- WOCAT. (2023). *What is SLM for WOCAT?* https://www.wocat.net/en/slm/sustainable-land-management/

Module 1.7 Related concepts for sustainable agriculture and land restoration

Learning objectives

- Compare SLM to related concepts for sustainable agriculture and land restoration;
- Apply SLM and related concepts for disaster risk reduction.

Overview of session

Introduction slides – 2 mins

Part 1: Concepts related to SLM – 30 mins

- Mini lectures and student activities – 30 mins

Part 2: Disaster risk reduction – 25 mins

- Lecture: Details of the United Nations Decade on Ecosystem Restoration – 10 mins
- Student activity: How is risk reduced? – 15 mins

Lessons learned – 3 mins

Summary

- Part 1: Concepts related to SLM
  - While this course emphasizes SLM, there are a variety of related concepts for sustainable agriculture and land restoration;
  - Through a series of short videos, students are introduced to four such concepts: climate-smart agriculture, nature-based solutions, regenerative agriculture and agroecology.
- Part 2: Disaster risk reduction
  - Disaster risk reduction is introduced as an umbrella concept for sustainable agriculture and land restoration;
  - Several key concepts are defined and illustrated with examples, including disaster, risk, disaster risk reduction, exposure, vulnerability, adaptive capacity and ecosystem-based disaster risk reduction;
  - Students consider how farmers can reduce the risks of flooding and how SLM and related concepts (e.g. agroecology) could be used as part of a disaster risk reduction strategy.

Teaching notes

- Part 1: Concepts related to SLM
  - Invite students to take notes on the key principles or objectives of each concept and how they are similar or different to SLM. After showing the videos, invite students to discuss their notes in pairs or small groups. Afterwards, facilitate a classroom discussion. Organize students' answers in a table on a blackboard or screen.
- Part 2: Disaster risk reduction
  - Give students 5 to 10 minutes to discuss the questions in pairs or in small groups. Afterwards, facilitate a classroom discussion.

Key references/resources

- Renaud, F, Sudmeier-Rieux, K, Estrella, M. (2013) *The Role of Ecosystems in Disaster Risk Reduction.* United Nations University Press, Tokyo, 489 pp. https://digitallibrary.un.org/record/768410?ln=en.
- Food and Agriculture Organization of the United Nations. (2023). *The 10 elements of agroecology*: https://www.fao.org/documents/card/en/c/I9037EN/https://www.fao.org/documents/card/en/c/I9037EN/.

See case study from: India.

Module 1.8 Justice, power and gender

Learning objectives

- Critically reflect on restoration;
- Evaluate restoration in terms of justice, power and gender.

Overview of session

Introduction slides – 2 mins

Part 1: Restoration of what, for whom and why? – 20 mins

- Scenario: Restoration of what, for whom and why? – 20 mins

Part 2: Justice, power and gender – 35 mins

- Mini lectures and scenario: Restoration of what, for whom, and why? – 35 mins

Lessons learned – 3 min

Summary

- Part 1: Restoration of what, for whom and why?
  - A scenario is used to facilitate an exploration of the themes of justice, power and gender. In the scenario, land is to be restored to one of two baselines: an original baseline, in which local communities had access to the land and used it for subsistence farming through agroforestry, and a later baseline, in which the local communities were evicted and an international investor used the land for intensive food production;
  - The starting point for the scenario is a state of social and ecological degradation;

- Students are asked to consider whether to restore the social conditions only, the ecological conditions only, or both the social and ecological conditions, and to which baseline.

- Part 2: Justice, power and gender
  - After the first exercise, students are introduced to concepts of justice (distributive, procedural and recognitional), concepts of power, and gender;
  - Students revisit the scenario and develop ideas about which restoration option to select, and why; who has or does not have power, and with what consequences; and how the restoration options could affect the values, needs and interests of women.

Teaching notes

- Part 1: Restoration of what, for whom and why?
  - Give students 10--15 minutes to discuss the questions. Afterwards, facilitate a classroom discussion.
- Part 2: Justice, power and gender
  - For each exercise, give students 5 to 10 minutes to discuss the question in pairs or in small groups. Afterwards, facilitate classroom discussions.

Key references/resources

- Tribaldos, T. & Kortetmäki, T. (2022). Just transition principles and criteria for food systems and beyond. *Environmental Innovation and Societal Transitions*, 43, 244–256. https://doi.org/10.1016/j.eist.2022.04.005.
- Lukes, S. (1974). *Power: A radical view* (2nd ed). Palgrave Macmillan.

See case studies from: Ghana, India.

Module 2: Agricultural approaches to sustainable land management

Core competencies

Academic knowledge:

- Sustainable land management principles to enhance environmental functions
- Sustainable land management (SLM) practices (SLM Technologies and SLM Approaches) for sustainable agriculture;
- Classification of SLM Technologies into five measures and a range of technology groups;
- SLM Approaches (participation, role of stakeholders, …)
- Relevance of agro-ecological zones (AEZ) and landscape units for sustainable land management;
- Application of SLM practices within larger landscapes, watersheds, AEZs;
- Barriers to and enablers of SLM adoption;
- Theories of change for sustainable agriculture.

Practical skills:

- Application of the SLM framework to specific cases;
- Apply the SLM principles to enhance environmental functions;
- Identify and apply suitable SLM practices in efforts to achieve sustainable agriculture and land restoration at multiple scales;
- Develop an intervention: analyse the context of a problem and design a theory of change.

Attitudes and values:

- Underline the importance of inclusivity, participation and context sensitivity in SLM;
- Motivation and desire to engage in SLM.

Module 2.1 Sustainable land management – Principles to enhance environmental functions

Learning objectives

- Apply the SLM conceptual framework to specific cases (e.g. peanut farming in Haiti);
- List the principles of SLM to enhance environmental functions;
- Explain the principle of SLM related to water availability/the water cycle.

Summary

In part 1 of this submodule, students apply the SLM conceptual framework to an actual case in Haiti. They reflect on (i) global and local/national drivers; (ii) the selected land management practices; and (iii) the impact they have on the health of land resources, ecosystem services and human well-being.

In part 2, students learn about the principles of SLM to enhance environmental functions. The principles of water productivity/the water cycle will be elaborated on. The water cycle and related challenges will be elaborated on for humid areas, where the regulation of discharge is essential (redirect, slow down, prevent and catch, save). A series of structural measures will be shown. In addition, the water cycle in semi-arid areas will be illustrated, where water harvesting, improved infiltration and the prevention of evaporation are essential. The water productivity/water cycle theory will be illustrated by an example from Ethiopia, showing how structural and vegetative measures have been combined.

Overview of session

Introduction slides – 2 mins

Part 1: Applying the SLM conceptual framework

- Group exercise: Applying the SLM conceptual framework – 15 mins;
- Plenary discussion and results slide – 10 mins.

Part 2: Principles of SLM

- Watch the "SLM principles" video and list the key elements – 20 mins;
- Introduction to SLM principles and water availability/the water cycle – 10 mins.

Lessons learned - 3 mins

Teaching notes

Introduction slides – 2 mins

- Introduce the session's outline and the learning objectives.

Part 1: Applying the SLM conceptual framework

- Group exercise: Applying the SLM conceptual framework – 15 mins

The session starts with a group session of about 20 minutes. Students watch a video (7 mins) about peanut farmers in Haiti and try to answer guiding questions in small groups.

- Plenary discussion and results slide – 10 mins

Students share their results in plenary and the lecturer moderates a classroom discussion. The lecturer may show a results slide that presents the answers to the questions.

Part 2: Principles of SLM

- Watch the "SLM principles" video and collect key elements – 20 mins

Students watch the "SLM principles" video in plenary. While watching the video, students should capture the problems and solutions mentioned (individual note-taking). Students share their results in plenary. The lecturer notes down the problems/solutions on a flip chart or blackboard/whiteboard. In the discussion, the lecturer tries to elaborate on key elements that are particularly important, clustering the inputs (problems and solutions) related to the SLM principles (refer to the lecture notes at the end of the PowerPoint slide).

- Introduction to SLM principles and water availability/the water cycle – 10 mins

The lecturer lists the principles of SLM to enhance environmental functions: water productivity/the water cycle; cover (vegetation, mulch); soil fertility: organic matter/nutrient cycle; and micro-climate. The lecturer explains that these key elements/principles are often "disrupted".

The lecturer shows a short video clip about the "disruption of the water cycle and related SLM principles" (3 mins). While watching the video, students should reflect on: (i) How does land management affect the SLM principles? and (ii) What can you do to prevent the disruption of the listed SLM principles? Ideally, the notes by the students will already be clustered according to the four SLM principles.

The lecturer moderates a discussion to answer "What can you do to prevent a 'disrupted' water cycle?" and collects the points mentioned. The lecturer illustrates water productivity/the water cycle through a series of slides for "humid and semi-arid areas".

The lecturer concludes the session with the lessons learned slide (3 mins).

Key references/resources

- Mekdaschi Studer, R. and Liniger, H. (2013). *Water Harvesting: Guidelines to Good Practice*. Centre for Development and Environment (CDE), Bern; Rainwater Harvesting Implementation Network (RAIN), Amsterdam; MetaMeta, Wageningen; The International Fund for Agricultural Development, Rome. WaterHarvesting_lowresolution.pdf (wocat.net).
- Liniger, H.P., R. Mekdaschi Studer, C. Hauert and M. Gurtner. (2011). *Sustainable Land Management in Practice – Guidelines and Best Practices for Sub-Saharan Africa*. TerrAfrica, World Overview of Conservation Approaches and Technologies and Food and Agriculture Organization of the United Nations. SLM_in_Practice_E_Final_low.pdf (wocat.net).
- Liniger, H. P. & Mekdaschi Studer, R. (2019). *Sustainable rangeland management in Sub-Saharan Africa: Guidelines to good practice*. TerrAfrica; World Bank; World Overview of Conservation Approaches and Technologies; World Bank Group; Centre for Development and Environment: https://www.wocat.net/library/media/174/.

Module 2.2 Sustainable Land Management – Principles to enhance environmental functions, continued

Learning objectives

- Explain the principles of SLM to enhance environmental functions related to
  - Cover (vegetation, mulch);
  - Soil fertility: organic matter/nutrient cycle;
  - Micro-climate.
- Explain interdependence of SLM principles

Summary

In this session, the explanation of the principles of SLM to enhance environmental functions continues.

In part 1, the principle of cover (vegetation, mulch) is further elaborated on, followed by the principle of soil fertility and micro-climates. Each principle is illustrated through figures and examples from different countries.

In part 2, the four SLM principles to enhance environmental functions are connected and their interdependence is illustrated.

Overview of session

Introduction slides – 2 mins

Part 1: Principles of SLM to enhance environmental functions

- Explain principle of cover - 20 mins
- Explain principle of soil fertility - 10 mins
- Explain principle of micro-climates - 20 mins (including 9:30 min video)

Part 2: Take away principles of SLM to enhance environmental functions

- Take away: SLM principles - 5 mins

Lessons learned – 3 mins

Optional: Homework about strengths/weaknesses of SLM principles for different land use types.

Teaching notes

Introduction slides – 2 mins

- Introduce the session's outline and learning objectives.

Part 1: Principles of SLM to enhance environmental functions

The lecturer continues the discussion of the SLM principles.

- Explain principle of cover – 20 mins

The lecturer moderates a discussion and collects the answers to the two questions: (1) How does land management affect SLM principles? And (2) What can you do to prevent the disruption of the listed SLM principles? The soil cover (vegetation, mulch) is illustrated through figures and pictures.

- Explain the principle of soil fertility – 10 mins

The lecturer follows the same procedure as above for soil fertility.

- Explain the principle of micro-climate – 20 mins (including a 9:30 min video)

The lecturer leads a discussion and collects the answers to the two questions.

The lecturer then shows a video about micro-climates. Students should answer the following two questions:

1) What are the key features of a micro-climate?
2) How do the four SLM principles discussed influence the micro-climate?

The lecturer moderates a classroom discussion and concludes the discussion with a few content slides about micro-climates, using examples.

Part 2: Take away principles of SLM to enhance environmental functions

- Take away: SLM principles – 5 mins

In part 2, the four SLM principles to enhance environmental functions are connected and their interdependence is illustrated.

The lecturer concludes the session with the lessons learned slide (3 mins).

Optional: homework about the strengths/weaknesses of SLM principles for different land use types.

Key resources

- Mekdaschi Studer, R. and Liniger, H. (2013). *Water Harvesting: Guidelines to Good Practice.* Centre for Development and Environment, Bern; Rainwater Harvesting Implementation Network, Amsterdam; MetaMeta, Wageningen; The International Fund for Agricultural Development, Rome. WaterHarvesting_lowresolution.pdf (wocat.net).
- Liniger, H.P., R. Mekdaschi Studer, C. Hauert and M. Gurtner. (2011). *Sustainable Land Management in Practice – Guidelines and Best Practices for Sub-Saharan Africa*. TerrAfrica, World Overview of Conservation Approaches and Technologies and Food and Agriculture Organization of the United Nations: SLM_in_Practice_E_Final_low.pdf (wocat.net).
- Liniger, H. P. & R. Mekdaschi Studer. (2019). *Sustainable rangeland management in Sub-Saharan Africa: Guidelines to good practice*. TerrAfrica; World Bank; World Overview of Conservation Approaches and Technologies; World Bank Group; Centre for Development and Environment: https://www.wocat.net/library/media/174/.

Module 2.3 Sustainable land management -- practices (focus on SLM technologies)

Learning objectives

- Describe SLM practices: SLM technologies and SLM approaches;
- Classify SLM technologies into five measures.

Summary

This session introduces an SLM practice comprised of an SLM technology (a physical practice) and an SLM approach (ways and means used to implement one or several SLM technologies) following the WOCAT definition. WOCAT is the knowledge partner of the UNCCD. Therefore, this part focuses on definitions developed by WOCAT and used in the context of the UNCCD. https://www.unccd.int/land-and-life/sustainable-land-management-and-restoration/get-involved/unccd-wocat-partnership-slm.

In part 1, a series of SLM technologies and SLM approaches are presented (and illustrated through short videos).

In part 2, five SLM technology measures following the WOCAT definition are presented: (i) agronomic; (ii) vegetative; (iii) structural; (iv) management; and (v) any combination of these.

In part 3, students start an exercise about SLM technology measures by searching the online WOCAT SLM database. The results of this exercise will be presented in the next submodule 2.4.

Overview of session

Introduction slides – 2 mins

Optional: Discuss homework about the strengths/weaknesses of SLM principles for different land use types.

Part 1: SLM practice

- Presentation of SLM practice (SLM technology and SLM approach) – 15 mins
    - Optional: Show a short video clip of an SLM technology and/or SLM approach

Part 2: SLM technology

- Presentation of five SLM measures that used an SLM technology – 25 mins

Part 3: Exercise about SLM measures

- Introduction to group exercise – 5 mins
- Start of group exercise – 10 mins (to be continued in the next session)

Lessons learned – 3 mins

Teaching notes

Introduction slides – 2 mins

- Introduce the session's outline and learning objectives.

Optional: Discuss homework about strengths/weaknesses of SLM principles for different land use types.

Part 1: SLM practice

- Presentation of SLM practice (SLM technology and SLM approach) – 15 mins

The lecturer introduces SLM technologies by sharing the definition and showing examples. Short video clips are available on the WOCAT website. The lecturer can show short video clips on an optional basis. Similarly, an SLM approach is introduced.

Part 2: SLM technology

- Presentation of five SLM measures of an SLM technology – 25 mins

The lecturer introduces the five SLM technology measures following the WOCAT definition. Each measure is introduced separately and illustrated through examples.

Part 3: Exercise about SLM measures

- Introduction to the group exercise – 5 mins
- Start of the group exercise – 10 mins (to be continued in the next session)

In part 3, the students start a group exercise related to the SLM technology measures. They will need access to the internet to be able to search the online WOCAT SLM database. If there is no internet access, the SLM technology summaries can be provided in PDF files or printed and distributed to the students. The lecturer provides students with a template table to capture the results of their discussion. The students will finalize the group work as homework (if they were not able to finish) and present the results in the next session.

- The lecturer concludes the session with the lessons learned slide (3 mins).

Key resources

- World Overview of Conservation Approaches and Technologies (WOCAT) Sustainable Land Management (SLM) Technologies and Approaches website: https://www.wocat.net/en/global-slm-database/slm-practices-technologies-and-approaches/.
- WOCAT Questionnaire on SLM Technologies: https://wocat.net/library/media/15/.
- Measures are listed in chapter: 3.6 SLM measures comprising the Technology.
- WOCAT books on the website (including national compilations): https://www.wocat.net/en/wocat-media-library/?page=&search=&media_type=3&languages=&year__gte=&year__lte=&continent=&countries=.
- WOCAT 2007: where the land is greener – case studies and analysis of soil and water conservation initiatives worldwide. Editors: Hanspeter Liniger and William Critchley:where_the_land_is_greener_WEB.pdf (wocat.net).

See case studies from: Ecuador, Ghana, India, Indonesia, Jordan, Malawi, Nigeria and Slovenia

Module 2.4 Sustainable land management -- technology measures and SLM principles

Learning objectives:

- Explain SLM measures and how they address degradation;
- Relate SLM Technologies to the SLM principles;

Assign SLM Technologies to SLM Technology groups.

Summary

The discussion about SLM technology measures continues in this session. In a piece of SLM technology, SLM measures are often combined and address specific SLM principles to enhance environmental functions. The students will apply the concept of SLM principles to SLM technologies. They will discuss

the effect SLM practices can have on the SLM principles. Finally, the SLM technologies are assigned to different SLM technology groups.

Overview of session

Introduction slides – 2 mins

Part 1: Exercise about SLM measures

- Presentation and discussion of the group exercise (from the previous session) – 20 mins
- Part 2: Exercise applying the SLM principles (submodule 2.1. and 2.2.) – 20 mins
- Group exercise – 10 mins
- Plenary discussion – 10 mins

Part 3: SLM technology groups

- Presentation of SLM groups – 15 mins

Lessons learned – 3 mins

Teaching notes

Introduction slides – 2 mins

- Introduce the session's outline and the learning objectives.

Part 1: Exercise about SLM measures

- Presentation and discussion of the group exercise (from the previous session) – 20 mins

The lecturer makes a recap of the group exercise tasks from the previous session and invites the groups to present their results. The lecturer leads a classroom discussion. Did the students observe any interesting points?

Part 2: Exercise applying the SLM principles (submodule 2.1. and 2.2.) – 20 mins

- Group exercise – 10 mins
- Plenary discussion – 10 mins

The lecturer introduces an additional group exercise. Students continue to work in the same groups as before on the same SLM technologies that they analysed in the previous group session, and discuss them from the perspective of the SLM principles. The lecturer provides them with a template table to capture the results of their discussion.

The student groups present their results in plenary and the lecturer leads the discussion. Did the students have any challenges with the assignment? Try to find out if any parts of the SLM principles theory have not been fully understood.

Part 3: SLM technology groups

- Presentation of SLM groups – 15 mins

The lecturer presents the SLM technology groups by showing various examples. The SLM technology groups can be searched as a category in the global WOCAT SLM database.

The lecturer concludes the session with the lessons learned slide (3 mins).

Key resources

- World Overview of Conservation Approaches and Technologies (WOCAT) Sustainable Land Management (SLM) Technologies and Approaches website: https://www.wocat.net/en/global-slm-database/slm-practices-technologies-and-approaches/.
- WOCAT Questionnaire on SLM Technologies: https://wocat.net/library/media/15/.
- Measures are listed in chapter 3.6 "SLM measures comprising the Technology".
- WOCAT books on the website (including national compilations): https://www.wocat.net/en/wocat-media-library/?page=&search=&media_type=3&languages=&year__gte=&year__lte=&continent=&countries=.
- WOCAT 2007: Where the land is greener – case studies and analysis of soil and water conservation initiatives worldwide. Editors: Hanspeter Liniger and William Critchley: where_the_land_is_greener_WEB.pdf (wocat.net).

Module 2.5 Sustainable land management -- practices (approaches)

Learning objectives

- Describe SLM approaches in terms of type, scale, participation and role of stakeholders, technical support, capacity-building, knowledge management, financing and external material support;
- Identify enabling and hindering factors of SLM approaches.

Summary

In this session, the SLM approach is introduced following the WOCAT classification. Key elements of an SLM approach are presented, highlighting the three groups (traditional/Indigenous approach, recent local initiatives, project/programmes). The students explore the SLM approaches further by working with the global WOCAT SLM database. Enabling and hindering factors for the implementation of an SLM technology under the SLM approach are discussed.

