Teaching-Learning Assessment Plan

SARUA Curriculum Innovation Network SCIN

Agriculture, Food Security and Climate Change

Elective module 1 in Southern African Master's in Climate Change and Sustainable Development

This elective module examines the existing status of agriculture and food security in southern Africa. It then considers agricultural adaptation and mitigation opportunities that address climate change while ensuring food security. It includes conceptual and methodological skills, incorporating crop production, organic farming, conservation, climate smart agriculture and ecological principles, as well as supporting transdisciplinary skills to engage effectively and co-build resilience strategies with stakeholders.

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Important note: This TLA Plan does not provide details of the key resources. Details and guidelines are found in the Courseware Guidelines, designed as an essential complement to the TLA Plan.

Quick links

Introduction to the Teaching-Learning-Assessment Plan

The Teaching-Learning-Assessment (TLA) Plan is intended as a guide to the teaching, learning and assessment activities of the module. It aims to be more than merely the syllabus or content of the module. It includes the development of knowledge, skills and competencies, guidelines on teaching methodology, formative feedback and summative assessment – all of which contribute to the learning experience and therefore outcomes of the student. However, it is not a textbook. More detailed guidelines on the use of the resources is found in the module Courseware Spreadsheet.

In order to understand the TLA Plan better, the following points should be noted before reading it:

Assessment and feedback: Assessment is an integral component of the entire teaching and learning process rather than a final adjunct to it, and for this reason, assessment tasks are spread across the module. The curriculum upholds a supportive, proactive approach to the student's continuous development and achievement of the desired outcomes through frequent formative feedback from either the lecturer or the peer group. The student's grades are compiled from the summative tasks across the module.

All assessment and feedback should be based on clear, transparent criteria, provided (or developed by the class) in advance of the assignment. Assessment tasks can be completed by the individual student or a group of students. In the latter case, guidelines for awarding individual marks are provided in the Assessment Guidelines on the ePlatform.

There are two types of assessment: formative and summative.

i) Formative assessment/ feedback:

The student should receive formative feedback, from either the lecturer or peers, ideally for every assignment. This feedback outlines strengths and weaknesses and allows for reflection on areas for improvement, thus supporting the student's progress and development. Effective feedback is prompt, frequent, specific and personalised.

ii) Summative assessment:

The goal of summative assessment is to build up marks that ultimately contribute to the student's grade for the module. Summative assessment measures student achievement by comparing it against standard criteria (i.e. the desired module outcomes). Because summative assessment is for marks, it is 'high stakes' and has a motivational effect on student engagement. To avoid contention, summative tasks should be assessed by the lecturer and an independent

moderator and should be based on clear, explicit and transparent criteria. It is recommended that summative tasks account for about 20% of the student notional hours of a module and do not place too big a burden on the lecturer. Careful consideration must be given to ensuring proactively that plagiarism is avoided.

Additional activities: The TLA Plan provides activities for 200 student notional hours. It also provides additional activities for those universities that require additional hours in the module.

Courseware Guidelines: The TLA Plan gives only abridged references for the prescribed resources. The number in [ ] links to the associated module Courseware Guidelines, which is a spreadsheet with full references to key and additional resources (see the different tabs). The Courseware Guidelines contains further guidelines for using the resources.

Exam: Should an institution require students to write an exam at the end of the module, the time allocated for the exam would be over and above the 200 notional hours provided by the TLA Plan. It is recommended that the exam questions are broad and integrated across the module, so as to demonstrate achievement of the broader competency outcomes of the module. Examples of exam type questions are provided at the end of the TLA Plan.

Grades: Grades are calculated from summative tasks. These may be weighted according to the institution's requirements. An example of a module grade table is provided in the Overarching Resources on the ePlatform.

Group work: Group work is encouraged as this builds the essential outcome of teamwork, defined as the ability to work flexibly in teams, engage effectively with peers and successfully complete team tasks. There are several ways to award individual scores for group work (see Assessment Guidelines on the ePlatform). It is important that the lecturer plays a key facilitating role in supporting group work to achieve the desired outcomes. We suggest that group process/ participation skills are assessed by students rather than the lecturer and therefore that the assessment of group participation skills is used formatively but not for marks, to avoid contention.