Overview of session

Introduction slides – 2 mins

Part 1: SLM approach

- Short introduction – 5 mins
- Group exercise: search WOCAT database for SLM approaches – 15 mins
- Presentation and discussion of group exercise – 20 mins

Part 2: SLM Approach: enabling and hindering factors

- Introduction of hindering and enabling factors – 2 mins
- Short group exercise and discussion in plenary – 13 mins

Part 3: Conclusion

- Lessons learned – 3 mins

Teaching notes

Introduction slides – 2 mins

- Introduce the session's outline and the learning objectives.

Part 1: SLM Approach

- Short introduction – 5 mins

The SLM approach is introduced following the WOCAT classification. Key elements of an SLM approach are presented, highlighting the three groups (traditional/Indigenous approaches, recent local initiatives, project/programmes) and presenting examples.

- Group exercise: Search the WOCAT database for SLM approaches – 15 mins

Students explore SLM approaches by searching the online WOCAT SLM database in groups. If no internet access is available, the SLM approach summaries can be shared as PDF files or as hardcopies.

- Presentation and discussion of group exercise – 20 mins

The groups present their results in plenary and the lecturer facilities a classroom discussion.

Part 2:

- Introduction of hindering and enabling factors – 2 mins

The lecturer introduces enabling and hindering factors of SLM approaches.

- Short group exercise and discussion in plenary – 13 mins

The students continue to search the WOCAT SLM database for SLM approaches and focus particularly on enabling and hindering factors.

Part 3: The lecturer concludes the session with the lessons learned slide (3 mins).

Key resources

Additional material for lecturers:

- SLM approach examples

- World Overview of Conservation Approaches and Technologies (WOCAT) Sustainable Land Management (SLM) Technologies and Approaches website: https://www.wocat.net/en/global-slm-database/slm-practices-technologies-and-approaches/.
- WOCAT questionnaire on SLM technologies: https://wocat.net/library/media/15/.
- Measures are listed in chapter 3.6 "SLM measures comprising the technology".
- WOCAT books on the website (including national compilations): https://www.wocat.net/en/wocat-media-library/?page=&search=&media_type=3&languages=&year__gte=&year__lte=&continent=&countries=.
- WOCAT 2007: Where the land is greener – case studies and analysis of soil and water conservation initiatives worldwide. Editors: Hanspeter Liniger and William Critchley:_where_the_land_is_greener_WEB.pdf (wocat.net).

See case studies from: Ecuador, Ghana, India, Indonesia, Jordan, Malawi and Nigeria.

Module 2.6 Sustainable Land Management interventions at the landscape level

Learning objectives

- Describe the relevance of agro-ecological zones (AEZs) and landscape units for land management;
- Apply SLM technologies within larger landscapes, watersheds and AEZs.

Summary

In this session, part 1, we will consider SLM interventions at the landscape level. Landscapes and their AEZs will be defined at the beginning of the sessions. The landscapes will be further divided into different landscape units based on their landforms, slope and elevation. Various examples from different countries will be illustrated. In part 2, SLM technologies will be selected for specific landscape units. Students will select specific SLM technologies for specific landscape units in a group exercise.

Overview of session

Introduction slides – 2 mins

Part 1: SLM interventions at the landscape level

- Introduction to landscapes, AEZs and landscape units (including a short discussion with students) – 25 mins

Part 2: Implementing SLM technologies in specific landscape units:

- Introduction to group exercise (example from Cambodia)
- Group exercise: 20 mins
- Presentation and discussion of group exercise – 10 mins

Lessons learned – 3 mins

Teaching notes

Introduction slides – 2 mins

Part 1: SLM interventions at the landscape level

- Introduction to landscapes, AEZs and landscape units (including a short discussion with students) – 25 mins

The lecturer introduces landscapes and their AEZs. The landscapes are further divided into different landscape units (based on their landforms, slope and elevation). Various examples from different countries are illustrated.

Part 2: Implementing SLM technologies in specific landscape units

- Group exercise (example from Cambodia) – 20 mins

The lecturer introduces the group exercise illustrating specific landscape units for Cambodia (feel free to adjust the exercise to your country).

The student groups start to work on the tasks.

- Presentation and discussion of group exercise – 10 mins

The groups present their results in plenary and the lecturer leads a classroom discussion.

The lecturer concludes the session with the lessons learned slide – 3 mins

Key resources

- Tim, S., Providoli, I., Sien, T., Yim, S., Kim, S., Liniger, H. 2023. Strengthening climate resilience of rural communities by co-producing landscape-specific integrated farming systems in Cambodia. *Journal of land use science*, 18(1), pp. 152-175. Taylor & Francis 10.1080/1747423X.2023.2190740.

See case studies from: Ghana, India, Jordan, Malawi and Nigeria

Module 2.7 Barriers to and enablers of SLM adoption

Learning objectives

- Analyse the characteristics of key decision-makers to identify potential barriers and enablers of SLM adoption;
- Analyse lock-in mechanisms and cognitive biases and heuristics that impede SLM adoption; consider potential solutions.

Overview of session

Introduction slides – 2 mins

Part 1: Decision-makers and decision-making environments – 30 mins

- Scenario: Adopting SLM practices - 10 min
- Lecture (mainstreaming, scaling-out, decision-makers) – 10 mins
- Student activity: Decision-makers (questions to ask) – 15 mins
- Lecture (environments, literature, examples)

Part 2: Deep barriers - 25 min

- Lecture: Lock-in and cognitive biases and heuristics – 10 mins
- Student activity: Analysing deep barriers – 15 mins

Lessons learned – 3 min

Summary

- Part 1: Decision-makers and decision-making environments
  - Mainstream and scaling-out are introduced as techniques for overcoming barriers and harnessing enablers of SLM adoption;
  - Barriers and enablers are explored at two levels: decision-makers (e.g. farmers) and decision-making environments (e.g. markets);
  - Students are introduced to an inventory of concepts for assessing how decision-makers affect SLM adoption: identities, values, goals, needs, knowledge, beliefs and resources. Environmental factors (laws, regulations, social norms, finance, markets) are listed;
  - Literature on barriers and enablers is briefly described; examples of specific and generalized findings are highlighted.
- Part 2: Deep barriers
  - Deep barriers to change are introduced: lock-in (related to environmental barriers/enablers) and cognitive biases and heuristics.

Teaching notes

- Part 1: Decision-makers and decision-making environments
  - Scenario: adopting SLM practices: Give students 5–10 minutes to discuss the questions in pairs or in small groups. Afterwards, facilitate a classroom discussion;
  - Fill in the table with students;

Decision-makers (questions to ask): Give students 10–15 minutes to discuss the questions in pairs or in small groups. Afterwards, facilitate a classroom discussion. Present the examples in the table, then invite students to share their examples and discussions.

- Part 2: Deep barriers
  - Analysing deep barriers: Give students 10–15 minutes to discuss the questions. Afterwards, facilitate a classroom discussion. Ask for multiple speakers from each group (e.g. one speaker per question).

Key resources

- Harari, N., Mekdaschi Studer, R., Bastidas Fegan, S., Schlingloff, S., & Brès, A. (2023). *Promoting sustainable land management through evidence-based decision support*. Food and Agriculture Organization of the United Nations: https://doi.org/10.4060/cc6118en.
- Liniger, H., Harari, N., van Lynden, G., Fleiner, R., de Leeuw, J., Bai, Z., & Critchley, W. (2019). Achieving land degradation neutrality: The role of SLM knowledge in evidence-based decision-making. *Environmental Science & Policy*, 94, 123–134: https://doi.org/10.1016/j.envsci.2019.01.001.

See case study from: Slovenia

Module 2.8 Theories of change

Learning objectives

- Think systematically about how to initiate and guide processes of change.

Overview of session

Introduction slides – 2 mins

Part 1: Main components of a theory of change – 25 mins

- Lecture – 30 mins

Part 2: Practice designing a theory of change – 30 mins

- Student activity: Presenting the Action Plan of the United Nations Decade on Ecosystem Restoration as a theory of change – 30 mins

Lessons learned – 3 mins

Summary

- Part 1: Main components of a theory of change (ToC)
  - A ToC is a set of interrelated hypotheses about how a problem can be solved;
  - Reasons are given for developing ToCs: specifying problem understandings, communicating ideas and attracting support, etc.
  - Main components of ToC are introduced: long-term goals, short-term goals, outputs, and activities, with examples;
  - Project scope, contextual analysis, uncertainties, and uses for ToCs are discussed.
- Part 2: Practice designing a ToC
  - Student exercise on translating the Action Plan of the United Nations Decade on Ecosystem Restoration into a ToC.

Teaching notes

- Part 1: Main components of a ToC
  - n/a
- Part 2: Practice designing a ToC
  - Slide 24: presenting the Action Plan of the United Nations Decade on Ecosystem Restoration as a ToC: Give students 15–20 minutes to carry out the instructions. Afterwards, facilitate a classroom discussion. Have each group present its ToC.
- Assign homework for the next lesson:
  - If not already done earlier in the course, students should get into final project groups (e.g. 3–4 students);
  - If not already done earlier in the course, groups should select a problem to work on (i.e. a landscape with unsustainable agriculture and degraded land). See case studies as examples of suitable problem types. Ideally, provide students with a list of problems they can work on, selected for their relevance to the students' circumstances (e.g. the

country, subnational area, or landscape in which the course is being taught).

Module 2.9 Designing an innovative sustainable agriculture intervention (part 1)

Learning objectives

- Analyse the context of a problem related to unsustainable agriculture and land degradation.

Overview of session

- Introductory slides (10 mins)
  - Designing an intervention
  - Guiding questions
  - Things to keep in mind
- Group presentations (50 mins)

Summary

- Groups present contextual analyses for their final project problems and receive feedback from the instructor and fellow students.

Teaching notes

- Divide the presentation time according to the number of groups in the class;
- Encourage groups to share visuals and/or textual summaries of their contextual analyses with the class in advance of their presentations (e.g. a few days before);
- Facilitate a constructive exchange of feedback: encourage students to help one another improve their context analyses (e.g. what is missing, what could be interpreted differently, what evidence is needed?).

Module 2.10

Title: Designing an innovative sustainable agriculture intervention (part 2)

Learning objectives

- Design a theory of change for an intervention based on a contextual analysis.

Overview of session

- Introductory slides (10 mins)
  - Designing an intervention
  - Guiding questions
  - Things to keep in mind
- Group presentations (50 mins)

Summary

- Groups present ToCs for their final project problems and receive feedback from the instructor and fellow students.

Teaching notes

- Divide the presentation time according to the number of groups in the class;
- Encourage groups to share visuals and/or textual summaries of their contextual analyses with the class in advance of their presentations (e.g. a few days before);
- Facilitate a constructive exchange of feedback: Encourage students to help one another improve their contextual analyses (e.g. what is missing, what could be interpreted differently, what evidence is needed?).

Module 3: Tools and technologies for land restoration assessment and monitoring

Core competencies

Academic knowledge:

- Decision-support framework;
- Data literacy;
- Land assessment and monitoring data and tools;
- Citizen science;
- Technologies (drones, sensors, etc.) for innovation to address land degradation and SLM.

Practical skills:

- Data management, analysis and interpretation;
- Use of assessment and monitoring tools.

Attitudes and values:

- Importance of data literacy;
- Concern for suitability and applicability of tools and technologies.

Module 3.1 Decision support for sustainable agricultural land management

Learning objectives

- Think systematically about how to support good decision-making around the sustainable management of agricultural land.

Overview of session

Introduction slides – 2 mins

Part 1: Decision-makers in agricultural land use – 20 mins

- Student activities (2): Who makes decisions that affect agricultural land use? – 20 mins

Part 2: Decision-support framework – 35 mins

- Lecture: WOCAT decision-support framework – 35 mins

Lessons learned – 3 mins

Summary

- Part 1: Decision-makers in agricultural land use
  - A pair of exercises help students reflect on who makes decisions that affect agricultural land use (links to module 2.7 on barriers and enablers).
- Part 2: Decision-support framework
  - The WOCAT decision-support framework is introduced step-by-step. The official WOCAT figure is adapted for the PowerPoint presentation; the same colour scheme is used to link to the official figure;
  - Topics introduced include mainstreaming and scaling-out; national/subnational assessment; prioritization of regions/landscapes; landscape/local-level assessment; land-use/territorial planning; implementation and scaling-out; and knowledge management.

Teaching notes

- Part 1: Decision-makers in agricultural land use
  - Student activity: Set up a Menti at https://www.mentimeter.com. Add the access code to this slide. Give students five minutes to add their ideas. Share the results with the class and facilitate a classroom discussion;

- Student activity: Give students five minutes to discuss the reflection question in pairs or small groups. Afterwards, facilitate a classroom discussion.

- Part 2: Decision-support framework:
  - Present the lecture on the WOCAT decision-support framework. Extensive notes are provided in the "Notes" sections of the presentation. Note that the visualization of the decision-support framework differs slightly from the official figure presented in Harari et al. (2023). However, the same colour scheme is used to ensure comparability.

Key resources

- Food and Agriculture Organization of the United Nations (FAO). (2018). *Sustainable food systems: Concept and framework:* https://www.fao.org/3/ca2079en/CA2079EN.pdf.*
- Harari, N., Mekdaschi Studer, R., Bastidas Fegan, S., Schlingloff, S., & Brès, A. (2023). *Promoting sustainable land management through evidence-based decision support*. FAO: https://doi.org/10.4060/cc6118en.

Module 3.2 Data and data literacy

Learning objectives

- Think critically about data, including how and why data is generated, collected and handled;
- Reflect on your own data ethics and learn to handle data responsibly.

Overview of session

Introduction slides – 2 mins

Part 1: Data, data literacy and data protection and ethics – 25 mins

- Lecture: What is data literacy?; what is data?; how is data collected?; why do we care about data?; data protection and ethics; examples of data protection laws, responsibilities, AI – 15 mins
- Student activity (What are your data ethics?) – 10 min

Part 2: Sources and types of data and open science – 30 min

- Lecture: Why do we need data for sustainable agriculture?; sources and types of data; open science – 20–30 mins
- Optional student activities – 10 mins

Lessons learned – 3 mins

Summary

- Part 1: Data, data literacy, data protection and ethics
  - Data literacy and data is defined, and types of data are described (unstructured vs. structured). Methods of data collection are described. Reasons for collecting and using data are given, linking to values, goals and actions. Students reflect on their own data ethics. Examples of data protection laws are given, along with examples of responsibilities under those laws. Data protection and AI are discussed.
- Part 2: Sources and types of data, and open science
  - Data needs for agricultural land management are discussed. Sources (primary and secondary) and types (variables, time, space) of data are reviewed. The concept of open science is introduced.

Teaching notes

- Part 1: Data, data literacy, and data protection and ethics
  - Student activity (What are your data ethics?): Give students 5–10 minutes to discuss the questions in pairs or small groups. Afterwards, facilitate a classroom discussion;
  - Optional student activity (data protection and AI): Give students five minutes to discuss the reflection question. Afterwards, facilitate a classroom discussion.
- Part 2: Sources and types of data and open science
  - Student activity (Why do we need data for managing agricultural land?): Set up a Menti at https://www.mentimeter.com. Add the access code to this slide. Give students 2–5 minutes to add their ideas. Share the results with the class and facilitate a classroom discussion;

- Optional student activity (open science): Give students 5 minutes to discuss the reflection question in pairs or in small groups. Afterwards, facilitate a classroom discussion.

Module 3.3 Assessment and monitoring for land degradation neutrality

Learning objectives

- See land through the lens of the land degradation neutrality (LDN) framework;
- Familiarize yourself with the national processes related to achieving and monitoring progress towards land degradation neutrality.

Overview of session

Introduction slides – 2 mins

Part 1: Land degradation neutrality – 20 mins

- Lecture: What is LDN, neutrality mechanism, objectives, response hierarchy, overall conceptual framework – 20 mins

Part 2: National processes for LDN implementation and the LDN Target Setting Programme (LDN TSP) – 35 mins

- Lecture: National commitments, LDN projects, national reporting, LDN TSP – 10 mins
- Student activity (Who has LDN targets?) – 25 mins

Lessons learned – 3 mins

Summary

- Part 1: Land degradation neutrality
  - LDN is defined. LDN is positioned in relation to the SDGs. The neutrality mechanism is explained. The response hierarchy is illustrated. The overall conceptual framework is presented.
- Part 2: National processes for LDN implementation and the LDN TSP
  - National processes for LDN implementation are introduced. The LDN TSP is described. Students pick a country and evaluate its reporting to the UNCCD.

Teaching notes

- Part 1: Land degradation neutrality
  - See lecture notes in presentation.
- Part 2: National processes for LDN implementation and the LDN TSP
  - Student activity (Who has LDN targets?): Give students 15–20 minutes to carry out the instructions in pairs or small groups. Afterwards, facilitate a classroom discussion. If a country has voluntary targets and a report, they will be listed under "Voluntary LDN targets (Optional)". If a country has a national action plan, it will be listed under "National Action Programmes". If a country has reported to the UNCCD (Performance Review and Assessment of Implementation System 4 (PRAIS4)), the report will be listed under "Submitted reports in the UNCCD reporting process".

Key references/resources

- Cowie, A. L., Orr, B. J., Castillo Sanchez, V. M., Chasek, P., Crossman, N. D., Erlewein, A., Louwagie, G., Maron, M., Metternicht, G. I., Minelli, S., Tengberg, A. E., Walter, S., & Welton, S. (2018). Land in balance: The scientific conceptual framework for Land Degradation Neutrality. *Environmental Science & Policy,* 79, 25–35: https://doi.org/10.1016/j.envsci.2017.10.011.
- United Nations Convention to Combat Desertification. *Land Degradation Neutrality*. (2023). https://www.unccd.int/land-and-life/land-degradation-neutrality/overview.

Module 3.4 Data, methods and apps for mapping land degradation

Learning objectives

- Assess land degradation datasets, data sources and analytical methods for strengths and weaknesses;
- Design participatory approaches for mapping land degradation that combine global data and local knowledge;
- Integrate multiple sources of evidence to make judgments about land degradation.

Overview of session

Introduction slides – 2 mins

Part 1: Introduction to maps, data and methods – 20 mins

- Student activity (Is land degraded?) – 10 mins
- Lecture: What is the purpose of mapping?; mapping difficulties; what data and methods should be used?; worldwide examples – 10 mins

Part 2: Indicators and tools – 35 mins

- Lecture: Indicators, best available data, legends, transition matrices, participation, combining indicators – 25 mins
- Student activity (combining the three indicators) – 10 mins

Lessons learned – 3 mins

Summary

- Part 1: Introduction to maps, data and methods
  - The importance of maps is explained. Students see how different datasets can lead to different maps (of degradation). Data and methods for mapping are introduced. Worldwide examples of participatory land degradation are provided.
- Part 2: Indicators and tools
  - Indicators of land degradation from the PRAIS 4 reporting system are introduced.

Examples of approaches to monitoring and assessing land degradation are provided for each indicator. Topics include best available data; support tools; UNCCD land classifications; land degradation map legends; Trends.Earth; Google Earth Engine. Students learn how to integrate the three indicators to achieve an overall impression of the state of land.

Teaching notes

- Part 1: Introduction to maps, data and methods
  - Student activity (Is the land degraded?): Give students five minutes to follow the instructions in pairs or small groups. Afterwards, facilitate a classroom discussion.
- Part 2: Indicators and tools
  - Student activity (combining the indicators): Give students five minutes to discuss the scenarios. Afterwards, facilitate a classroom discussion;
  - Optional student activity (GEO LDN Toolbox): Give students 5–10 minutes to explore the GEO LDN toolbox. Afterwards, invite students to share some of the data and tools that interest them.

Key references/resources

- FAO elearning Academy (nd) Using land-cover information to monitor progress on Sustainable Development Goal 15 https://elearning.fao.org/course/view.php?id=1098
- Orr, B.J., A.L. Cowie, V.M. Castillo Sanchez, P. Chasek, N.D. Crossman, A. Erlewein, G. Louwagie, M. Maron, G.I. Metternicht, S. Minelli, A.E. Tengberg, S. Walter, and S. Welton. (2017). *Scientific Conceptual Framework for Land Degradation Neutrality. A Report of the Science-Policy Interface*. United Nations Convention to Combat Desertification (UNCCD), Bonn, Germany. https://www.unccd.int/sites/default/files/2018-09/LDN_CF_report_web-english.pdf
- Sims, N.C., Newnham, G.J., England, J.R., Guerschman, J., Cox, S.J.D., Roxburgh, S.H., Viscarra Rossel, R.A., Fritz, S. and Wheeler, I. (2021). *Good*

Practice Guidance. SDG Indicator 15.3.1, Proportion of Land That Is Degraded Over Total Land Area. Version 2.0. United Nations Convention to Combat Desertification, Bonn, Germany. https://www.unccd.int/sites/default/files/documents/2021-09/UNCCD_GPG_SDG-Indicator-15.3.1_version2_2021.pdf

Module 3.5 Participatory expert assessment of land degradation

Learning objectives

- Set up a process for mapping land degradation and SLM in a specific area;
- Systematically document land degradation and generate expert recommendations for SLM.

Overview of session

Introduction slides – 2 mins

Part 1: Overview of the Land Degradation Assessment in Drylands (LADA)-WOCAT mapping process – 10 mins

- Lecture: Steps in the process – 10 mins

Part 2: LADA-WOCAT questionnaire for mapping land degradation and SLM – 45 mins

- Lecture: The questionnaire, contributing specialists, land use systems, land degradation per land use system, land conservation per land use system, expert recommendations, exemplary applications – 15 mins
- Student activity (experimenting with the questionnaire) – 30 mins

Lessons learned – 3 mins

Summary

- Part 1: Overview of LADA-WOCAT mapping process
  - The LADA-WOCAT mapping process is introduced. The four units are briefly described:
    - Unit 1: Preparation and planning;
    - Unit 2: Developing and validating land-use systems and defining mapping units;
    - Unit 3: Assessing and mapping select mapping units;
    - Unit 4: Reporting and recommending.
- Part 2: LADA-WOCAT questionnaire for mapping land degradation and SLM
  - The LADA-WOCAT mapping questionnaire is introduced. Important practical considerations are reviewed. The steps in the questionnaire are outlined. Key concepts from the questionnaire's supporting documentation are highlighted. Students experiment with using the QM.

Teaching notes

- Part 1: Overview of LADA-WOCAT mapping process
  - See lecture notes in presentation.
- Part 2: LADA-WOCAT questionnaire for mapping land degradation and SLM
  - Student activity (experimenting with the questionnaire)

Recommended: a field trip exercise based on Module 3.5 is highly recommended.

See also the case study from Ecuador.

Key references/resources

- Food and Agriculture Organization of the United Nations. (2019). *Guidelines for the national assessment and mapping of land degradation and conservation:* https://wocat.net/documents/576/Guidelines_national_assessment_and_mapping_of_land_degradation_and_conservation.pdf.
- World Overview of Conservation Approaches and Technologies. (2008). *Questionnaire for mapping land degradation and sustainable land management (QM)*: https://wocat.net/documents/209/MapQuest_version_1.pdf.

Module 3.6 Citizen science in SLM and land restoration

Learning objectives

- Define, give examples of, and explain the need for citizen science in SLM/land restoration.
- Assess challenges and opportunities involving members of the public in science for SLM/land restoration.

Overview of session

Introduction slides – 2 mins

Part 1: Definition, examples, and the need for citizen science – 25 mins

- Lecture - 10 mins
- Reflection question - 15 mins

Part 2: Citizen science in SLM and land restoration – 30 mins

- Group discussions - 30 mins

Lessons learned – 3 mins

Summary

- Part 1: Definition, examples, the need for citizen science
  - Definitions and examples of citizen science, the need for citizen science, an example (geo-engineering, climate change, and agriculture)
- Part 2: Motivations, challenges, and opportunities for citizen science in SLM/land restoration
  - Group discussions

Teaching notes

- Part 1: Definition, examples, and the need for citizen science
  - See lecture notes in presentation.
- Part 2: Motivations, challenges, and opportunities for citizen science in SLM/land restoration
  - See lecture notes in presentation.

Key references / resources

- Eaton, D. P., Keuroghlian, A., & Santos, M. do C. A. (2017). Citizen scientists help unravel the nature of cattle impacts on native mammals and birds visiting fruiting trees in Brazil's southern Pantanal. *Biological Conservation,* 208, 29–39. https://doi.org/10.1016/j.biocon.2016.09.010.
- von Gönner, J., Herrmann, T. M., Bruckermann, T., Eichinger, M., Hecker, S., Klan, F., Lorke, J., Richter, A., Sturm, U., Voigt-Heucke, S., Brink, W., Liedtke, C., Premke-Kraus, M., Altmann, C., Bauhus, W., Bengtsson, L., Büermann, A., Dietrich, P., Dörler, D., … Bonn, A. (2023). Citizen science's transformative impact on science, citizen empowerment and socio-political processes. *Socio-Ecological Practice Research,* 5(1), 11–33. https://doi.org/10.1007/s42532-022-00136-4.

Module 3.7 Drones for assessing and monitoring land degradation

Learning objectives

- Gain an overview of the use and potential of low-cost unmanned aerial vehicles (UAVs);
- Understand the methodological framework for using UAV for land monitoring
- Process drone imagery and export results;

Overview of session

Introduction slides – 2 mins

Part 1: Overview of the use and potential of low-cost unmanned aerial vehicles (UAVs) – 30 mins

- Lecture: General information about UAVs, conditions for using drones, and types of drones and sensors – 15 mins
- Examples of UAV products for monitoring land – 15 mins

Part 2: A methodological framework for UAV usage and monitoring land – 25 mins

- Lecture: Overview of the steps to use UAV for monitoring land – 10 mins
- Guided exercise with Agisoft Metashape for monitoring land – 15 mins

Lessons learned – 3 mins

Summary

- Part 1: Overview and the use and potential of low-cost UAV
  - General information on UAVs is presented. Conditions for using drones are described. Types of drones and sensors are reviewed. Products obtained from UAV surveys
- Part 2: Methodological framework for UAV usage for monitoring land
  - Students become familiar with the methodological framework to use UAV for monitoring land
  - Students become familiar with Agisoft Metashape for processing drone imagery

Teaching notes

- Part 1: Overview and the use and potential of low-cost UAV
  - See lecture notes in the presentation
- Part 2: Methodological framework for UAV usage for monitoring land
  - Guided exercise with Agisoft Metashape.

Key references/resources

Madagascar case study; Ecuador case study

Module 3.8 Sensors and Internet of Things

Learning objectives

- Acquire introductory knowledge on the potentials of sensor technologies and the Internet of Things in relation to land restoration.

Overview of session

Introduction slides – 2 mins

Part 1: Introduction to environmental monitoring sensors and technologies – 15 mins

- Lecture: Environmental modelling defined, reasons for monitoring the environment, concept and cycle of environmental modelling and links with sustainable agriculture – 10 mins

Part 2: Application of environmental sensors for land degradation – 10 mins

- Lecture: Sensors for monitoring soil moisture, wind velocity, precipitation, ambient temperature, solar radiation; concept of the Internet of Things – 10 mins
- Student exercise: Three short student exercises, one in part 1, and two in part 2. Lecturer will ask questions about the importance of environmental monitoring and their parameters and the importance of measuring important parameters such as soil moisture and precipitation for sustainable land management - 10 mins

Lessons learned – 3 mins

Summary

- Part 1: Introduction to environmental monitoring sensors and technologies
  - Environmental monitoring is defined. Reasons are given for monitoring the environment. The concept and cycle of environmental modelling and links with sustainable agriculture are introduced.
- Part 2: Application of environmental sensors for land degradation

- A variety of sensors are reviewed: soil moisture, wind velocity, precipitation, ambient temperature, and solar radiation. The Internet of Things concept is briefly introduced.

Teaching notes

- Part 1: Introduction to environmental monitoring sensors and technologies
  - See lecture notes in presentation.
- Part 2: Application of environmental sensors for land degradation
  - See lecture notes in presentation.

Key references/resources

- Atzori, L., Iera, A., and Morabito, G. (2010) "The Internet of Things: A survey", *Comput. Netw.,* vol. 54, no. 15, pp. 2787-2805.
- Ogden, F., Selker, J., & Wendroth, O. (2008). Soil Moisture Measurement for Ecological and Hydrological Watershed-Scale Observatories: A Review. *Vadose Zone Journal,* 7(1), 358–389. https://doi.org/10.2136/vzj2007.0143.

Module 3.9 Suitability and applicability

Learning objectives

- Analyze options for monitoring and assessment of land degradation and SLM in a context-sensitive way

Overview of session

Introduction slides – 2 mins

Part 1: Challenges, costs and regulations – 25 mins

- Lecture: Challenges, costs and regulations; overviews and specifics – 25 mins

Part 2: Cultural considerations, bridging different knowledge systems – 30 mins

- Lecture: Cultural considerations and bridging different knowledge systems; overviews and specifics – 30 mins
- Lessons learned – 3 mins

Summary

- Part 1: Challenges, costs and regulations
  - Overviews and specifics are provided about challenges, costs, and regulations in terms of the suitability and applicability of options for monitoring and assessing land degradation and SLM.
- Part 2: Cultural considerations, bridging different knowledge systems
  - Overviews and specifics are provided about cultural challenges and bridging different knowledge systems in terms of the suitability and applicability of options for monitoring and assessing land degradation and SLM.

Teaching notes

- Part 1: Challenges, costs and regulations
  - Review the overviews and specifics with the class. Invite students to share other examples.
- Part 2: Cultural considerations and bridging different knowledge systems
  - Review the overviews and specifics. Invite students to share other examples.

Module 3.10 Revising your draft innovative sustainable agriculture intervention

Learning objectives

- Revise the ToC developed in Module 2 for your proposed intervention, incorporating your new knowledge of assessment and monitoring.

Overview of session

Introduction slides – 10 mins

- Designing an intervention

- Guiding questions
- Things to keep in mind

Group presentations – 50 mins

Summary

- Groups present their revised ToC for their final project problems and receive feedback from the instructor and fellow students.

Teaching notes

- Divide the presentation time according to the number of groups in the class;
- Encourage groups to share visuals and/or textual summaries of their contextual analyses with the class in advance of their presentations (e.g. a few days before);
- Facilitate a constructive exchange of feedback: encourage students to help one another improve their contextual analyses (e.g. what is missing, what could be interpreted differently and what evidence is needed?).

Module 4: Decision-making tools and enabling factors for land restoration

Core competencies

Academic knowledge:

- Economic, sociocultural and environmental rationale of implementing innovative sustainable agricultural solutions for land restoration at the farm and societal levels;
- The module covers various evaluation methods such as cost-benefit analysis (CBA), social cost-benefit analysis (SCBA), multi-criteria analysis (MCA) and participatory impact assessment (PIA), focusing on understanding method differences, assessing benefits and shortcomings, and learning the procedure for carrying them out in the context of land restoration;
- Facets of enabling factors that support the implementation of innovative sustainable agricultural solutions for land restoration: governmental, financial, social, technological (see module 3), including sustainable value chains as an enabling factor.

Practical skills:

- Appraise the economic, sociocultural and environmental rationale for land restoration;
- Procedures for undertaking evaluation.

Attitudes and values:

- Logical thinking when evaluating land restoration initiatives;
- Awareness of enabling factors that support land restoration.

Learning objectives:

- An overview of the economic, sociocultural and environmental rationale of implementing innovative sustainable agricultural solutions for land restoration at the farm and societal level;
- Gain awareness of enabling factors that support sustainable agricultural solutions for land restoration;
- Appraise the economic, sociocultural and environmental rationale of sustainable agricultural solutions for land restoration;
- Learn about procedures for undertaking evaluation;
- Improve ability to evaluate sustainable agricultural solution initiatives for land restoration.

Module 4.1 Benefits and trade-offs of Sustainable Land Management and land restoration at the societal level

Learning objectives

- Understand the economic, sociocultural and environmental benefits of land restoration at the societal level;
- Understand the trade-offs of sustainable agriculture solutions for land restoration at the societal level.

Summary

- Students can explore the economic benefits associated with sustainable agriculture solutions for land restoration, such as job creation, drawing insights from empirical data gathered in Belize, El Salvador, Honduras and Togo by Raes *et al.* (2019), as well as from the successful creation of Emscher Landscape Park in the Northern Ruhr region of Germany. Despite the evident benefits, the emergence of a land restoration economy is slower than expected. Students will be able to explore barriers to the investment and development of a land restoration economy. This will foster a deeper understanding of the economic dynamics at play at the societal level.
- Students will delve into the social benefits of SLM for land restoration, focusing on aspects such as improved food quality. The discussion will use agroecology as a prime example of sustainable agriculture. However, students will explore the feasibility of this approach in

addressing the consumption needs of the rapidly increasing human population. Additionally, they will examine strategies to sustainably improve both the quantity and quality of food production. Through these discussions, students will gain a comprehensive understanding of the social implications and challenges associated with innovative sustainable agriculture solutions for land restoration practices at the societal level.

- Finally, students will explore the environmental benefits of SLM for land restoration through examples.

Overview of the session

- Outline and learning objectives – 3 mins
- Part 1: Introduction – 10 mins
- Part 2: Economic benefits and trade-offs of land restoration – 15 mins
  - Student question – 10 mins
- Part 3: Socio-cultural benefits and trade-offs of land restoration – 10 mins
- Lessons learned/class discussion – 12 mins

Teaching notes

- This submodule equips students with a comprehensive perspective by encouraging them to consider both benefits and trade-offs, highlighting the complexities involved in land restoration initiatives at the societal level. The balanced approach is essential in subsequent submodules discussing the theory and practical aspects of four widely used evaluation methods.
- We encourage professors to interact with students through open-ended student questions. Facilitating such discussions will help cultivate ideas.
- See also additional links in slides and the video on the environmental benefits of land restoration.

Key references/resources

- Ding, H., Faruqi, S., Wu, A., Altamirano, J.-C., Ortega, A. A., Cristales, R. Z., Chazdon, R., Vergara, W., & Verdone, M. (2017). *Roots of prosperity: The economics and finance of restoring land.* Washington, D.C.: World Resources Institute: https://www.wri.org/research/roots-prosperity-economics-and-finance-restoring-land.
- King, R., Benton, T., Froggatt, A., Harwatt, H., Quiggin, D., & Wellesley, L. (2023). *The Emerging Global Crisis of Land Use: How rising competition for land threatens international and environmental stability, and how the risks can be mitigated,* Chatham House. United Kingdom: https://www.chathamhouse.org/2023/11/emerging-global-crisis-land-use.
- Raes, L., Mittempergher, D., Piaggio, M., & Siikamäki, J. (2021). *Nature-based Recovery can create jobs, deliver growth and provide value for nature.* Gland: International Union for Conservation of Nature: https://www.iucn.org/sites/default/files/2022-06/iucn-nbr-tp-3-compressed.pdf.

Module 4.2 Benefits and trade-offs of Sustainable Land Management and land restoration at the farm level.

Learning objectives

- Understand the economic, sociocultural and environmental benefits of sustainable agriculture solutions for land restoration at the farm level.
- Understand the trade-offs of sustainable agriculture solutions for land restoration at the farm level.

Summary

- Students will understand the active role of farmers in implementing SLM agriculture technologies for land restoration. They will explore the economic benefits, recognizing that SLM practices, like agroecology, often yield diversified income streams compared to conventional farming methods. Subsequently, students will evaluate the trade-offs/challenges farmers face when transitioning to sustainable farming practices. Examining governing factors such as the Common Agricultural Policy in the European Union, students will gain valuable insights into how policies can ease the pressures on farmers during the transition period. Students are encouraged to consider enabling policies in the Global South.

- Students will explore the social benefits associated with the adoption of SLM technologies for land restoration among farmers. These benefits encompass enhanced social cohesion and women's empowerment, exemplified by a case study on an agroecological programme initiated by a women's group in Burkina Faso. Through this case study, students will attain insights into the societal impacts of SLM practices, improving their understanding of the multifaceted benefits of sustainable agriculture.
- Through a case study focusing on beekeeping in the uplands of Tajikistan, students will acquire a deeper understanding of environmental benefits created by employing SLM technologies for land restoration.

Overview of the session:

- Outline and learning objectives – 3 mins
- Part 1: Introduction – 2 mins
- Part 2: Economic benefits and trade-offs – 10 mins
- Part 3: Social benefits and trade-offs – 10 mins
- Video on transition period and discussion – 10 mins
- Part 4: Environmental benefits – 10 mins
- Lessons learned/class discussion – 15 mins

Teaching notes

- Submodule 4.1 and 4.2 cultivate a mindset for analysing land restoration at various levels, from macro to micro, recognizing the diverse contexts in which land restoration projects are implemented.
- See also the additional links in slides and the video on the transition period from conventional to sustainable agriculture.

Key references/resources

- Gomiero, T. (2018). Food quality assessment in organic vs. conventional agricultural produce: Findings and issues. *Applied Soil Ecology,* 123, 714-728.
- International Panel of Experts on Sustainable Food systems (IPES-Food). (2016). *From uniformity to diversity: a paradigm shift from industrial agriculture to diversified agroecological systems*. IPES-Food: www.ipes-food.org.

Module 4.3 Overview of decision-making tools for sustainable agriculture solutions for land restoration

Learning objectives

- Understand the value of decision-making tools for evaluating innovative sustainable agriculture solutions for land restoration;
- Identify the advantages and disadvantages of different decision-making tools;
- Select a suitable decision-making tool depending on the rationale and objective of the evaluation.

Summary

- Students will learn the fundamentals of evaluation and understand why it is important to evaluate an innovative sustainable agriculture solutions project. Given the multifunctional nature of land restoration and the various stakeholders that bear the cost and benefits, this submodule will remind students of the importance of positionality and of considering the various direct and indirect stakeholders involved in a project. It will also explain to students the value of including both domain experts and primary stakeholders in the evaluation process.
- In part two, students will explore four evaluation methods: cost-benefit analysis (CBA), social cost-benefit analysis (SCBA), multi-criteria analysis (MCA) and participatory impact assessment (PIA). Students will learn the advantages and shortcomings of each method, as well as the purpose it is best suited to. This part is important as students need to know when

to apply which method depending on the context and the purpose of the evaluation.

- Students will apply the knowledge in the submodule through a series of student questions.

Overview of the session:

- Outline and learning objectives – 5 mins
- Part 1: Why evaluate SLM options for land restoration? – 15 mins
- Part 2: Methods for decision making on SLM for land restoration options - 30 mins
  - Student questions – 10 mins

Teaching notes

- There are benefits and costs of converting land for restoration. These need to be carefully evaluated to ensure the right decision is made. This submodule introduces students to four widely used decision making tools: CBA, SCBA, MCA and PIA. The goal is to equip students with the essential tools for advising farmers, eco-entrepreneurs and other stakeholders in order to increase benefits while reducing costs. Subsequent submodules will focus on each evaluation method.

Key references/resources

- Millennium Ecosystem Assessment, 2005. *Ecosystems and Human Well-being: Synthesis.* Island Press, Washington, DC.
- Pérez-Soba, M., Petit, S., Jones, L., Bertrand, N., Briquel, V., Omodei-Zorini, L., Contini, C., Helming, K., Farrington, J.H., Mossello, M.T. and Wascher, D., (2008). *Land use functions—A multifunctionality approach to assess the impact of land use changes on land use sustainability. Sustainability impact assessment of land use changes,* pp.375-404.
- Purushothaman, S., Abraham, R., & Patil, S. (2013). Tropical farms as social-ecological systems: Tools for assessment. In A. Christinck & M. Padmanabhan (Eds.), *Cultivate Diversity! A Handbook on Transdisciplinary Approaches to Agro Biodiversity Research* (pp. 163-183). Margraf Publishers: Welkersheim, Germany.

Module 4.4 Cost-benefit analysis versus social cost-benefit analysis: applications

Learning objectives:

- To understand the differences and advantages of an SCBA as compared to a CBA for decision-making;
- To understand the various steps needed to develop an SCBA based on case study examples;
- To critically assess the economic costs and benefits versus the social costs and benefits.

Summary

- Initially, students will understand the differences between a CBA and SCBA by comparing the use, underlying assumptions, outcomes and methodologies. Students will realize that an SCBA goes a step further than the CBA by evaluating the social aspect.
- In the subsequent sections, students will be guided through a step-by-step procedure of conducting an SCBA, using a case study from India that evaluates two land-use alternatives (Purushothaman, 2005). Students will explore identifying social costs and benefits for farmers and assigning monetary values to these. Practical demonstrations of the process will be provided through screenshots within a spreadsheet, which will enhance students' understanding of the methodology. Finally, students will work in pairs to learn about discount rates and net present values (NPVs), which they will use to make informed decisions on the two land-use alternatives. A student exercise requiring students to delve deeper into research on land-use alternatives will support or change their initial decision.

Overview of the session:

- Outline and learning objectives – 3 mins
- Part 1: What is an SCBA? – 10 mins
- Part 2: Scenario examples – 5 mins
- Part 3: SCBA steps – 30 mins

- Student questions – 10 mins

- Lessons learned – 2 mins
- Optional videos on discount rates and NPVs

Teaching notes

- Following on from the overview of the evaluation methods (submodule 4.3), we will focus on CBA and SCBA. You will teach students the differences between the two methods and teach them how to develop one through case study examples. We begin with these two methods as they involve minimal participation from stakeholders.
- See also supplementary material: case study from Jordan.
- See also additional links in slides: videos on discount rates and NPVs.