Key concepts: The key concepts detailed under some of the Learning Themes refer to concepts that the student should be familiar with before the first class in the Learning Theme. This means that if the student is not familiar with the term, s/he should undertake a simple search to get a basic understanding of the term, in advance of the class.

Marking rubrics: An assessment rubric with clear criteria should be provided (or developed by the class as a group) in advance for all student assignments to ensure that assessment is transparent and fair. The student should know, in advance, what is expected of the assignment, how the task links to the outcomes of the module and what is valued in the module. The following standard rubrics

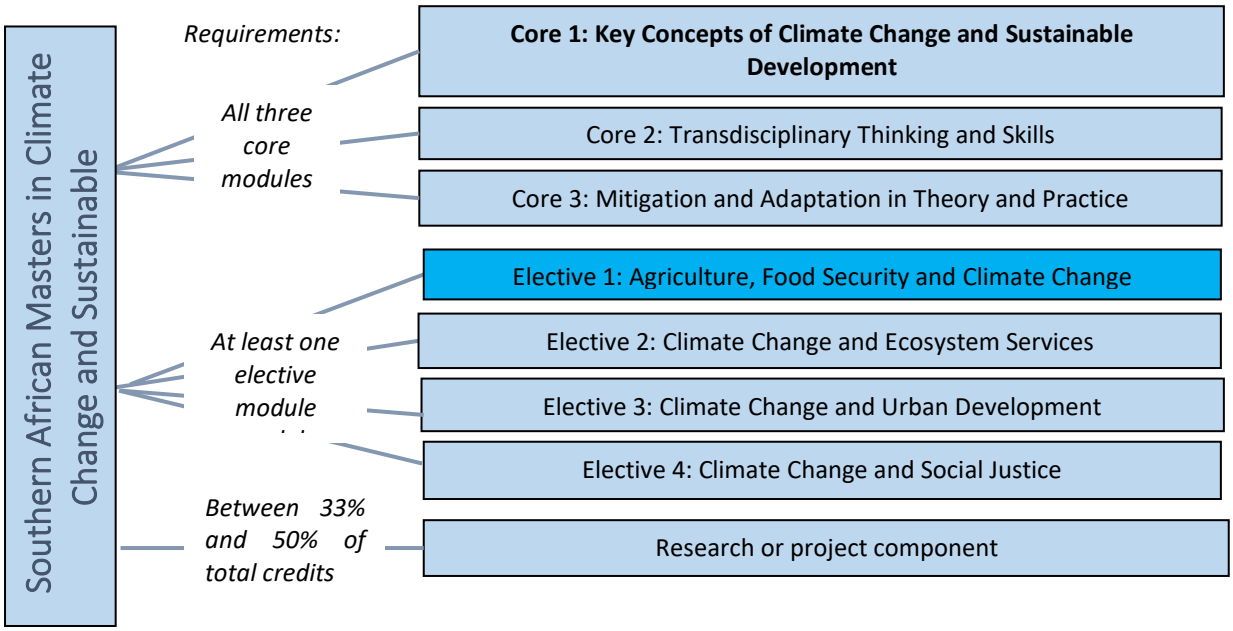
are found in the *Assessment Guidelines and Tools* on the ePlatform and can be adapted and weighted as necessary: Presentation, Report, Analytical Essay and Development of Writing Rubric. These are to be adapted to assess the desired outcomes of each task.

Outcomes: The TLA Plan provides topic-level and module-level outcomes that align with the curriculum-level outcomes. The curriculum outcome categories are derived from the South African Qualifications Authority (SAQA) National Qualifications Framework Master's level outcomes (Level 9) and the Critical Cross Field Outcomes, as these are consistent with regional requirements.

Student notional hours: The guidelines for hours in the TLA Plan refer to 'student notional hours'. A student notional hour is the estimated learning time taken by the average student to achieve an average pass rate for a specified task. Student notional hours are suggested for each activity to give an indication of the envisioned effort. The module provides for 200 student notional hours, with additional hours for institutions requiring a longer module.

Introduction to Module

Agriculture, Food Security and Climate Change is the first optional elective module in the Southern African Master's in Climate Change and Sustainable Development.