Key references/resources

- McDonald, L.A. & G.M. Johns (2007) Integrating social benefit cost accounting into watershed restoration and protection programs. *Journal of the American Water Resources Association.* Paper No. 98027 https://doi.org/10.1111/j.1752-1688.1999.tb03614.x
- Purushothaman, S. (2005). *Land-use strategies, economic options and stakeholder preferences: A study of tribal communities in forest peripheries.* Kathmandu, Nepal:SANDEE.
- Wainaina P, Gituku E, Minang P. (2020). *An exploratory study of cost-benefit analysis of landscape restoration.* Working Paper number 306. World Agroforestry, Nairobi, Kenya. DOI http://dx.doi.org/10.5716/WP20014.PDF

Module 4.5 Multi-criteria analysis (MCA) for evaluating land restoration options

Learning objectives:

- Understand the process of developing an MCA;
- Develop critical thinking about how you might adapt this process to land restoration options.

Summary:

- Initially, students learn a formal definition of an MCA and outline its key characteristics, which ensures a uniform understanding of an MCA among students. Subsequently, we compare MCAs and CBAs, highlighting the similarities and differences in the methodologies. The comparison is facilitated by prior knowledge of CBAs that students may have.
- Subsequently, students will learn the step-by-step procedure of an MCA using both a practical example from Purushothaman (2005) and a hypothetical example. Students will learn the different steps necessary to carry out an MCA: how to identify indicators for each criterion and attribute value to them, and how to calculate the weight of each criterion compared to one another.

Overview of the session:

- Outline and learning objectives – 3 mins
- Part 1: Introduction – 5 mins
- Part 2: MCA vs. CBA – 10 mins
- Part 3: MCA steps – 10 mins
- Part 4: MCA example – 30 mins
- Lessons learned – 2 mins

Teaching notes:

- MCA can account for non-monetizable changes and are hence more inclusive of diverse impacts.

Key references/resources

- Gamper, C., Thöni, M., & Weck-Hannemann, H. (2006). A conceptual approach to the use of Cost Benefit and Multi Criteria Analysis in natural hazard management. *Natural Hazards and Earth System Sciences,* 6(2), 293-302.
- Geneletti, D. (2019). Principles of Multicriteria Analysis. In: *Multicriteria Analysis for Environmental Decision-Making*. Anthem Press; 5-16.

Module 4.6 Participatory impact assessments for decision-making on land restoration

Learning objectives:

- How to implement participatory impact assessments (PIAs) in various contexts to make decisions on SLM options for land restoration.
- Understand the difference between two useful frameworks: ecosystem services and land use functions (LUFs) and when to use each one.

Summary:

- In this submodule, students will explore the PIA method in more detail using the LUF framework. In the first part, students will explore the relationship between the LUF and ecosystem services framework and why PIA uses the LUF framework. Additionally, they will learn the advantages and disadvantages of the PIA/LUF evaluation method given that different agricultural actors value land-uses differently.
- In the second part, students will start learning the different stages of a PIA/LUF evaluation. It will start with the first stage: defining scenarios. Students will learn how they can work with experts and various stakeholders to define relevant and probable SLM options that can then be compared and evaluated with stakeholders. This process will be supplemented by case studies from König *et al.* (2012). Subsequently, students will learn to choose and define specific indicators that stakeholders can grade and rank based on the LUFs chosen, considering the context of a specific project. Lastly, they will learn how to score the various scenarios based on the indicators, the weight that stakeholders attributed to each of them, and the evolution that they will experience in the light of the various pre-defined scenarios.
- Finally, results from the case study evaluation introduced at the beginning will be presented. Students will have the opportunity to better grasp the different purposes that PIAs/LUFs can serve depending on the context and see how actions have been informed by their results.
- A student exercise encouraging discussion among students will help guide their interpretation of the results.
- In the last part, students will learn the different and most suitable ways to communicate results depending on the context.

Overview of the session:

- Outline and learning objectives – 3 mins
- Part 1: Why PIAs? – 10 mins
- Part 2: PIA steps – 20 mins
  - Student questions – 7 min
- Part 3: Communicating results – 10 min
  - Concluding thoughts – 10 mins

Teaching notes

- PIA is the most participatory evaluation method.
- Also see additional links in slides and videos on participatory research and payments for ecosystem services, with theoretical and practical examples.

Key references/resources

- König, H. J., Uthes, S., Schuler, J., Zhen, L., Purushothaman, S., Suarma, U., Sghaier, M., Makokha, S., Helming, K., & Sieber, S. (2013). Regional impact assessment of land use scenarios in developing countries using the Framework of Participatory Impact Assessment (FoPIA) approach: Findings from five case studies. *Journal of environmental management,* 127, S56-S64.

- Purushothaman, S., Patil, S., Francis, I., König, H. J., Reidsma, P., & Hegde, S. (2013). Participatory impact assessment of agricultural practices using the land use functions framework: case study from India. *International Journal of Biodiversity Science, Ecosystem Services & Management,* 9(1), 2-12.
- Pérez-Soba, M., Petit, S., Jones, L., Bertrand, N., Briquel, V., Omodei-Zorini, L., Contini, C., Helming, K., Farrington, J.H., Mossello, M.T. and Wascher, D., 2008. *Land use functions—A multifunctionality approach to assess the impact of land use changes on land use sustainability. Sustainability impact assessment of land use changes*, pp.375-404.

Module 4.7 Enabling factors and governance for land restoration

Learning objectives:

- Understand the various facets of governance and enabling factors for SLM and innovative sustainable agriculture solutions for land restoration.

Summary:

- Students will discover that enabling factors for successful innovative sustainable agriculture solutions for land restoration include political, financial, social and technological dimensions. A mix of incentives and disincentives is vital for effective restoration efforts, facilitated by clear policy directives.
- Students will explore non-financial, financial, social and technological incentives and disincentives, understanding their roles and impact on innovative sustainable agriculture solutions for land restoration. Real-life and theoretical examples will illustrate their functions, complemented by student exercises fostering discussions and diverse perspectives for enhanced learning.

Overview of the session:

- Outline and learning objectives – 3 mins
- Part 1: Introduction – 10 mins
- Part 2: Political: regulations and policies – 20 mins
- Part 3: Financial incentives – 5 mins
- Part 4: Social incentives – 5 mins
  - Student exercise – 10 mins
- Part 5: Social and technological incentives – 5 mins
- Lessons learned – 2 mins

Teaching notes

- Submodules 4.1 and 4.2 introduced students to the benefits, drawbacks, and trade-offs of SLM and innovative sustainable agriculture solutions for land restoration. Building on this foundation, submodules 4.3–4.6 delved into four decision-making tools for assessing SLM and innovative sustainable agriculture solutions for land restoration. In the following submodules (4.7–4.9), we will explore enabling factors that contribute to successful land restoration through sustainable agriculture solutions for land restoration.

Key references/resources

- Neely, C., Trautman, S., Parramon-Gurney, M., Milne, E., Kindt, R., Winowiecki, L., Karambiri, M. Bourne, M.. Vagen T-G and T. Lemann. (2023). *Exploring the Resilience of Restoration Efforts Under Climate Change: The value of applying foresight analysis for accelerating the impacts of the Great Green Wall Initiative.* Regreening Africa; Shared; CIFOR-ICRAF; WOCAT https://regreeningafrica.org/wp-content/uploads/2024/02/SHARED-Foresight-Brief_20_12_23-FINAL.pdf
- Sapkota, R., Stahl, P., & Rijal, K. (2018). Restoration governance: An integrated approach towards sustainably restoring degraded ecosystems. *Environmental development,* 27, 83-94.
- Wainaina, P., Minang, P. A., Nzyoka, J., Duguma, L., Temu, E., & Manda, L. (2021). Incentives for landscape restoration: Lessons from Shinyanga, Tanzania. *Journal of environmental management,* 280, 111831.

Module 4.8 Enabling policies for land restoration

Learning objectives

- Understand the importance of policies and land rights in the success of innovative sustainable agriculture solutions for land restoration;
- Identify perverse incentives that hinder the success of innovative sustainable agriculture solutions;
- Grasp the importance of markets for restoration goods and services as critical enablers of land restoration.

Summary:

- Students will define policies and recognize their significance in land management, particularly in securing land tenure for successful restoration efforts. Neglecting land policies can increase land degradation and hinder restoration initiatives;
- Students will also explore policies promoting the growth of environmental markets and their benefits, and examine instances of market failures. Students will then complete exercises to identify and understand these failures.

Overview of the session:

- Outline and learning objectives – 3 mins
- Part 1: Introduction – 10 mins
- Part 2: Policy as an enabling factor in innovative sustainable agriculture solutions for land restoration – 15 mins
- Part 3: Policies to encourage markets for environmental goods and services – 10 mins
- Part 4: Sustainable value & supply chains as drivers - 10 mins
- Student questions – 10 mins
- Lessons learned – 2 mins

Teaching notes

- See also: case study from Ghana.

Key references/resources

- Haggar, J., Phillips, D., Kumar, R. and Nelson, V. (2014). *Market and Incentive-Based Mechanisms to Support Integrated Landscape Initiatives: A Summary Report of their Potential and Limitations.* NRI Report, University of Greenwich, Chatham: UK.
- Slobodian, L., Vidal, A. and Saint-Laurent, C. (2020). *Policies that support forest landscape restoration: What they look like and how they work*. Gland, Switzerland: International Union for Conservation of Nature.

Module 4.9 Enabling financing for land restoration

Learning objectives

- Understand the different options available for financing SLM and innovative sustainable agriculture activities, projects and initiatives for land restoration;
- Become familiar with innovative options for financing SLM and sustainable agriculture interventions for land restoration;
- Apply the knowledge gained from one financing modality in your country and how it affects your country's land and environment.

Summary:

- Students will discover that investment in SLM and sustainable agriculture interventions for land restoration is profitable despite a significant investment shortfall. This shortfall is the result of differing goals and return-on-investment expectations between public and private stakeholders;
- Students will explore various sources of public, private and blended funding through global examples;

- An optional term paper accompanies this submodule, offering students the opportunity to deepen their understanding and apply the knowledge. By researching and analysing financing options to enable innovative sustainable agriculture solutions for land restoration within their own countries, students will also grasp the course material and develop an understanding of the financial landscape specific to their local circumstances.

Overview of the session:

- Outline and objectives – 5 mins
- Part 1: Introduction – 10 mins
- Part 2: Public funding – 10 mins
- Part 3: Private funding – 5 mins
- Part 4: Blended finance – 15 mins
  - Optional term paper – 10 mins
- Lessons learned – 5 mins

Teaching notes

Assignment overview:

For the proposed assignment, students are invited to conduct a case study on the financing of innovative sustainable agriculture practices in their countries. They will (i) explore the context, various types of financing mechanisms and working modalities; (ii) assess the outcomes and (iii) identify the main challenges associated with these initiatives. This assignment will provide students with a practical understanding of the financial aspects of innovative sustainable agriculture practices and how they impact their country's land and environment. (3,000–3,500 words in length).

Assignment components:

- Contextual analysis
- Types of financing
- Working modalities
- Assessment of outcomes
  - Evaluate the impact of sustainable agriculture practice financing on land conservation, ecosystem resilience and community well-being.
- Analyse the quantitative and qualitative results achieved through these initiatives.
- Main challenges

Key references/resources

- Ding, H. et al. (2017) *Roots of Prosperity: The Economics and Finance of Restoring Land.* Washington DC: World Resources Institute: https://www.wri.org/research/roots-prosperity-economics-and-finance-restoring-land.
- Ecosystem Marketplace. (2019). *State of Private Investment in Conservation 2019:* https://www.forest-trends.org/wp-content/uploads/2019/12/SOVCM2019.pdf.

Module 4.10 Social incentives for land restoration and module 4 conclusions

Learning objectives

- Learn about social factors that enable SLM and innovative sustainable agriculture solutions for land restoration;
- Develop critical thinking about the land restoration trade-offs and how to overcome them.

Summary:

- Students will learn the pivotal role of social incentives in driving engagement and fostering community involvement in land restoration efforts. By leveraging social, cultural and community-based motivations, these incentives aim to cultivate a sense of responsibility and collective action among stakeholders. Students will recognize that restoration programmes cannot operate in isolation from the communities they serve.

The participation of stakeholders is paramount, as it contributes to the likelihood of a project's success.

- In this submodule, students will delve into the concept of social cohesion and the ways in which SLM for land restoration can contribute to this. Finally, to reinforce their understanding, the submodule will conclude with a comprehensive recap of the module, accompanied by a series of student questions that encourage critical thinking and reflection.

Overview of the session:

- Outline and objectives – 3 mins
- Part 1: Introduction – 5 mins
- Part 2: Socio-cultural incentives for land restoration - 15 mins
- Part 3: Module conclusions & final exercise: Barriers and enabling factors – 15 mins
  - Student questions – 10 mins
  - Instructions forModule 4 final exercise - adding barriers and enabling factors to the draft innovative sustainable agriculture intervention and Theory of Change (from Modules 2 & 3) - 10 mins
    - As a homework assignment, students are asked to revisit their proposed intervention that they began developing in Modules 2 and 3.
      - » This exercise will help them in preparing for your restoration business proposal in Module 5.
      - » Ask students to reflect on barriers and enabling factors in developing their interventions.
      - » Ask them to start by noting the barriers to developing their interventions.
      - » For each barrier, drawing upon lessons learned from Module 4, they should be able to find several enabling factors to overcome each barrier.
      - » What conclusions can they draw from this exercise?
  - Lessons learned – 3 mins

Teaching notes

- See also supplementary material: case study from India.

Key references/resources

- Sapkota, R., Stahl, P., & Rijal, K. (2018). Restoration governance: An integrated approach towards sustainably restoring degraded ecosystems. *Environmental development*, 27, 83-94.

Module 5. Catalysts for innovation and start-ups

Core competencies

Academic knowledge:

- Understand and diagnose sustainable land management (SLM) as an innovation for agriculture and land restoration;
- Co-design contextualized, inclusive and scalable innovations for agriculture and land restoration;
- Develop an innovative start-up for agriculture and land restoration.

Practical skills:

- Critical thinking;
- Collaboration skills;
- Ecopreneurial skills;
- Planning and project management.

Attitudes and values:

- Willingness to think creatively and explore unconventional solutions;
- An awareness of the ethical implications of innovation and entrepreneurship;
- Appreciation for the value of collaboration and teamwork in co-designing and implementing innovative solutions.

Module 5.1 Innovative aspects of sustainable agriculture for land restoration

Learning objectives

- Understand the multiple scales in innovation for sustainable agriculture solutions for land restoration;
- Understand the drivers and challenges of innovation in agricultural systems and how they affect SLM for land restoration.

There are three key parts to this session. The first aims to summarize the key elements of land restoration and SLM tools and techniques covered in Modules 1 to 4. In doing so, it will summarize not only the definition of SLM, but also a conceptual framework of SLM for land restoration and the key principles of SLM.

The session will then cover multiple scales of innovative sustainable agriculture solutions for land restoration, from the farm level to communities and sustainable landscape innovation. This ranges from basic ideas of the landscape approach to using the 10 principles of the landscape approach as a basis for innovative land restoration action. This part of the session also aims to introduce learners to the idea of sustainable and unsustainable landscapes and how numerous techniques can contribute to land restoration.

Finally, the session will introduce the drivers and challenges of innovation in sustainable agriculture solutions for land restoration, outlining key aspects of both.

Teaching notes

Introduction:

- Introduce the session's objectives and the outline

Part 1: A Recap - 20 mins

- Conceptual framework and defining innovative sustainable agriculture solutions - 2 mins
- SLM Recap: Defining SLM - 5 mins
  - Define sustainable land management (SLM) and its objectives.
    - Provide definitions sourced from FAO and TerrAfrica.
- SLM Recap: The Principles of SLM - 10 mins
  - Revisit the principles of SLM using the WOCAT video.

- Emphasize the importance of these principles in land management.

- Landscapes and Land Use - 5 mins
  - Define a landscape and its characteristics.
  - Discuss the UN Decade on Ecosystem Restoration's definition of eight ecosystems.
  - Define land degradation according to the UNCCD.

Part 2: Multiple scales in innovation for land restoration - 15 mins

- Land Restoration, Landscapes and Landscape Approaches - 10 mins
  - Scales of land restoration
  - Define landscape approach according to Sayer et al. (2013).
  - Discuss the holistic view of landscapes and the 10 principles guiding it.
- Landscape Innovation - 5 mins
  - Explain the dynamic nature of landscape processes and innovation.
  - Discuss the need for inclusive, iterative innovation processes.
  - Emphasize the importance of innovation benefiting both ecosystems and people.
    - Facilitators present an image from module 1 and ask students to recall (from module 1) which image represents a sustainable landscape and why.
    - Facilitate a plenary discussion based on this image and highlight the differences between unsustainable and sustainable landscapes.

Part 3: Drivers and Challenges of Innovation - 15 mins

- Drivers of Innovation - 2 mins
  - Discuss main drivers such as adaptation, research and development, financial support, and policy intervention.
- Challenges of Innovation - 3 mins
  - Explore challenges including climate change, technology-reality gap, urbanization, lack of knowledge, financial support, and policy intervention.
    - Encourage participants to identify local examples of these drivers and challenges.

- Student exercise: Localise! - 10 mins

Conclusion - 5 mins

- Summarize key takeaways from the session.
- Close the session with a message of encouragement for innovative sustainable land management practices.

Key references/resources

- Freeman, O. E., Duguma, L. A., & Minang, P. A. (2015). Operationalizing the integrated landscape approach in practice. *Ecology and Society*, 20(1), art24. https://doi.org/10.5751/ES-07175-200124.
- Organisation for Economic Co-operation and Development (OECD) (no date). *Agricultural productivity and innovation—OECD*. OECD. Retrieved 1 December 2023, from: https://www.oecd.org/agriculture/topics/agricultural-productivity-and-innovation/.
- Pesce M., Kirova M., Soma K., Bogaardt M-J., Poppe K., Thurston C., Monfort Belles C, Wolfert S., Beers G., Urdu D. (2019). *Research for AGRI Committee – Impacts of the digital economy on the food-chain and the CAP,* European Parliament, Policy Department for Structural and Cohesion Policies, Brussels.
- Reed, J., Deakin, L., & Sunderland, T. (2015). What are 'Integrated Landscape Approaches' and how effectively have they been implemented in the tropics: A systematic map protocol. *Environmental Evidence*, 4(1), 2: https://doi.org/10.1186/2047-2382-4-2.
- Sayer, J., Sunderland, T., Ghazoul, J., Pfund, J.-L., Sheil, D., Meijaard, E., Venter, M., Boedhihartono, A. K., Day, M., Garcia, C., Van Oosten, C., & Buck, L. E. (2013). Ten principles for a landscape approach to reconciling agriculture, conservation, and other competing land uses. *Proceedings*

of the National Academy of Sciences, 110(21), 8349–8356: https://doi.org/10.1073/pnas.1210595110.

Module 5.2 Diagnosing innovation in sustainable agriculture solutions for land restoration

- **Learning objectives**
  - Evaluate how sustainable agriculture solutions and landscape approaches can be used as a tool for innovation for land restoration;
  - Diagnose land innovation in agricultural systems and identify opportunities for improvement;
  - Explore the principles and practices of SLM and how they can be implemented in agricultural systems;
  - Understand project cycles and how they can be used to plan, implement and evaluate innovative sustainable agriculture projects.
- **Summary**

The session is divided into two parts. The first is the frameworks for innovation, which begins by asking students to debate the difference between innovation and invention. The session concludes that an innovation is only considered to be so when it is embedded into the behaviour of society. This means that it has transformed from an invention into an innovation – something that is part of policy as well as daily life.

At this point, learners are introduced to the innovation matrix which outlines four types of innovation and how they affect the sector they belong to, more broadly, the world at large. The four types of innovation are:

1. Breakthrough innovation
2. Sustaining innovation
3. Basic research
4. Disruptive innovation.

Each type of innovation is supported by a case study of action within a landscape.

Having discussed the types of innovation and the innovation matrix, the session moves into land restoration implementation as well as project cycles to better support learners with their own innovation thinking.

Teaching notes

Introduction - 5 mins

- Introduce the session's topic: "Diagnosing Innovation for Sustainable Land Management."
- Stress the significance of understanding innovation within the context of sustainable land management, emphasizing its role in addressing contemporary environmental challenges.

Part 1: Frameworks for Innovation - 15 mins

- Facilitate a debate among participants to explore and compare various definitions of innovation.
  - Divide participants into three groups.
  - Let each group discuss and choose one of the provided statements on innovation.
  - Have each group prepare arguments to defend their chosen statement.
  - Facilitate a debate, ensuring each group defends their statement based on their formulated arguments and steer the discussion towards a compromise and conclusion.
- Synthesize the distinction between inventions and innovations, highlighting the transformational aspect of the latter.

Part 2: Case Studies of Innovation - 10 mins

- Present the Innovation Matrix as a comprehensive framework for categorizing different types of innovation, illustrating its application in understanding innovation in sustainable land management.
- Provide detailed case studies exemplifying different types of innovation:

- Breakthrough innovation: Geographic Information Systems (GIS) for Precision Agriculture in the Himalayas, emphasizing its transformative impact on agriculture in high-altitude regions.
- Sustaining innovation: The Mosaik Initiative Rehabilitation for Sustainable Utilization, focusing on their long-term impact on landscape restoration and community welfare.
- Basic Research: Awba Dam Watershed Rehabilitation for Sustainable Utilization
- Disruptive innovation: Highlight the Pepsee micro-irrigation system in India as a disruptive innovation, showcasing its potential to revolutionize irrigation practices.

- Individually or in groups participants analyze each case study using the Innovation Matrix, identifying key attributes and impacts.

Part 3: Implementing Land Restoration through SLM - 5 mins

- Recap the concept of sustainable land management (SLM) and draw parallels on how it aligns with project management principles.
  - Successful SLM necessitates
    - meticulous planning, execution, and evaluation
    - context-specific approaches.
    - Stakeholder engagement and integrated planning

Part 4: Project Cycle Management - 20 mins

- Introduce the project life cycle framework, comprising initiation, planning, execution, and closure phases.
- Discuss the application of project cycle management in SLM projects, emphasizing the need for thorough assessments, locally specific designs, and stakeholder engagement.
- Assign participants to develop project life cycles for selected innovations from the Innovation Matrix, providing detailed plans for each phase.
  - Learners go back to their Innovation Matrix, and choose the project they like most.
  - Then Create a life cycle for the project, and be specific what needs to be done in every phase of the life cycle, how this should be done, and who should do it.

Conclusion - 5 mins

- Summarize key insights gained from the session, including the importance of innovation in sustainable land management, the role of integrated landscape planning, and the application of project cycle management.
- Conclude with a call to action, urging participants to apply innovative approaches in their respective fields to address land management challenges effectively.

Key references/resources

- Food and Agriculture Organization of the United Nations. (2001). *Project Cycle Management Technical Guide:* https://www.fao.org/3/ak211e/ak211e00.pdf.
- Joshi, M. (2013). Invention, Innovation, Innovative Practices: A Reason to Study. *SSRN Electronic Journal:* https://doi.org/10.2139/ssrn.2250975.
- Liniger, H., Studer, R. M., Hauert, C., Gurtner, M., Gämperli, U., Kummer, S., & Hergarten, C. (2011). *Sustainable Land Management in Practice*.
- Mittal, R. (2012). From Invention to Innovation: Analysing the Tools and Trolls of the Journey. *Journal of the Indian Law Institute*, 54(4), 480–505.
- Van Oosten, C., Van Weert, F., & Bake, A. (2022). *Towards climate-smart, sustainable and inclusive landscapes: A People's Landscape Approach : A policy study for Oxfam Novib and Oxfam Nepal.* Wageningen Centre for Development Innovation: https://doi.org/10.18174/572657.

Module 5.3 Locally led innovation

Learning objectives

- Identify locally led innovations in agriculture and their potential use for land restoration;
- Understand the important role of local knowledge in SLM development;
- Identify how SLM interventions could help support gender-balanced outcomes.

Summary

Session 5.3 discusses locally led innovation practices for land restoration, the role of local and Indigenous SLM knowledge for land restoration, as well as gender equity.

The session begins with a short activity where students are encouraged to watch a video about innovative farmers in Africa and answer a few questions to help them to ground themselves in the topic.

The session then expands further into defining locally led innovation, which consists of individuals, communities, and local and national organizations developing innovative solutions to locally defined problems. Locally led innovation can make use of externally driven technology, but only if it fits locally and is managed and used by local actors

At this point, the session breaks down the importance of local, traditional and Indigenous knowledge systems to land restoration practices and SLM. Because of the way we define local knowledge, it becomes evident that the well-being of human society is closely related to the well-being of natural ecosystems.

Teaching notes

Introduction (5 mins)

- Begin by introducing the session's topic: "Locally led innovation for Sustainable Land Management (SLM)."
- Emphasize the importance of understanding locally led innovation within the context of SLM, highlighting its role in addressing environmental challenges.
- Briefly outline the objectives of the session.

Part 1: Locally led innovation for SLM and land restoration - 10 mins

- Present key concepts related to locally led innovation, including definitions and characteristics.
- Discuss the importance of locally led innovation for SLM, emphasizing its role in addressing local challenges and leveraging indigenous knowledge.
- Highlight examples of local innovations and their impact on land restoration.
    - Encourage participants to reflect on the significance of locally led innovation in their own contexts.

Part 2: The importance of local knowledge for innovative land restoration - 20 mins

- Initiate a discussion on the significance of local knowledge in land restoration and SLM.
    - Facilitate an activity where participants reflect on the role of local knowledge in different scenarios, using provided reflection exercises.
- Present key aspects of local knowledge systems in SLM and its benefits.
- Discuss the challenges associated with integrating local knowledge into SLM practices and strategies to overcome them.
- Encourage participants to share their experiences and insights related to local knowledge in land restoration.
    - Prompt them to reflect on the relevance and implications of local knowledge for their own work or research. This fosters deeper understanding and personal connection to the topic.

Part 3: Gender responsiveness in SLM - 20 mins

- Introduce the concept of gender responsiveness in SLM and its importance for achieving sustainable outcomes.
- Conduct a group activity where participants analyze gender-related barriers in SLM and brainstorm solutions.
    - This is a reflection exercise that aims at training the participants to look at SLM from different gender perspectives. You can ask participants to do this individually, but you can also do it in pairs. In this case, both individuals look at the same case study but through the eyes of either an elderly male or a young female. Let the pairs switch roles halfway, to let them look at the case study from both perspectives.

    Agree or disagree exercise:

    - Remove all tables and chairs from the classroom;
    - Use the floor to sketch a Likert scale, ranging from 'agree' to 'disagree'. If you don't know what this is, you can find an explanation here: What Is a Likert Scale? | Guide & Examples (scribbr.com).; Have students decide where they stand on the Likert scale and physically stand in that position;
    - Facilitate a discussion by asking people to either agree or disagree using effective argumentation;
    - Keep in mind that there are multiple answers possible. This means that what matters most is not so much agreement or disagreement, but whether one has effective argumentation.
    - Facilitate a discussion on the role of gender-responsive approaches in promoting inclusivity and effectiveness in SLM.

- Encourage participants to reflect on their own contributions to building socially equal and just societies.
- Summarize key learnings from the session and highlight actionable takeaways for participants.

Conclusion (5 mins):

- Recap key insights gained from the session, emphasizing the significance of locally led innovation, local knowledge, and gender responsiveness in SLM.

Reflection exercise:

This is a reflection exercise that aims to train the participants to look at SLM from different gender perspectives. You can ask participants to do this individually, but you can also do it in pairs. In this case, both individuals look at the same case study but through the eyes of either an elderly male or a young female. Allow the pairs to switch roles halfway through to let them look at the case study from both perspectives.

Key references/resources

- Berkes, F. (2001). Religious Traditions and Biodiversity. In *Encyclopedia of Biodiversity* (pp. 109–120). Elsevier: https://doi.org/10.1016/B0-12-226865-2/00231-5.
- Bullock, R., & Kariuki, J. (2019). *A review of gender and sustainable land management: Implications for research and development*. International Livestock Research Institute: https://cgspace.cgiar.org/bitstream/handle/10568/106538/gender.pdf.
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- Uprety, Y., Asselin, H., Bergeron, Y., Doyon, F., & Boucher, J.-F. (2012). Contribution of traditional knowledge to ecological restoration: Practices and applications. *Écoscience*, 19(3), 225–237: https://doi.org/10.2980/19-3-3530.

Module 5.4 Scaling Innovation - what, where and how?

Learning objectives

- Define and internalize what innovation is and the types of innovation;
- Evaluate the methods for scaling innovations to sustainable agriculture for land restoration;
- Explore and assess the available window of opportunities, which will allow you to successfully scale sustainable agriculture for land restoration innovation.

Summary

Session 5.4 explores the scaling of innovation for land restoration. It begins by speculating on the types of innovation and outlining three:

- Technological;
- Social;
- Institutional.
    - It is important that learners know about these types of innovation as they could help to define their own innovative ideas, allowing them to further consider how to develop their ideas into successful projects. After unpacking the types of innovation and their specificity, the session introduces the idea of scaling. It discusses the important challenges one may face while aiming to scale and innovate, but also highlights the importance of patience. Defining a process for innovation clearly illustrates how innovation can grow, as well as the key actors potentially involved in this growth. After understanding the trajectory which innovations may take in a market, the session explores the life cycle of an innovation, up and until it is a sustained process in the sphere it influences. Finally, the session ends by introducing key windows of opportunity to learners, that is, ways in which they can cultivate innovation for land restoration and the key elements that are needed for this process.

Teaching notes

Introduction - 5 mins

- Welcome participants to the session on "Scaling Innovation" within the context of sustainable agriculture and land restoration.
- Emphasize the importance of understanding different types of innovation and their role in scaling solutions for Sustainable Land Management (SLM).

Part 1: Unpacking Innovation - 15 mins

- Explain the three types of innovation: technological, social, and institutional, using examples and visuals provided in the lecture.
- Engage participants in a discussion on how each type of innovation contributes to SLM, drawing insights from case studies presented.
- Encourage participants to reflect on the definitions of SLM provided and discuss how they relate to technical, social, and institutional innovation.
- Facilitate a reflection session where participants express their preferences for a particular definition of SLM and justify their choice.

Part 2: How to Scale SLM Innovation? - 20 mins

- Discuss the challenges associated with scaling innovation, including low adoption rates, lack of support, and the "Growth Gap," referencing E. Rogers' "Diffusion of Innovations."
- Present the life cycle of a successful innovation and introduce the three dimensions of scaling: out, up, and deep, as well as the fourth dimension of scaling responsibly.
- Discuss the three dimensions of scaling: scaling out, scaling up, and scaling deep, using examples to illustrate each dimension.
- Introduce the fourth dimension: scaling responsibly, emphasizing the need to combine the three dimensions while ensuring justice, equality, and avoiding unintended consequences.
- Encourage participants to apply their understanding by evaluating the scaling methods for innovations presented in the case studies.

- Facilitate a group discussion on lessons learned from scaling innovations, focusing on key success factors and challenges encountered.

Part 3: Recap and Lessons Learned - 15 mins

- Review the Innovation Matrix earlier presented in the lecture and encourage participants to reconsider their perspectives on scaling innovations based on the case studies introduced in 5.2
  - Facilitate a reflection exercise where participants reflect on.
    - Which innovation was the most successful, and why?
    - Sketching the life cycle of innovation?
    - How was the innovation scaled?

Conclusion - 5 mins

- Summarize key lessons learned, highlighting the multidimensional nature of innovation and its potential to create lasting impact on society.
- Remind participants of the next steps in the course and encourage them to stay engaged in the learning process.

Key references/resources

- Baregheh, A., Rowley, J., & Sambrook, S. (2009). *Towards a multidisciplinary definition of innovation. Management Decision*, 47(8), 1323–1339: https://doi.org/10.1108/00251740910984578.
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- Schot, J., & F.W Geels. (2008). Strategic niche management and sustainable innovation journeys: Theory, findings, research agenda, and policy. *Technology Analysis & Strategic Management,* 20(5), 537–554: https://doi.org/10.1080/09537320802292651.

Module 5.5 Multi-stakeholder collaborations

Learning objectives

- Apply multi-stakeholder tools to develop plans and strategies for their own localized sustainable agriculture innovation for land restoration;
- Foster participation and collaboration with a diverse group of stakeholders.

Summary

This submodule explores the pivotal role of multi-stakeholder partnerships (MSPs) as catalysts for innovation in agriculture and land restoration. Throughout the learning journey, the focus is to equip learners with the knowledge and tools necessary to co-design contextualized, inclusive and scalable innovations.

Learners will explore the critical aspects of MSPs, including understanding what multi-stakeholder collaborations entail and how to facilitate them using the MSP process model effectively. They will explore the principles underpinning effective MSPs and be guided through stakeholder analysis, emphasizing the tangible benefits of such analysis.

This submodule stands out with its dynamic approach, blending theory with engaging activities, discussions, and real-world examples. By the end of the submodule, learners will understand the theoretical underpinnings of MSPs and have practical skills to navigate the complexities of multi-stakeholder collaborations, and contribute meaningfully to agricultural innovation and land restoration initiatives.

Teaching notes

- Introduction: What are multi-stakeholder collaborations? -7 mins
  - Briefly introduce the module on multi-stakeholder collaborations for innovative agriculture solutions for land restoration;
  - Use a tangible example or case study related to multi-stakeholder collaborations to highlight the importance of diverse perspectives in addressing global challenges;
  - Recap the concept of multi-stakeholder collaborations, emphasizing their role as a cooperation arrangement to solve specific problems through joint dialogue and action.
- The MSP process model -10 mins
  - Present the MSP process model Adapted from Brouwer et al., 2016, 'The MSP Guide';
  - Break down each step, starting with adaptive planning, collaborative action; and reflective monitoring;
  - Share the learnings from each stage, emphasizing the importance of early consultation, responsive planning, resource mobilization and reflective monitoring.
- Conducting stakeholder analyses -10 mins
  - Introduce the stakeholder identification matrix;
  - Explain how it helps generate an inventory of stakeholders, including their roles, interests and resources;
  - Encourage participants to think about implementation mechanisms for their innovations using this tool.
- The interest-influence matrix -10 mins
  - Introduce the interest-influence matrix;
  - Explain the importance of reviewing stakeholders' interest and influence on an issue;
  - Discuss strategies to engage stakeholders effectively based on their interests and influence.
- Mapping stakeholders on your landscape -10 mins
- Emphasize the value of landscape mapping to streamline the understanding of one's landscape, including its elements and relationships;
  - Encourage participants to form groups and engage in a simple landscape mapping exercise.
- The seven principles of MSPs -10 mins
  - Discuss the seven principles for creating effective multi-stakeholder collaborations: Embrace systemic change; Transform institutions; Work with power; Deal with conflict; Communicate effectively; Promote collaborative leadership; and Foster participatory learning; Provide real-world examples or anecdotes to illustrate each principle.
- Experiencing an MSP -10 mins
  - Introduce an activity where students develop a script focusing on a key landscape issue;
  - Instruct them to consider communication strategies and the issues their stakeholders might face;
  - Facilitate a brief discussion on the activity's outcomes.
- Conclusion -3 mins
  - Summarize key takeaways from the session;
  - Provide references for further reading and exploration.

Key references/resources

- Brouwer, H., Woodhill, J., Hemmati, M., Verhoosel, K., & Van Vugt, S. (2016). *The MSP Guide: How to Design and Facilitate Multi-Stakeholder Partnerships*. Practical Action Publishing: https://doi.org/10.3362/9781780446691.
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- The MSP Guide: https://mspguideorg.files.wordpress.com/2021/12/the_msp_guide_3rd_ed_2019_wcdi_brouwer_woodhill.pdf.

Module 5.6 Business and finance for innovative sustainable agriculture and land restoration

Learning objectives

- Understand how to identify opportunities for innovative sustainable agriculture and land restoration;
- Understand how to attract land restoration finance.
- Learn about sustainable value & supply chains
- Summary

As global resource demand rises, businesses increasingly rely on landscape resources for various products and services. However, this reliance has led to challenges such as overexploitation, environmental degradation and social inequalities.

This submodule explores the dynamic and multifaceted world of businesses and finance to fund innovation in sustainable agriculture, examining how to navigate the delicate balance between economic prosperity, environmental sustainability and social equity.

Learners will explore the sustainable agriculture and landscape business terrain, examining different scales of innovation from farm scale to landscape businesses. The aim of landscape businesses is to adopt SLM practices to secure resource supply, comply with international standards, provide multiple products and services, and build an understanding of the transition from ordinary agricultural practices to diversified, sustainable and socially responsible models at the landscape level. It also introduces the triple bottom line (TBLs), a powerful tool measuring the impact of businesses on people, the planet and profits.

In the subsequent sections, learners transition into the evolving landscape of finance and investment, where private and public investors play distinct roles. They will analyse the criteria, considerations and challenges associated with each investor. Emphasizing the importance of stakeholder engagement, learners will interact with the landscape investment matrix, showcasing stakeholder trust and holistic impact measurement.

This submodule culminates in discussions on blended finance and integrated landscape investment, providing a nuanced understanding of how financial mechanisms can underpin sustainable practices and briefly introduces sustainable value chains and supply chains as drivers for innovative sustainable agriculture solutions to land restoration.

Teaching notes

- Pre-session Asynchronous Activities (before/after lecture):
  - Watch the video on the triple bottom line
  - Review the video on the business case in landscape Massive Open Online Courses (MOOCs)
  - Explore the business model canvas video
  - Familiarize yourself with the video on asset and enabling investment
- Introduction - 5 mins
  - Welcome and outline the session's objectives.

Part 1: Restoration Businesses

- Understanding the restoration business - 5 mins
  - Explore the reliance of worldwide businesses on landscape resources;
  - Discuss the environmental and social implications of increasing demand and unsustainable practices;

- Emphasize the importance of sustainable landscape businesses in the global context;
- Present the integrated landscape approach as a solution to balance competing demands.

- TBL exploration - 5 mins
  - Define the three areas of impact in the TBL: people, planet and profits;
  - Discuss how landscapes offer opportunities to align economic interests with social and environmental justice;
  - Analyse the TBL in the context of landscape businesses.
- Group work: agricultural production systems - 15 mins
  - Sort students into groups and assign each a specific agricultural production system (agroforestry, pastoralism, agroecology, aquaculture and fisheries);
  - In groups, define the value proposition of the assigned system in terms of social, financial and environmental value.
- Values-based approaches to investment - 5 mins
  - Introduce the values-based approaches to investment;
  - Discuss the transition of the financial world towards sustainable and fair businesses;
  - Emphasize the compliance of investors, including private companies, with voluntary standards.

Part 2: Financing land restoration innovation - 10 mins (also see Module 4.9 which covers this topic in more detail).

- Financing land restoration - 5 mins
  - Introduce land restoration finance and its role in sustainable investments;
  - Discuss challenges faced in sustainable investments, focusing on investors' responsibility towards landscapes.
- Finance for land restoration investments - 5 mins

Discuss two main sources: private investors and public civic investors;

- Explore criteria for private investors and considerations for evaluating public investments;
- Present various global and local sources, including multinational corporations, impact investors, national and international banks, government agencies, non-governmental organizations (NGOs) and blended finance.

Part 3: Sustainable value and supply chains as drivers - 5 mins

- Introduces sustainable value chains and supply chains as drivers for innovative sustainable agriculture solutions to land restoration.

Part 4: Optional exercise: students revise the Theory of Change for their draft sustainable agriculture innovation interventions (suggested as a homework assignment)

- Students are asked to revisit the theory of change for their proposed intervention that they began developing in modules 2, 3 and 4.
- This exercise will help them in preparing for your restoration business proposal in Module 5.7.
- Reflect on which innovations will help students in developing your intervention.
- For each innovation, consider the pros and cons.
- What are the conclusions?
- Conclusion and recap - 5 mins
  - Summarize key points covered in the session;
  - Emphasize the importance of responsible landscape finance for sustainable investments.

Key references/resources

- FAO. (2014). *Developing sustainable food value chains – Guiding principles*. Rome. https://www.fao.org/policy-support/tools-and-publications/resources-details/en/c/422953/
- Giddings, B., Hopwood, B., & O'Brien, G. (2002). Environment, economy and society: Fitting them together into sustainable development. *Sustainable Development,* 10(4), 187–196: https://doi.org/10.1002/sd.199.
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Module 5.7 Developing your restoration business

- **Learning objectives**
  - Identify key skills, knowledge and attitudes essential for ecopreneurs;
  - Develop an understanding of the restoration Business Model Canvas and its application in developing innovative sustainable agriculture business ideas.
- **Summary**

This submodule empowers aspiring restoration entrepreneurs with the knowledge and skills to develop and nurture businesses that contribute positively to the environment and society. Learners will embark on a journey, starting with foundational steps such as understanding landscape needs, assessing resource interdependencies and navigating regulatory landscapes. They then identify their niche. They address challenges in innovative sustainable agriculture solutions for land restoration in order to cater to the needs of diverse stakeholders.