Module rationale

Robust farming systems are able to change and adjust to new conditions and successful farmers are able to develop and apply methods to enhance ecosystem functions aiming to produce food in a sustainable fashion. Considering the growing climate related uncertainties and threats (such as extreme weather events) to agriculture, climate resilient farming practices have gained attention. Emphasis is placed on integrating proven local knowledge and climate resilient farming techniques to overcome climate related challenges. Changes in climate considerably affect the dynamics and status of the agrosystem biotic components including crops, livestock, pests and parasites, natural enemies, and other associated plants and animals. Climate change adaptation has been recognized as an essential aspect of a systems' sustainability that enhances farm productivity and food security. Climate resilient crop and animal agriculture enables the integration of adaptation and mitigation approaches via better land, water, fertiliser and energy management, restoration of cultivated soils, etc., for increased sustainability of the agrosystem. The sustainability of postharvest processing and that of other components of food security, namely food availability, food accessibility, food supply and food utilization is also affected by climate change, and appropriate and context-specific adaptation measures must be developed and implemented. A transdisciplinary approach that includes the ability to conduct research *with* – rather than for – farmers, extension staff and

other stakeholders is essential for collaborative development of climate resilience in agriculture.

Module Learning Outcomes

The student will be able to identify and evaluate various climate change adaptation and mitigation strategies for a given farm or other stage in the agrifood system. The student will understand the different classification basis of farming systems in southern Africa, and their vulnerabilities to key drivers of change, including climate variability, climate change and extreme events. The student will be able to identify and evaluate the vulnerabilities of a given type of farming system using established indices and methodologies, and estimate GHG emissions of the system. The student will be able to identify and evaluate the impacts of climate change on agricultural production and food supply, postharvest processing, food availability, food accessibility and food utilisation. The student will be able to demonstrate knowledge of approaches to estimate GHG emissions, to evaluate the climate resilience of a given agro-ecosystem, and to develop recommendations for adaptation and mitigation strategies suitable to the system.

Knowledge Outcomes

Specialist Knowledge - Student is able to demonstrate specialist knowledge to engage with and critique advanced thinking and research in the field of climate change and sustainable development as related to agriculture and food security in southern Africa.

Knowledge of applications — Student is able to understand, evaluate and select appropriate methods, tools, processes or technologies to understand and evaluate climate resilience of a given farm/ farming system, estimate GHG emissions, and compare adaptation strategies

Knowledge literacies — Student is able to

- evaluate current processes of knowledge production, including derivation, contestation, dissemination
- access, process and manage information regarding agriculture, food security and climate change

Research literacies - Student is able to:

- Choose the appropriate tools and methods for studying various aspects of climate change (impacts, vulnerabilities, GHG emissions, adaption, mitigation, climate resilience, etc.) As it relates to agriculture and food security.
- Conduct a comprehensive review of leading and current research in the area of climate change and agriculture/ food security.
- Demonstrate research-based insights from the design and implementation of adaptation and mitigation packages for climate

resilience of a given farm/ farming system.

- Use appropriate, ethical research principles in any research involving living organisms, such as plants, animals and humans.

Skill Outcomes

Method and procedure — Student is able to apply appropriate and creative methods, techniques, processes or technologies for the study of climate change impacts on agriculture and food security, their vulnerabilities to climate change, and potential adaptation and mitigation strategies.

Producing and communicating information — Student is able to conduct field research on climate change adaptation and mitigation measures, disseminate the results to farmers, extension staff, policy makers and other stakeholders using appropriate communication channels that ensure understanding and uptake of the research results by the end users.

Independent learning — Student is able to demonstrate effective self-driven learning for academic or professional development.

Teamwork - student demonstrates an ability to work in teams, communicate effectively with fellow students and successfully complete projects that require group processes and outcomes.

Stakeholder engagement — Student is able to communicate effectively with farmers, extension staff, policy makers, NGOs, and other stakeholders

Competency Outcomes

Problem solving — Student is able to use a wide range of specialised skills in identifying, conceptualising, designing and implementing methods of enquiry to address complex and challenging problems in agriculture and food security raised by a changing climate.

Context and systems-thinking — Student is able to recommend climate change adaptation and mitigation measures for a given farm/ farming system, based on a good understanding of the biophysical and socioeconomic context of the system.