Key components include developing a business plan with a focus on attracting funding from impact investors, forming strategic partnerships through networking, and implementing scalable and responsible growth strategies. A highlight of this is the introduction of the Restoration Business Model Canvas, a holistic tool for summarizing and visualizing the critical elements of innovative business ideas for land restoration.

Through engaging exercises and real-world case studies, learners apply their knowledge to develop innovative agriculture solution business ideas with a triple bottom line approach, taking into account environmental, social and economic impacts in developing and growing landscape businesses sustainably.

- **Teaching notes**
- Introduction - 5 mins
  - Briefly introduce the concept of ecopreneurship;
  - Highlight the definition of ecopreneurship.

- Group discussion - 10 mins
  - Get into pairs and discuss the skills, knowledge and attitudes required to be an ecopreneur;
  - Encourage participants to share their insights with the larger group.

Part 1: Start-ups

- Key characteristics of an ecopreneur - 5 mins
  - Discuss the key characteristics of an ecopreneur:
    - Systems thinker;
    - Know their landscape
    - Innovative idea;
    - Start-up mindset.
- Start-ups and ecopreneurship - 5 mins
- Define the concept of start-ups in the context of ecopreneurship;
  - Emphasize the role of start-ups in driving positive change and innovation;
  - Discuss the importance of identifying a landscape business case.
- Kick-starting start-ups - 5 mins
  - Discuss the steps to kick-start a start-up:
    - Identifying restoration needs;
    - Defining resource interdependencies;
    - Conducting market research;
    - Understanding regulations and compliance;
  - Emphasize the need to identify a niche and define a clear vision and mission.
- Financing and partnerships - 5 mins
  - Explore financing options for start-ups;
  - Discuss the importance of partnerships and collaborations;
  - Offer tips on developing a business plan for investors;
  - Highlight the role of impact investors with a focus on environmental and social impacts.
- Scaling and growth strategy - 5 mins
  - Discuss the importance of planning for scalability;
  - Explore strategies for diversifying products and services.

Part 2: Restoration Business Model Canvas

- Restoration Business Model Canvas - 5 mins
  - From the Theory of Change to the Business Model Canvas
  - Introduce the restoration Business Model Canvas;
  - Discuss the seven steps of the Canvas;
  - Encourage participants to use the Canvas to map out their restoration business ideas.
- Group exercise -10 mins
  - Sort students into groups of three to five individuals:
    - Assign each group a case study;
    - Each group develops a landscape business idea, defining triple bottom line value propositions, key activities and resources, landscape partnership governance, and business impact on the landscape;
    - Each group presents their landscape business idea.

- Facilitate a discussion on the challenges faced and lessons learned during the exercise:
  - Encourage participants to reflect on how they can apply these concepts to their own circumstances.

- Conclusion - 5 mins
  - Summarize key takeaways.

Key references/resources

- Larson, A. L. (2000). Sustainable innovation through an entrepreneurship lens. *Business Strategy and the Environment*, 9(5), 304–317: https://doi.org/10.1002/1099-0836(200009/10)9:5<304::AID-BSE255>3.0.CO;2-O.
- Schuyler, G. (1998). Merging Economic and Environmental Concerns through Ecopreneurship. *Digest* Number 98-8. For full text: http://www.https://eric.ed.gov/?id=ED434220.
- Triple Bottom Line Value Proposition Image: https://drive.google.com/file/d/15a5VQqio7E3eGsyKqn0o4f5hYCOp71VG/view?usp=drive_link.

Module 5.8: Pitching your restoration business

- **Learning objectives**
  - Navigate various platforms, tools, and financial opportunities to kickstart their innovation ideas;
  - Demonstrate the ability to pitch their restoration business ideas effectively.

Summary

This submodule empowers learners with crucial skills to navigate platforms, tools, sustainable finance opportunities, and effective pitching for landscape business startups. The submodule is split into two parts: the first concentrates on community and knowledge platforms, restoration tools, and financing avenues. Learners gain insight into platforms like Global Landscape Forumx (GLFx) and tools like the Land Degradation Surveillance Framework and the Framework for Ecosystem Restoration Monitoring (FERM) registry to help them implement and monitor their impact and sustainable finance options, such as Terra Match. The second part focuses on pitching innovative sustainable agriculture for land restoration business ideas, emphasizing problem identification and business model articulation and creating a compelling value proposition. The submodule culminates with a practical group session and challenges learners to craft a three-minute video pitch, fostering real-world application of the concepts. Overall, this submodule equips learners with the knowledge to initiate restoration businesses innovatively and the ability to secure sustainable financing and effectively communicate their ideas through persuasive pitching.

Teaching notes

Introduction - 5 mins

- Briefly introduce the concept of restoration business pitching;
- Acknowledge the importance of effective communication in the entrepreneurial landscape.

Part 1: Platforms, tools and finance - 10 mins

- Community and knowledge platforms - 10 mins
  - Discuss the significance of community platforms for knowledge exchange;
  - Highlight platforms such as GLFx, WOCAT and Restor;
  - Display a screenshot of the GLFx platform for visual reference.
- Sustainable finance -10 mins
  - Explore sustainable finance opportunities, including Terra Match and regional/national grant opportunities
  - Emphasize the importance of funding for sustainable activities;
  - Include visuals or examples to illustrate funding options.

Part 2: Pitching your sustainable landscape innovation - 20 mins

- What makes a good pitch? -10 mins
  - Reference elevator pitch examples and the foolproof pitch template;

- Discuss critical aspects: a clear restoration problem, solutions, with a business model, a convincing unique value proposition, an interesting hook, and overall pitch cohesion.

- Group work: Video pitch development -10 mins
  - Sort students into groups of three to five individuals
    - Assign each group the task of developing a three-minute video pitch to a potential investor;
    - Stress that the pitch should cover the restoration business model developed in the previous session.
  - If time allows, have groups present their pitches:
    - Facilitate peer reviews, focusing on strengths and areas for improvement.

- Reflection on lessons learned -10 mins
  - Summarize the key takeaways and relate the lesson to the broader context of sustainable entrepreneurship;
  - Open the floor for questions;
  - Provide additional resources for further reading.

Key references/resources

- 15 Elevator Pitch Examples (+Foolproof Pitch Template) [2022].
- Framework for Ecosystem Restoration Monitoring (FERM) registry.
- GLFx community-led platform.https://glfx.globallandscapesforum.org/
- How To Create the Perfect Elevator Pitch in 6 Steps | Indeed.com.
- Larson, A. L. (2000). Sustainable innovation through an entrepreneurship lens. Business Strategy and the Environment, 9(5), 304–317. https://doi.org/10.1002/1099-0836(200009/10)9:5<304::AID-BSE255>3.0.CO;2-O.
- Schuyler, G. (1998). Merging Economic and Environmental Concerns through Ecopreneurship. Digest Number 98-8. For full text: https://eric.ed.gov/?id=ED434220.
- Terra Match: https://www.terramatch.org/.
- The Land Degradation Surveillance Framework Field Manual.
- World Overview of Conservation Approaches and Technologies Database on Sustainable Land Management. https://www.wocat.net/en/global-slm-database/

Module 5.9 From theory to practice: developing a restoration business – role play

Here, we also recommend a final exercise: a role play, which is an excellent way to enable students to learn about several key points made during the course in a very practical manner.

Objectives:

- The goal of the role play is to decide whether to submit a proposal to the national climate financing agency to fund conversion from flower cultivation to agroforestry (local trees combined with coffee plantation).
- The national climate finance agency would fund a three year conversion period on the condition that the local NGO leads the project to which all stakeholders agree.
- The ultimate goal is to improve water quality, soil quality, biodiversity as well as livelihoods at the landscape level.
- Develop soft skills in negotiating and discussing trade-offs in conversion to SLM for land restoration.

Suggested role play situation:

- The students are community members who have been cultivating flowers for export for 10 years and are now realizing that this has created a serious water pollution problem.

- A young extension agent has been assigned to work with the village board to assist the community in converting their land to more sustainable agriculture practices.
- The rainy seasons, which used to provide abundant rainfall in the winter and summer have also started to shift and become less predictable.
- Agroforestry (combining a local tree species with coffee) has been proposed by a local NGO with ties to national climate financing as an alternative but this would require a change of mindsets and initial investments.
- The farmer's women's savings group also needs to be convinced of this plan, as without the acceptance of the women's farmers, the proposal will not work.
- The NGO wants to convince the community to request funding to the climate financing agency for agroforestry, however the community is worried about this transition as they are not sure that they would maintain the same level of income as for flower cultivation.
- The village committee is meeting to decide whether to submit a proposal to the climate financing agency, which would fund conversion activities over a three year period.

Instructions:

1. Provide students with the instructions **the week before** to allow them time to prepare for the role play in groups.

2. Students are all assigned roles, such as:

- Village mayor (chairperson for the role play)
- Extension agent
- Farmers women's savings group
- Flower cooperative representative
- 1-2 farmers
- District environmental agency (water and soil quality technical agents)
- National climate financing agency
- Local NGO with ties to national climate financing
- Media representative
- Other students: active observers who will be asked to share their observations

3. Approximate timing:

- Introduction and instructions - 10 mins
- Role play, where each actor is requested to speak for 1-2 minutes on their position – 20 mins
- Wrap up and reflections - 20-30 mins
  - Start by asking the student observers to share their observations
  - Ask all students to reflect on:
  - What did they learn from the role play?
  - Was this a realistic situation?
  - What were the main trade-offs and how did the actors manage them?
  - What were the power plays?
  - Were all stakeholder voices considered equally?
  - Did the outcome of the exercise cover biodiversity and the multi functionality of the landscape?

Module 5.10 Course conclusions, wrap-up and final assignment

Part 1: Course highlights and wrap up

This module starts with a quick review of the course journey and main points covered in each module.

Part 2: Optional serious learning game: the CIFOR-ICRAF “Landscape Game 2”

Serious learning games can be powerful learning tools. This online game, “Landscape Game 2”, updated by CIFOR-ICRAF in 2024 can be introduced at any stage of the course to emphasize learning outcomes.

Part 3: Final summative assignment

A final summative assignment is proposed, developed around the Theory of Change, which they have been developing throughout the course and the Restoration Business Canvas Model (BMC) presented in sub-modules 5.6 and 5.7. In all cases, students are encouraged to review sections from previous modules as tools to help them complete their assignments.

Students are given three different options for their final assignment. All are various types of “restoration businesses”:

1. A business plan for a farm-level innovation in sustainable agriculture or for a social enterprise;
2. A proposal for an NGO or Government agency to assist a community in converting to sustainable agriculture practices;
3. A business plan for multiple stakeholders to develop a landscape business.

Instructions:

Students are encouraged to use their Theory of Change proposal and / or the Business Model Canvas to draft a 2 page brief outlining their innovative idea for land restoration.

This exercise serves as a way to combine concepts and tools learned throughout Modules 1-5.

A grading matrix is proposed in table 1 below

Table 1. Assessment grading matrix

	Very poorly (1)	Poorly (2)	Somewhat (3)	Well (4)	Exceeded expectations (5)
Is there a convincing value proposition?					
Does the restoration Business Model Canvas (BMC) address various levels (e.g. landscape level vs farm level?)					
Is the innovation/impact clear?					
Is the restoration BMC specific and consistent among all elements?					
Are there well- defined sustainable land management (SLM) techniques and approaches identified earlier in the course?					
Has the BMC been adapted to support the various types of possible innovations?					
Is there a clear solution for reversing land degradation or related impacts?					
Are there coherent goals to aim for?					
Does it consider both local stakeholders and wider-level stakeholders (including gender, women, youth, and Indigenous and local communities)?					
Were the appropriate decision-making tools chosen for the assignment?					

5. Case study descriptions

The ten case studies in table 2 below were developed by our partners with the objective of providing a variety of ideas and real-life examples of a host of "innovative sustainable agriculture solutions".

The case studies are each approximately 15–20 minutes in length and can replace or supplement various lectures in the course modules.

Table 2. Case studies overview

Case study title	Country	Main topic covered	Suggested course module(s)
1. Experimental plots for assessing soil erosion prevention practices via remote-sensing tools	Ecuador	Soil erosion prevention practices	2,3
2. Automated environmental monitoring with SmartSense	Germany	Automated environmental monitoring	3,5
3. Agricultural land degradation in the Prestea-Huni Valley Municipality of Ghana: Causes, impacts and proposed rehabilitation strategies	Ghana	Agricultural land degradation	1,4
4. Kalpavalli Community participatory approach to land restoration, India	India	Community based land restoration	4,5
5. Land Suitability Evaluation for Rice Production in Banyumas Regency	Indonesia	Land suitability evaluation for rice production	2,3
6. Hydroponic Farm: Protecting the Ecosystem Through Water Savings and Soil Protection while enhancing Food security	Jordan	Demonstration hydroponic farms for water management	4
7. Agricultural fire breaks through fuel cutting, Madagascar	Madagascar	Demonstration of agricultural fire breaks and drone monitoring	2,3
8. STEPA model farm: Restoring Degraded Croplands for Sustainable Land Management in Malawi	Malawi	Demonstration farm for land restoration	1,2,4,5
9. Integrated Management of Awba Dam Watershed Ecosystem for Sustainable Utilisation	Nigeria	Agroforestry for restoring degraded agriculture land	1,2,5
10. Reducing Tillage to Prevent Soil Erosion: Perspectives on Soil, Technology, Society, and Policy, Pesnica, Slovenia	Slovenia	Soil, technology, society, and policy	1-5

A cross-cutting case study, **Farm Better,** was developed to provide an inspiring example of a restoration business, that is an innovative sustainable agriculture solution start-up. Farm Better is an award-winning app launched in 2018, which provides farmers around the world with regularly updated information on sustainable farming practices. See the case study materials to learn more about Laxmi Dawadi from Kaski District, Western Nepal, which faces land management problems, such as soil erosion and soil fertility depletion. She has been a Community Business facilitator and extension agent with the project since 2017 promoting new farm practices and technologies in her locality, including the farmbetter app. She is an entrepreneur and her firm primarily focuses on agricultural activities such as selling seeds, providing mulching teaching, nursing farms, and producing vermicompost. Additionally, she educates other farmers and serves as a model farmer and demonstration farm in her community. Please note that although this case study is disseminated in our course materials, the G20 GLI/UNCCD does not necessarily endorse the farmbetter app.

Figure 9. Laxmi Dawadi, Community Business Facilitator, Agripath/ Farm better project, Nepal

Case study 1: Experimental plots for assessing soil erosion prevention practices via remote-sensing tools, Ecuador

Geographic location	Ecuador/Azuay province/Guachapala
Scale	Experimental plot
Type of ecosystem	Agriculture areas
Climate	Subtropical
Author	University of Cuenca, Ecuador

Description

Practices to combat soil erosion are implemented worldwide and have proven to be effective to avoid or reduce soil movement. For practices like terracing, it is important to understand the impact of different soil tillage methods on soil movement and erosion. In the Faculty of Agricultural Sciences at Universidad de Cuenca, Ecuador, an experimental plot was established in the "El Romeral" experimental farm. In an area covering 2,000 m^2, terraces were built on zones with a median slope of 35 per cent. The aim was to measure the effectiveness of unmanned aerial vehicles (UAV) to estimate soil movement under different terrace soil tillage practices. The results show that UAVs are a reliable tool to measure soil movement and offer advantages such as high-resolution images, which can create better estimates of soil movement with relatively low costs. With regard to different soil tillage practices applied on the terraces, the results show that under some soil tillage practices (mouldboard plow, manual tillage and nontillage), the soil movement was equal to zero.

After going through the case study, learners should be able to:

- Understand soil conservation principles and practices;
- Apply agricultural techniques, such as terrace construction and soil preparation;
- Apply skills in data collection, analysis and interpretation to study soil behaviour and volume changes.

Fig. 10. Top photo: Terrace building, Ecuador

Fig. 11. Bottom photo: Drone image of research area, Ecuador

Case study 2: Automated environmental monitoring with SmartSense, Germany

Geographic location	Germany, North Rhine-Westphalia, Gymnicher Mühle
Scale	Small-scale (up to 1 hectare)
Type of ecosystem	Depends where the SmartSense station is implemented
Climate	Depends where the SmartSense station is implemented
Author	Institute for Technology and Resources Management in the Tropics and Subtropics (ITT) TH Köln, University of Applied Sciences, Germany

Description

Environmental monitoring serves as the tool that provides evidence to assess the state of environmental health and the severity of degradation. Accurate and comprehensive environmental monitoring has gained increased significance during times of change, particularly concerning climate, land use and industries. Data collection is central to environmental monitoring. In the past, the sampling and collection of data were carried out with labour-intensive and time-inefficient methods, resulting in sporadic and incomplete data. Nowadays, advancements in sensor technologies and data transmission have enabled more reliable, robust, objective, and error-free options for collecting environmental data. However, these technologies are often expensive, emphasizing the need for automated data collection on a budget.

The ITT SmartSense team is dedicated to developing automated systems for use in remote, data-sparse regions of the world at affordable costs. The system allows for the measurement of discharge, weather conditions, and water quality parameters. For agricultural and land-related applications, variables such as temperature, solar radiation, wind velocity and direction, precipitation, and soil moisture (soil water content) are automatically monitored by the SmartSense system.

While still in the development phase, SmartSense holds immense potential for monitoring land degradation by continuously providing data on crucial land parameters. The SmartSense team has installed the equipment at the Gymnicher Mühle in the North Rhine-Westphalia state of Germany and receives continuous data on various climate parameters.

After going through the case study, learners should be able to:

- Identify the needs and potentials of farm scale data for land monitoring;
- Understand and evaluate how a small-scale monitoring system can make useful agricultural decisions;

Understand the challenges in implementing small-scale monitoring systems.

Fig. 12. SmartSense device, Germany

Fig. 13. Installation of a SmartSense Monitoring System by students, Germany

Case study 3. Agricultural land degradation in the Prestea-Huni Valley Municipality of Ghana: Causes, impacts and proposed rehabilitation strategies

Geographic location	Ghana/Western/Prestea-Huni Valley
Scale	Landscape
Type of ecosystem	Forest
Climate	Tropical
Author	University of Cape Coast, Ghana

Description

This case study is gleaned from fieldwork in the municipality that considered the feasibility of restoring land degraded from artisanal and small-scale mining (ASM). ASM is pervasive in the municipality and has been practiced for centuries. As one of the mining hubs of Ghana, the municipality is known to suffer from extensive land degradation, especially in agricultural lands, due to ASM, which is poorly regulated and labelled as illegal. This case study looks at the varied and complex effects of ASM-induced degradation of agricultural lands in the municipality, as gleaned from the field studies and literature. First, it focuses on unpacking the direct and indirect drivers of this form of land degradation, and proceeds to look at the associated myriad ill-effects (direct and indirect) on formerly agriculturally productive lands and the community. Deploying different types of agricultural methods was seen as the most suitable rehabilitation measure for the area. The main strategies proposed to convert the degraded lands into other sustainable agricultural sites for livelihoods are also highlighted.

After going through the case study, learners should be able to:

- Explain the direct and indirect drivers of ASM-related land degradation in the municipality;
- Articulate the diverse impacts of land degradation in the municipality;
- Construct a web of interactions between the causes and effects of land degradation for the municipality.

Fig. 14. Top photo: Farmland destroyed through ASM in the Prestea-Huni, Ghana

Fig. 15. Bottom photo: ASM-impacted Ankobra river and its riparian vegetation, Ghana

Case study 4. Kalpavalli Community participatory approach to land restoration, India

Geolocation (country/ region/ municipality)	Anatapuram District, Andhra Pradesh, India
Scale (e.g. smallholder farm)	Common lands (used for grazing, non-timber forest produce, and agriculture)
Type of ecosystem(s)	Savannah ecosystem
Climate	Arid
Author	Timbuktu collective, India

Description

The Kalpavalli Community Conservation Area (KCCA) is a 6,500-acre (2,630-hectare) expanse of community-regenerated arid land located in the state of Andhra Pradesh in southern India. Over thirty years, participatory efforts have protected and restored this savannah ecosystem, with direct and indirect benefits to the community. This community-centred conservation of common lands is termed the Kalpavalli conservation approach.

The Kalpavalli conservation approach is renowned for its focus on restoring common lands through the efforts of a cooperative society based on a federation of village forest committees. Community members are the beneficiaries. Through this approach, 6,500 acres (2,630 hectares) of arid and severely degraded common lands have been successfully rejuvenated over the past 33 years. An NGO, Timbaktu Collective has facilitated the conceptualization and implementation of the approach.

The primary stakeholders are marginalized community members, including Dalits (the socially disadvantaged lowest castes), who have traditionally been landless labourers and pastoralists. The Timbaktu Collective has played a critical role in community mobilization, capacity-building, training and documentation. The approach has empowered the lower castes to participate actively in the decision-making process and enabled them to advocate for benefits from government programmes. However, the lack of absolute ownership of the common lands and the potential influence of private parties with vested interests remain challenges.

At the end of this case study, learners should be able to:

- Learn about a successful restoration initiative;
- Learn about how local communities are part of restoration efforts;
- Understand the complexity of restoration efforts.

Fig. 16. Top photo: Women community members engaged in seasonal collection of broom grasses and thatch from community lands in Kalpavalli, India

Fig. 17. Bottom photo: Community fire watchers taking preventive measures for fire prevention, Kalpavalli, India

Case study 5: Land Suitability Evaluation for Rice Production in Banyumas Regency, Indonesia

Geographic location	Indonesia/Central Java Province/Banyumas Regency
Scale (e.g. smallholder farm)	Regency
Type of ecosystem	Paddy field
Climate	Tropics
Author	Universitas Gadjah Mada, Indonesia

Description

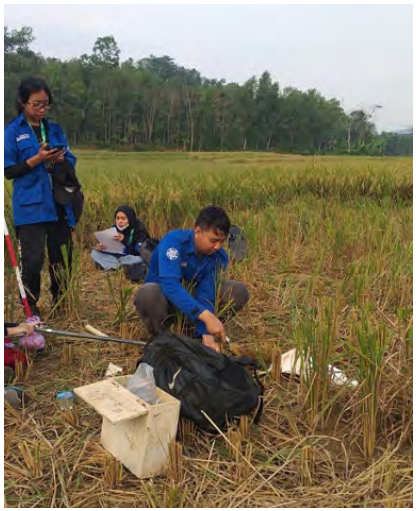
The project on land suitability evaluation and climate impact on rice production originated from fieldwork conducted by students from the Faculty of Geography in June 2023, which resulted in a substantial amount of available data. The primary goal of this project is to assess the suitability of land for rice agriculture and identify the key factors contributing to the reduction in areas devoted to rice fields. Banyumas is renowned for its extensive rice fields, however, there has been a noticeable decrease in their size over the past few years. Several factors can be attributed to this decline. The analysis indicates a positive correlation between population growth, industrial expansion and gross regional domestic product, with changes in agricultural land within Banyumas Regency. Weather and climate fluctuations can also lead to a decrease in rice productivity. Furthermore, climate change has the potential to affect the quality of crops produced in agriculture and plantations, with certain plants experiencing a decline in quality due to variances in their ability to withstand different weather conditions.

After going through the case study, learners should be able to:

- Map the land suitability for paddy fields;
- Understand and evaluate the impact of climate change on agricultural land, particularly paddy fields;
- Evaluate the productivity of paddy fields in Banyumas Regency.

Fig 18. Geomorphological condition at one of the case study locations in Banyumas Regency, Indonesia

Fig 19. Land Capability Parameter Analysis, Indonesia



Case study 6. Hydroponic Farm (The Water-Energy-Food-Ecosystem nexus)

Protecting the Ecosystem Through Water Savings and Soil Protection while enhancing Food security, Jordan

Geographic location	Dhiban area/Madaba Governorate/Jordan
Scale	Small youth cooperative (50 per cent women) farm
Type of Ecosystem	Cropland
Climate	Semi-arid
Author	German-Jordanian University, Jordan

Description

The site is a demonstration project funded by Partnership, Research, and Innovation in the Mediterranean (PRIMA), a European Union-funded project. German-Jordanian University is a partner in the project which aims to test solutions for economically viable, socially inclusive, water-efficient and sustainable agriculture production systems in Jordan. The demonstration project consists of two hydroponic production systems (46.5 metres long and 9 metres wide, 418.5 m^2 each) powered by a 3-kWh solar photovoltaic system for the energy requirements, and two traditional farming greenhouses established and operated at the premises of Dhiban Youth Cooperative.

The hydroponic irrigation system is drip irrigation with a tough, soilless growing medium. The water is collected from the Al Wala valley stream, filtered, and circulated in a closed loop throughout the hydroponic greenhouses. The fertilizers are supplied and dosed based on a self-adjusting system.

With the overall aim of supporting income-generation activities among small farming communities and increasing the socioeconomic as well as environmental resilience of agricultural production in Jordan, the demonstration project targets the supply of high-quality vegetable value chains while promoting eco-friendly water-saving farming practices that are youth and women-inclusive. This case study aims to give the learner the chance to economically analyse and compare two systems (one hydroponic and the other traditional) that are subjected to the same conditions. The analysis will utilize the data generated from the pilot site.

After going through the case study, learners should be able to:

- Understand the components of one sustainable agriculture scheme vis-à-vis the protection of natural resources;
- Understand the economic feasibility of a small sustainable agriculture scheme;
- Evaluate the economic feasibility of a scheme for job creation, especially for women and youth in a vulnerable community;
- Identify the necessary enabling factors to ensure the success of small agriculture schemes;
- Identify the potential of upscaling in other communities and regions.

Fig. 20. Fig. 21: Hydroponic greenhouse before planting, Jordan; Right: after planting.

Case study 7: STEPA Model Farm: Restoring Degraded Croplands for Sustainable Land Management in Malawi

Geographic location	Upper Lilongwe River Catchment, Lilongwe, Malawi
Scale	Farm
Type of Ecosystem	Agriculture ecosystems
Climate	Subtropical
Author	Centre for Applied Systems Analysis (CASA), Malawi

Description

Established in response to the urgent need for SLM practices, particularly in the face of increasing land degradation and declining agricultural productivity, the STEPA Model Farm serves as a living laboratory for implementing and testing innovative silvicultural and restoration methods grounded in science and operational practice. Located in Malawi, a country severely affected by soil erosion, nutrient depletion and loss of biodiversity, the Farm addresses these pressing issues head-on. Through its innovative approaches, the STEPA Model Farm seeks to reverse this trend, offering hope for the restoration and sustainable management of the catchment and beyond. This initiative aims to serve as a restoration hub for degraded farmlands, functioning as a living laboratory and demonstration site for implementing, testing and showcasing diverse conservation, restoration, and SLM practices, innovations and technologies. The Model Farm also plays a central role in restoration education, research, policy advocacy, and community engagement efforts.

After going through the case study, learners should be able to:

1. Analyze the role of integrated agroforestry systems and soil and water conservation measures in restoring degraded croplands, as exemplified by the STEPA Model Farm, and in addressing challenges of soil erosion, nutrient depletion and loss of biodiversity in Malawi.
2. Evaluate the effectiveness of community engagement and capacity-building initiatives implemented at the STEPA Model Farm in empowering local communities with the skills and knowledge needed for SLM practices.
3. Assess the impact of innovative silvicultural and restoration methods tested and implemented at the STEPA Model Farm on enhancing soil fertility, water retention and agricultural productivity, thus contributing to the broader goal of SLM in Malawi and beyond.

Fig. 22. Top photo: Tree seedlings nursery at STEPA Model Farm, Malawi

Fig. 23. Bottom photo: Deep bed farming, Malawi

Case study 8. Agricultural fuel breaks for fire management, Madagascar

Geolocation (Country/ Region/ Municipality)	Boény Region, Madagascar
Scale (e.g., smallholder farm)	Farmland
Type of Ecosystem(s)	Savannah ecosystem
Climate	Dry
Authors	Land, Landscape and Development Research Lab (Llandev) and WOCAT

Description

Fuel cutting by agriculture, more commonly called agricultural fuel breaks for fire management, is practiced around forest mosaics and protected areas, near farmers' villages in Madagascar. Generally established on open landscapes dominated by grassy savannah, these fuel cuts limit the spread of fires. Unlike "classic" firebreaks generally having a width of 3 to 10 m, fuel cuts by agriculture have a greater width of 25 to 100m. They thus limit the impact of fires and have to be cleared every three years. They can be created by farmers and can generate additional livelihoods while limiting biomass accumulation or fuel load from regular cultivation. Land use rights must be secured for farmers to invest long-term in the agricultural firebreaks. Drones are being used to plan, create baseline data and monitor agricultural firebreaks in Madagascar.

After going through the case study, learners will:

- Understand the significance of agricultural fuel cuts in Madagascar
- Understand how drones can be used for assessment and monitoring of fuel cuts

Fig. 24. Top photo: Agricultural fuel break, Madagascar

Fig. 25. Bottom photo: Agricultural fuel break, Madagascar

Case study 9. Integrated Management of Awba Dam Watershed Ecosystem for Sustainable Utilization, Nigeria

Geographic location	Southwest Nigeria
Scale	Landscape
Type of Ecosystem	Rainforest
Climate	Tropical
Author	University of Ibadan

Description

The Awba reservoir rehabilitation project is focused on restoring the degraded vegetation of a watershed ecosystem around a reservoir that was constructed in 1964. This ecosystem, which was modified tropical rainforest vegetation, had been affected by intensive farming activities and chemical use (herbicides, pesticides and fertilizers). The water body became polluted while the vegetation cover was completely altered due to clearing, uncontrolled tillage and invasion of invasive plants. The project, which commenced in 2021, aims to rehabilitate the landscape using indigenous tree species. The site will also serve as a living lab for student training, research and data collection, as well as a conservation area for threatened tree species. After two years, the vegetation is in the process of recovery, with the establishment of native tree species and the protection of the water body. Agroforestry practices are being encouraged in some sections of the watershed. The use of chemicals has been discontinued, and the university is working with local farmers on the management of the watershed. The project will be used to introduce students to landscape restoration and provide empirical data on ecosystem recovery. Agroforestry plots, which promote sustainable farming, are established by students of the University of Ibadan, Nigeria.

After going through the case study, learners should be able to:

- Identify the challenges and opportunities available in land rehabilitation and the integrated management of degraded ecosystems;
- Understand and evaluate various research activities required for land rehabilitation projects and determine potential data obtainable from living labs;
- Highlight and discuss the career opportunities that students could develop in landscape restoration and rehabilitation.

Fig. 26. Top photo: High siltation and growth of aquatic weeds on Awba Dam Reservoir, Nigeria

Fig. 27. Bottom photo: Pegging and tree planting operation by students at Awba Dam Reservoir, Nigeria

Case study 10. Reducing Tillage to Prevent Soil Erosion: Perspectives on Soil, Technology, Society, and Policy, Pesnica, Slovenia

Geographic location	Pesnica, Slovenia
Scale	Agricultural landscape
Type of Ecosystem	Cropland
Climate	Temperate
Authors	University of Ljubljana

Description

The Pesnica, Slovenia case study examines how the reduction of tillage can enhance the resilience of agricultural catchments to soil erosion. The study focuses on soil, technology, society, and policy. The catchment area is characterized by intensive agricultural production, mainly cattle and pig breeding and arable farming. The area is vulnerable to drought in the spring and summer, whereas in the autumn and winter, severe precipitation events cause significant soil erosion. According to climate change projections, there will be an increase in the number of days with intense precipitation events, which will further increase surface runoff, sediment transportation, and river discharges.

A combination of measures is required to reduce soil erosion. The case study outlines measures to reduce runoff by decreasing tillage, such as mulch-tillage, use of winter cover crops, converting arable fields to grassland at steeper slopes, contour tillage, and grassed buffer strips. The study offers insights into how various instruments can be used to engage with farmers to increase awareness, build capacity, and explore possible solutions to accelerate the implementation of sustainable land management measures (SLMs). It includes identifying potentials and constraints to SLMs implementation, using demonstration sites, catchment modelling, environmental monitoring, and technological guidelines. Finally, the case study provides policy recommendations to suggest how decision-makers can respond with appropriate policy mechanisms to support farmers and improve SLMs uptake.

After going through the case study, learners should be able to:

- Understand how to successfully manage soil erosion by reducing soil tillage to increase organic soil content in the upper soils layer and improve soil water holding capacity.
- Increase the ability of stakeholders to identify potentials and constraints to SLMs implementation, through demonstration sites, catchment modelling, environmental monitoring, and technological guidelines.
- Understand the importance of formulation of appropriate policies for enabling SLM uptake.

Fig. 28. Top photo: Landscape at Slovenia Case study Pesnica

Fig. 29. Bottom photo: Maize crop after shallow soil preparation


Who?

Annexes: Course outlines

Fig. 30. Course overview of all submodules

Module 1: Land, landscapes and society 8 contact hours					
Core competencies					
Academic knowledge: ▸ Multifunctional landscapes, plural valuation, ecosystem services; ▸ Agriculture and its complex interactions with land, biodiversity, climate and livelihoods; ▸ Schools of thought for sustainable agriculture and land restoration (definitions, key concepts, histories, examples); ▸ States, trends, drivers and projections of land degradation (regionally and globally); ▸ Core ideas and objectives of sustainable land management, including a conceptual framework ▸ Power, gender and justice in relation to land restoration and land conflicts. Practical skills: ▸ Systems thinking; ▸ Context-sensitivity. Attitudes and values: ▸ Optimistic outlook for how sustainable land management (SLM) could combat land degradation/support land restoration; ▸ Awareness and concern for sustainability, power, gender and justice.					
Modular learning objectives	**Submodule topics**	**Synchronous (lecture elements)**	**Synchronous (interactive elements)**	**T**	**Asynchronous**
Differentiate between different landscapes, land uses and the role of agriculture Understand how our own worldviews shape what we see and value and develop the ability to gain perspective	1.1 Agriculture, ecosystem services, and value	▸ Introduction to landscapes and different land uses ▸ Introduction to ecosystem services ▸ Input on the valuation of nature	What do you see in this landscape? Comparing sustainable and unsustainable landscapes Managing on-site and off-site effects What does a bee mean to you?	1 hr	Required readings: World Resources Institute (2003) Optional readings: Read Martín-López 2023

Modular learning objectives	Submodule topics	Synchronous (lecture elements)	Synchronous (interactive elements)	T	Asynchronous
Understand agriculture in the context of food systems Consider interactions among agriculture, land degradation, biodiversity, livelihoods and climate	1.2 Agriculture and sustainability	▸ Sustainable agriculture and food systems ▸ Agriculture and land degradation: biodiversity, livelihoods and climate	Short student exercise about their favourite foods -- short reflections and discussions Short student exercises about climate change projections and IPBES figures on natural capital	1 hr	Homework: Agriculture and land degradation Required readings: FAO (2016) Optional readings: IPBES (2018) Calvin et al. (2023)
Connect sustainable agriculture and land restoration to major global initiatives Analyse co-benefits and trade-offs among the principles of the United Nations Decade on Ecosystem Restoration	1.3 Agriculture, restoration, and the environmental movement	▸ Timeline of the global environmental movement ▸ United Nations Decade on Ecosystem Restoration	Your journey through the timeline The principles: co-benefits and trade-offs	1 hr	Required readings: UN Decade on Ecosystem Services (2023) Optional readings: WCED (1987)
Reflect on different definitions of land degradation Identify types of land degradation	1.4 Land degradation – Introduction	▸ Definitions of land degradation ▸ Types of land degradation ▸ Drivers of land degradation	Group exercise about land degradation types	1h	Homework: Develop a DPSIR framework for your country. Optional readings: Harari et al. (2017) Case studies: Ecuador, Ghana, India, Indonesia, Jordan, Madagascar, Malawi, Nigeria, Slovenia
Learn about different assessments of land degradation Understand drivers of land degradation and factors enabling restoration	1.5 : Land degradation – (continued)	▸ Different global assessments of land degradation and restoration ▸ Drivers of land degradation at global and national level	Student exercise: Progress towards SDGs 2 and 15 Optional: video for classroom or homework	1h	Optional readings: IPBES (2018)

Modular learning objectives	Submodule topics	Synchronous (lecture elements)	Synchronous (interactive elements)	T	Asynchronous
Describe the core ideas and objectives of sustainable land management (SLM) Describe the SLM conceptual framework Describe land management practices	1.6 SLM –Introduction	▸ Definitions and objectives of SLM ▸ SLM conceptual framework ▸ Illustration of SLM practices and introduction of WOCAT network	Group work: watching a WOCAT movie and documenting elements of an SLM model, followed by facilitated classroom discussion	1h	Required readings: FAO (2023) Optional readings: WOCAT (2023)
Compare SLM to related concepts for sustainable agriculture and land restoration Apply SLM and related concepts for disaster risk reduction	1.7 Related concepts for sustainable agriculture and land restoration	▸ Concepts related to SLM ▸ Disaster risk reduction	Comparing concepts related to SLM (short videos and reflections) Considering how to reduce drought and flood risks for farmers	1h	Required readings: Renaud et al. (2013) Optional readings: FAO (2023c) Case studies: India
Critically reflect on restoration Evaluate restoration in terms of justice, power and gender	1.8 Power, justice and gender	▸ Restoration of what, for whom? ▸ Justice, power and gender	Scenario: Restoration of what, for whom? Scenario: restoration of what, for whom, and why?	1h	Required readings: Tribaldos et al. (2022) Optional readings: Lukes (1974) Case studies: Ghana, India

Module 2: Agricultural approaches to sustainable land management 10 contact hours					
Core competencies					
Academic knowledge: ▸ Application of the SLM framework to specific cases ▸ Sustainable land management principles to enhance environmental functions ▸ Sustainable land management (SLM) practices (SLM Technologies and SLM Approaches) for sustainable agriculture; ▸ Classification of SLM Technologies into five measures and technology groups; ▸ SLM Approaches (participation, role of stakeholders, …) ▸ Relevance of agro-ecological zones (AEZ) and landscape units for sustainable land management; ▸ Application of SLM practices within larger landscapes, watersheds, AEZs; ▸ Barriers to and enablers of SLM adoption; ▸ Theories of change for sustainable agriculture. Practical skills: ▸ Apply the SLM principles to enhance environmental functions; ▸ Identify and apply suitable SLM practices in efforts to achieve sustainable agriculture and land restoration at multiple scales; ▸ Develop an intervention: analyse the context of a problem and design a theory of change; ▸ Underline the importance of inclusivity, participation and context sensitivity in SLM; ▸ Motivation and desire to engage in SLM.					
Modular learning objectives	**Submodule topics**	**Synchronous (Lecture elements)**	**Synchronous (Interactive elements)**	**T**	**Asynchronous**
Apply the SLM conceptual framework to specific cases (e.g. peanut farming in Haiti)	2.1 SLM principles to enhance environmental functions	▸ SLM principles ▸ SLM principle related to water availability/ water cycle	Exercise: applying the SLM conceptual framework (watch video and reply to questions)	1 hr	Optional readings: Liniger & Mekdaschi-Studer (2019)

Modular learning objectives	Submodule topics	Synchronous (Lecture elements)	Synchronous (Interactive elements)	T	Asynchronous
List the principles of SLM to enhance environmental functions Explain SLM principles related to water availability/water cycle			How do land management practices relate to the SLM principles to enhance environmental functions? (Watch videos and interactive discussion)		
Explain the SLM principle related to cover, soil fertility and micro-climate Explain the interdependence of SLM principles	2.2 SLM principles to enhance environmental functions (continued)	SLM principles related to: cover, soil fertility and micro-climate	Facilitated plenary discussion following individual reflections exercises Exercise on micro-climate (watch video) and facilitated discussion	1 hr	Optional homework: Discuss SLM principles for different land management type Optional readings: Liniger & Mekdaschi-Studer (2019)
Describe SLM practices: SLM technologies and SLM approaches Classify SLM technologies into five measures	2.3 SLM practices (focus on SLM technologies)	SLM Practices ▸ SLM technologies & SLM approaches SLM technology: five SLM measures (agronomic, vegetative, structural, management-related and a combination)	Group exercise about SLM technology measures (search in global WOCAT database)	1 hr	Optional readings: Liniger & Mekdaschi-Studer (2019) Case studies: Ecuador, Ghana, India, Indonesia, Jordan, Malawi, Nigeria, Slovenia
Explain the SLM measures Apply the SLM principles to enhance environmental functions List the SLM technology groups	2.4. SLM technology measures and SLM principles	Plenary discussion on exercise about SLM measures Apply the SLM principles SLM technology groups	Present the results of the group exercise in plenary (from session 2.3). Exercise about SLM principles: hold presentation in plenary and facilitate classroom discussion.		

Modular learning objectives	Submodule topics	Synchronous (Lecture elements)	Synchronous (Interactive elements)	T	Asynchronous
Describe SLM approaches in terms of type, scale, participation and role of stakeholders, technical support, capacity-building and knowledge management, financing and external material support Identify enabling and hindering factors of SLM approaches	2.5 SLM practices (approaches)	Introduction to SLM practices (approaches) Enabling and hindering factors of SLM approaches	Exercise about SLM approaches (search WOCAT database) Exercise about enabling and hindering factors of SLM approaches	1h	Case studies: Ecuador, Ghana, India, Indonesia, Jordan, Malawi, Nigeria
Describe the relevance of agroecological zones (AEZs) and landscape units for land management Apply SLM technologies within larger landscapes, watersheds, AEZs	2.6 SLM interventions at the landscape level	Introduction to SLM within larger landscapes: definition of landscapes, AEZs and landscape units Context-specific selection of SLM technology interventions	Plenary discussion about the AEZs of your country/ region Group exercise on the use of SLM technologies in specific landscape units	1h	Required readings: Tim et al. 2023 Case studies: Ghana, India, Malawi, Nigeria
Analyse the characteristics of key decision-makers to identify potential barriers to and enablers of SLM adoption Analyse food systems to identify lock-in mechanisms and cognitive biases/ heuristics that impede SLM adoption; consider potential solutions	2.7 Barriers to and enablers of SLM adoption	▸ Decision-makers and decision-making environments as barriers to and enablers of SLM adoption ▸ Deep barriers to SLM adoption	▸ Scenario: Adopting SLM practices ▸ Analysing deep barriers	1h	Required readings: **One of:** Margini et al. (2018), Weituschat et al. (2022) or Waldman et al. (2019) Case studies: Slovenia
Think systematically about how to initiate and guide processes of change	2.8 Theories of change	▸ Main components of a theory of change ▸ Practise designing a theory of change	▸ Exercise: xpressing the United Nations Decade Action Plan as a theory of change		n/a

Modular learning objectives	Submodule topics	Synchronous (Lecture elements)	Synchronous (Interactive elements)	T	Asynchronous
Analyse the context of a problem related to unsustainable agriculture and land degradation	2.9 Developing your innovative sustainable agriculture intervention – Part I	▸ Guiding questions ▸ Things to keep in mind	▸ Carrying out a contextual analysis	1h	Required preparation: Select a case for designing an intervention (place, landscape, problem)
Design a theory of change for an intervention based on a contextual analysis	2.10 Revising your innovative sustainable agriculture intervention – Part II	▸ - Guiding questions ▸ - Things to keep in mind	▸ Designing a theory of change		Required preparation: Finalize a preliminary contextual analysis

Module 3: Tools and technologies for land restoration assessment and monitoring 10 contact hours					
Core competencies					
Academic knowledge: ▸ Decision-support framework; ▸ Data literacy; ▸ Land assessment and monitoring data and tools; ▸ Citizen science; ▸ Technologies (drones, sensors, etc.) for innovation to address land degradation and SLM. Practical skills: ▸ Data management, analysis and interpretation; ▸ Use of assessment and monitoring tools. Attitudes and values: ▸ Importance of data literacy; ▸ Concern for suitability and applicability of tools and technologies.					
Modular learning objectives	**Submodule Topics**	**Synchronous (Lecture elements)**	**Synchronous (interactive elements)**	**T**	**Asynchronous**
Think systematically about how to support good decision-making on the sustainable management of agricultural land	3.1 Decision support for sustainable agricultural land management	Decision-makers in agricultural land use Decision-support framework	Who makes decisions that affect agricultural land use?		Required reading: Harari et al. (2023) Optional reading: FAO (2018)
Think critically about data, including how and why data is generated, collected and handled Reflect on your own data ethics and learn to handle data responsibly	3.2 Data and data literacy	Data, data literacy, and data protection ethics and law Sources and types of data and open science	What are your data ethics? Why do we need data for agricultural land management?	1 hr	

Modular learning objectives	Submodule Topics	Synchronous (Lecture elements)	Synchronous (interactive elements)	T	Asynchronous
See land through the lens of the land degradation neutrality (LDN) framework Familiarize yourself with national progress reporting on LDN	3.3 Assessment and monitoring for LDN	LDN National processes for LDN implementation and the LDN Target Setting Programme	Exploring a country's UNCCD profile	1 hr	Required reading: UNCCD (2023) Optional reading: Cowie et al. (2018)
Assess land degradation datasets, data sources and analytical methods for strengths and weaknesses Design participatory approaches for mapping land degradation that combine global data and local knowledge Integrate multiple sources of evidence to make judgments about land degradation	3.4 Data, methods and apps for mapping land degradation	Introduction to maps, data and methods Indicators and tools	Is the land degraded? Exploring the Google Earth Engine with the LDN-PRAIS4 app Combining the three indicators: Is the land degraded? Exploring the GEO LDN Toolbox	1 hr	
Set up a process for mapping land degradation and sustainable land management (SLM) in a specific area Systematically document land degradation and generate expert recommendations for SLM	3.5 Participatory expert assessment of land degradation	Overview of the LADA-WOCAT mapping process LADA-WOCAT Questionnaire for Mapping Land Degradation and SLM	Experimenting with the questionnaire	1 hr	Required reading: FAO (2019) Optional reading: WOCAT (2008)
Understand the concept of citizen science, which includes the ideas of citizen engagement and citizen participation. Engage the fundamental concept of citizen science into SLM/land restoration programmes. Observe the importance and challenge of citizen science for land management/land restoration programmes.	3.6 Citizen science SLM and land restoration	Introduction and importance of citizen science Scope of citizen science and incorporation into SLM and land restoration		1h	Required readings: Co-Lab & UNDP (2022) Optional readings: von Gönner et al. (2023)

Modular learning objectives	Submodule Topics	Synchronous (Lecture elements)	Synchronous (interactive elements)	T	Asynchronous
Develop an overview of the use and potential of low-cost UAVs Prepare an automatic flight mission Process drone imagery and export results Use the results to delimit watersheds	3.7 Drones for assessing and monitoring land degradation	Overview and preparation of an automatic flight mission Processing drone imagery, exporting results, and using results to delimit watersheds	Guided exercise with Map Pilot PRO Guided exercise with Agisoft Metashape Guided exercise with QGIS Guided exercise with QSWAT	1 hr	
Acquire introductory knowledge on the potentials of sensor technologies and the internet of things (IOT) in relation to land restoration.	3.8 Sensors and IOT	Introduction to environmental monitoring sensors and technologies Application of environmental sensors for land degradation	Three short student exercises. Lecturer will ask questions about the importance of environmental monitoring and their parameters and the importance of measuring important parameters such as soil moisture and precipitation for sustainable land management		Required readings: Atzori et al. (2010) Optional readings: Ogden et al. (2008)
Analyse options for the monitoring and assessment of land degradation and SLM in a context-sensitive way	3.9 Suitability and applicability	Challenges and costs Regulations Cultural aspects Bridging different knowledge systems	Group and plenary discussions around issues setting up monitoring and assessment	1 hr	

Modular learning objectives	Submodule Topics	Synchronous (Lecture elements)	Synchronous (interactive elements)	T	Asynchronous
Revise the theory of change for your proposed intervention, incorporating your new knowledge on assessment and monitoring	3.10 Revising your draft innovative sustainable agriculture intervention (from 2.10)	Guiding questions Things to keep in mind	Group presentations		n/a

Module 4: Decision-making tools and enabling factors for land restoration 10 contact hours					
Core competencies					
Academic knowledge: Economic, sociocultural and environmental rationale of implementing innovative sustainable agricultural solutions for land restoration at the farm and societal levels; ▸ The module covers various evaluation methods such as cost-benefit analysis (CBA), social cost-benefit analysis (SCBA), multi-criteria analysis (MCA) and participatory impact assessment (PIA), focusing on understanding method differences, assessing benefits and shortcomings, and learning the procedure for carrying them out in the context of land restoration; ▸ Facets of enabling factors that support the implementation of innovative sustainable agricultural solutions for land restoration: governmental, financial, socio-cultural, technological (see module 3), including sustainable value chains as an enabling factor. Practical skills: Appraise the economic, sociocultural and environmental rationale for land restoration; ▸ Procedures for undertaking evaluation. Attitudes and values: ▸ Logical thinking when evaluating land restoration initiatives; ▸ Awareness of enabling factors that support land restoration.					
Modular learning objectives	**Submodule Topics**	**Synchronous (lecture elements)**	**Synchronous (interactive elements)**	**T**	**Asynchronous**
Understand the economic, sociocultural and environmental benefits of land restoration at the societal level Understand the trade-offs of land restoration at the societal level	4.1 Benefits and trade-offs of sustainable land management (SLM) and land restoration at the societal level	Introduction to module 4 and recap of SLM and land restoration Economic, sociocultural and environmental benefits of land restoration Job creation and food quantity vs. quality trade-offs	Student questions: If land restoration is so beneficial, what are the barriers to greater investments in land restoration?	1 hr	Optional readings: Ding *et al.* (2017) King *et al.* (2023) Raes *et al.* (2021) Post-session: Video on environmental benefits of land restoration

Modular learning objectives	Submodule Topics	Synchronous (lecture elements)	Synchronous (interactive elements)	T	Asynchronous
Understand the economic, sociocultural and environmental benefits of land restoration at the farm level Understand the trade-offs of land restoration at the farm level	4.2 Benefits and trade-offs of SLM and land restoration at the farm level	Higher and diversified returns of sustainable agriculture Trade-off: transition period Social benefits with a focus on increased social cohesion e.g. Burkina Faso Environmental benefits, e.g. Tajikistan	Video showing conditions during the transition period; students will be asked to discuss the conditions during the transition period	1 hr	Optional readings: Gomiero (2018)
Understand the value of decision-making tools for evaluating land restoration options through SLM Identify the advantages and disadvantages of different decision-making tools Select a suitable decision-making tool depending on the rationale and objective of the evaluation	4.3 Overview of decision-making tools for land restoration	Why evaluate SLM options for land restoration? What are the methods of evaluation? What are the benefits and shortcomings of the methods? How to choose the right tool?	Student questions: hort questions encouraging reflection on submodules 4.1 and 4.2 Which of the four methods are most appropriate for decisions on land restoration at the farm level? And which are most appropriate for decisions on land restoration to society (i.e. above-mentioned higher levels)?	1 hr	Optional readings: Purushothaman *et al.* (2013)
To understand the differences and advantages of an SCBA as compared to a CBA for decision-making To understand the various steps needed to develop an SCBA based on case study examples To critically assess the economic costs and benefits versus the social costs and benefits	4.4 Cost-benefit analysis versus social cost-benefit analysis – applications	Comparing SCBA and CBA Procedure for carrying out a SCBA using an example based on a study by Purushothaman (2005) (see course manual for full reference)	Short discussion amongst students on the decision made using an SCBA Long exercise – research on eucalyptus trees and their impacts. Revise decisions if needed.	1 hr	Optional readings: Purushothaman (2005) Post-session: Videos on discount rates and net present values

Modular learning objectives	Submodule Topics	Synchronous (lecture elements)	Synchronous (interactive elements)	T	Asynchronous
Understand the process of developing an MCA Develop critical thinking about how you might adapt this process to land restoration options.	4.5 MCA for evaluating land restoration options	Introduction to MCA and its characteristics Comparing MCA and CBA Procedure of carrying out an MCA using a hypothetical scenario		1 hr	Optional readings: Gamper *et al.* (2006) Geneletti (2019)
How to implement PIAs in various contexts to make decisions on SLM options for land restoration. Understand the difference between two useful frameworks: ecosystem services and land use functions (LUFs) and when to use each one	4.6 PIAs for decision-making on land restoration	Introduction to PIA Relationship between LUF and ecosystem services frameworks Procedure of carrying out a PIA using case study examples from Yogyakarta (Indonesia), Guyuan (China), Oum Zessar (Tunisia), Bijapur (India), and Narok (Kenya) Communicating results		1h	Optional readings: König *et al.* (2013) Peréz_Soba *et al.* (2008)
Understand the various facets of governance and enabling factors for promoting SLM for land restoration	4.7 Enabling factors and governance for land restoration	Introduction to submodules on enabling factors (4.7 - 4.10) Financial regulations and policies Financial and social incentives	Student questions that require discussion: In pairs, discuss which type of social incentives would prompt you to engage in land restoration Can you think of examples from your country?	1 hr	Optional readings: Sapkota *et al.* (2018) Wainaina *et al.* (2021) Post-session: Videos on (1) participatory research to support sustainable land management, (2) payment of ecosystem services with a hypothetical and (3) practical example

Modular learning objectives	Submodule Topics	Synchronous (lecture elements)	Synchronous (interactive elements)	T	Asynchronous
Understand the importance of policies and land rights in the success of land restoration initiatives Identify perverse incentives that hinder SLM success. Grasp the importance of markets for restoration goods and services as critical enablers of land restoration	4.8 Enabling policies for land restoration	Introduction to policies Policy as an enabling factor in land restoration Policies to encourage markets of environmental goods and services Understand sustainable value & supply chains as drivers for sustainable agriculture and land restoration	Discussion between pairs of students: What do we mean by an appropriate and supportive policy regime? Can you think of any policies that have supported market mechanisms for environmental goods and services either in your country or elsewhere?	1 hr	Optional readings: Haggar *et al.* (2014) Slobodian *et al.* (2020) Additional material: Ghana case study
Understand the various available options for financing SLM activities, projects and initiatives Get familiar with innovative options for financing SLM interventions. Apply the gained knowledge to draft a term paper on one financing modality in your country and how it impacts your country's land and environment	4.9 Enabling financing for land restoration	Introduction to restoration investment What is public funding? Examples included What is private funding? Examples included What is blended finance? Examples included		1 hr	Assignment: Optional term paper

Modular learning objectives	Submodule Topics	Synchronous (lecture elements)	Synchronous (interactive elements)	T	Asynchronous
Learn about social factors that enable land restoration. Develop critical thinking about the trade-offs in land restoration and how to overcome these	4.10 Social incentives for land restoration and Module 4 conclusions	Elaboration of social incentives from submodule 4.7 Student assignment: build on the Theory of Change from Modules 1,2, 3 Module conclusions	Student questions: Which of the enabling factors do you find the "easiest" to promote, and why? Which is the most "difficult" and why? Of the trade-offs discussed in this module, which are the easiest and most difficult to tackle and why? Optional assignment: barriers and enabling factors for "your innovative sustainable agriculture intervention"	1 hr	Optional readings: Sapkota *et al.* (2018) Additional material: India case study

Module 5: Catalysts for innovation and start-ups 10 contact hours					
Core competencies					
Academic knowledge: ▸ Understand and diagnose sustainable land management (SLM) as an innovation for agriculture and land restoration; ▸ Co-design contextualized, inclusive and scalable innovations for agriculture and land restoration; ▸ Develop an innovative start-up for agriculture and land restoration. Practical skills: ▸ Critical thinking; ▸ Collaboration skills; ▸ Ecopreneurial skills; ▸ Planning and project management. Attitudes and values: ▸ Willingness to think creatively and explore unconventional solutions; ▸ An awareness of the ethical implications of innovation and entrepreneurship; ▸ Appreciation for the value of collaboration and teamwork in co-designing and implementing innovative solutions.					
Modular learning objectives	**Submodule Topics**	**Synchronous (lecture elements)**	**Synchronous (interactive elements)**	**T**	**Asynchronous**
Understand the multiple scales in innovation for land restoration Understand the drivers and challenges of innovation in agricultural systems and how they impact SLM	5.1 Innovative aspects of sustainable agriculture for land restoration	Quick recap of agriculture, sustainability, SLM and land restoration Multiple scales of innovation for sustainable agriculture solutions for land restoration Drivers and challenges of innovation	Student questions relating to drivers and challenges of innovation in sustainable agricultural systems in student localities Video showing scales of innovation	1hr	Optional readings: Freeman *et al.* (2015) Reed *et al.* (2015) Sayer *et al.* (2013)

Modular learning objectives	Submodule Topics	Synchronous (lecture elements)	Synchronous (interactive elements)	T	Asynchronous
Evaluate how sustainable agriculture solutions and landscape approaches can be used as a tool for innovation for land restoration Diagnose land innovation in agricultural systems and identify opportunities for improvement Explore the principles and practices of SLM and how they can be implemented in agricultural systems Understand project cycles and how they can be used to plan, implement and evaluate innovative sustainable agriculture projects	5.2 Diagnosing innovation in sustainable agriculture solutions for land restoration	The innovation matrix Implementing SLM projects through project cycle management.	Debate on defining innovation Facilitated discussion on innovation vs. invention Landscape innovation matrix	1hr	Assignment: Create a life cycle for a project of your liking from the innovation matrix Optional assignment: Take the free open Coursera course on project life cycle management Optional readings: Liniger *et al.* (2011) Van Oosten *et al.* (2022)
Identify locally led innovations in agriculture and their potential use in land restoration Understand the important role of local knowledge in SLM development Identify how SLM interventions could help support gender balanced outcomes	5.3 Locally led innovation	Locally led innovation in SLM The importance of local knowledge for SLM Gender responsive SLM	Facilitated discussion using Likert scale. Interactive quiz and reflective exercise	1hr	Assignment: Student questions based on a video. Optional readings: Berkes (2001) Bullock and Kariuki (2019) Ogodo (2012) Uprety *et al.* (2012)
Define and internalize what innovation is and the types of innovation Evaluate the methods for scaling innovations for sustainable agriculture for land restoration Explore and assess the available window of opportunities, which will allow for the successful scaling of sustainable agriculture for land restoration innovation	5.4 Scaling innovation – what, where, and how?	▸ Unpacking innovation Scaling innovation (for what and for whom?) Scaling innovation in practice (policy advocacy and institutional change)	Debate and critical examination of definitions of SLM in terms of technological, social and institutional innovation Quiz and recap of the innovation matrix	1hr	Optional readings: Baregheh *et al.* (2009) Edison *et al.* (2013)

Modular learning objectives	Submodule Topics	Synchronous (lecture elements)	Synchronous (interactive elements)	T	Asynchronous
Apply multi-stakeholder tools to develop plans and strategies for your own localized sustainable agriculture innovation for land restoration Foster participation and collaboration with a diverse group of stakeholders	5.5 Multi-stakeholder collaborations	Multi-stakeholder collaborations Conducting stakeholder analysis	Stakeholder mapping (followed by discussion) – followed by script-writing (asynchronously) – to create an MSP situation in your landscape	1hr	Optional readings: Gaventa (2006) Brouwer *et al.* (2016)
Understand how to identify opportunities for innovative sustainable agriculture and land restoration Understand how to attract land restoration finance	5.6 Business and finance for innovative sustainable agriculture and land restoration	Restoration business and the triple bottom line Financing land restoration innovation Revise your Theory of Change to include innovation!	Group exercise: defining value proposition (social, financial and environmental) for an agricultural production system Optional exercise: students revise the Theory of Change for their draft sustainable agriculture innovation intervention to include pros and cons of innovations	1hr	Optional readings: Gommans *et al.* (2016) Giddings *et al.* (2002) Van Oosten *et al.* (2014)
Identify key skills, knowledge and attitudes essential for ecopreneurs Develop an understanding of the Restoration Business Model Canvas and its application in developing innovative sustainable agriculture business ideas	5.7 Developing your restoration business	Introduction to ecopreneurship Introduction to the Restoration Business Model Canvas	Student question: discuss in pairs what skills, knowledge and attitude an ecopreneur needs to have Breakout groups to define different aspects of the canvas (same case-study)	1hr	Optional readings: Larson (2000) Schuyler (1998)

Modular learning objectives	Submodule Topics	Synchronous (lecture elements)	Synchronous (interactive elements)	T	Asynchronous
Navigate various platforms, tools and financial opportunities to kickstart their innovation ideas Demonstrate the ability to pitch their restoration business ideas effectively.	5.8 Pitching your restoration business	Platforms, tools and match-making Pitching your project idea	Group work: build a project proposal or pitch for your business, social, tech, or institutional innovation Show videos of different pitches, and ask learners to reflect on them (if time allows)	1h	Assignment: Peer review pitches
Develop your innovative ideas through the Business Model Canvas for innovations and start-ups Combine ideas learned throughout Modules 1–5 in a coherent innovative idea, start-up, or landscape business framework	5.9 From theory to practice: developing a restoration business – role play		Role play - developing a restoration business		
Course highlights Final summative assignment	5.10 Course wrap- up" and final summative assignment	Course highlights Optional learning game "Landscape Game 2 Introducing the final assignment	Student question: what is your role as a future actor of change?		Summative assignment: Adapting and filling out the Business Model Canvas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Global Initiative on Reducing
Land Degradation and Enhancing
Conservation of Terrestrial Habitats

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