Transdisciplinary thinking – Student is able to demonstrate:

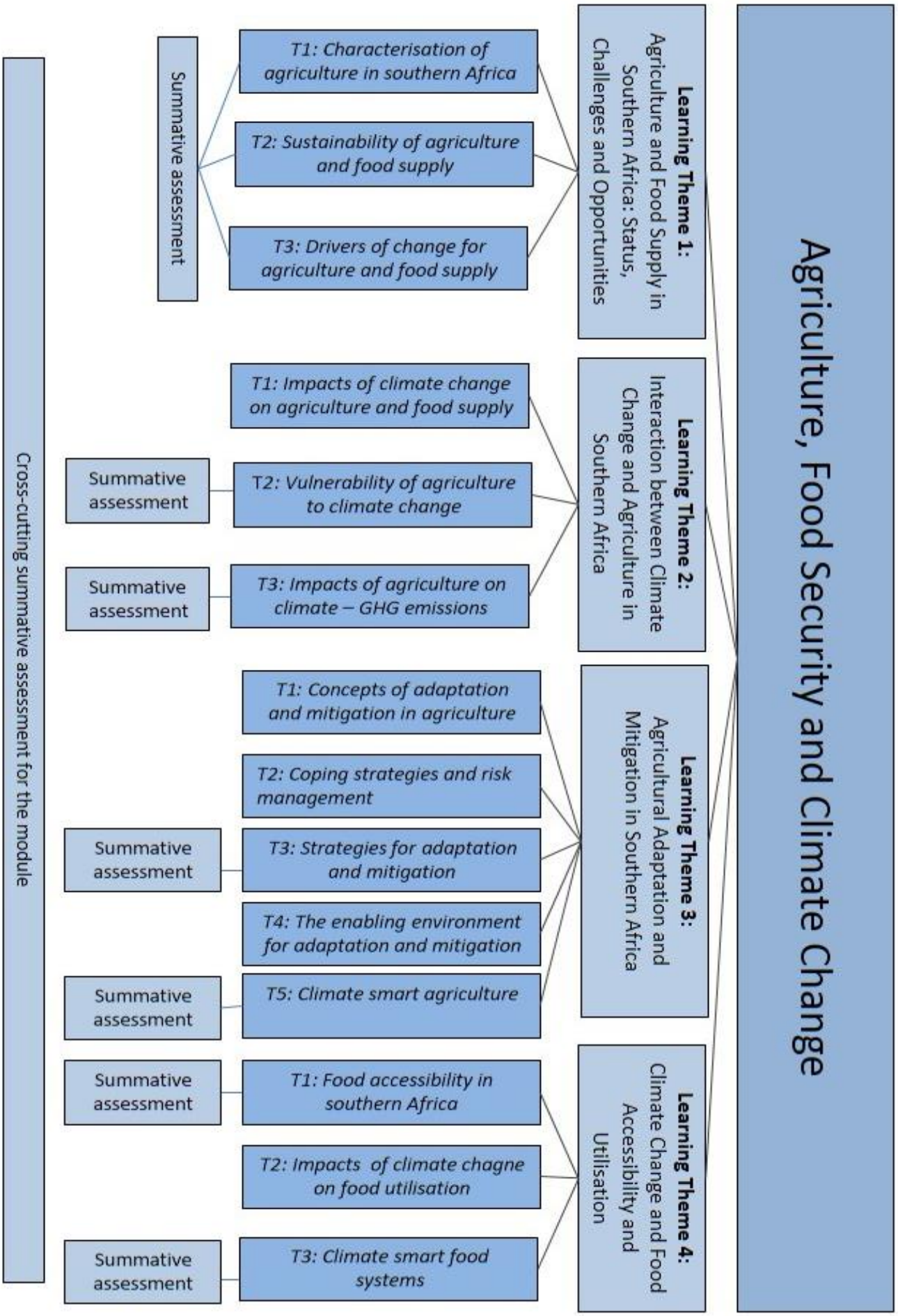
- a recognition and integration of different knowledge systems and disciplines, such as the various components of climate change, production factors in crop and livestock agriculture, socioeconomic factors, etc.
- the ability to conduct research *with* – rather than *for* – farmers, extension staff and other stakeholders in the identification of the problem, formulation of the research design, data collection and analysis and development of recommendations for climate change resilience in a given farming system.

Prior learning assumed to be in place

It is assumed that students have completed the three core modules of the curriculum and understand the general impacts of global climate change and the concepts and principles of Sustainable Development and Climate Compatible Development (Core 1), GHG emissions and their accounting, carbon footprints, carbon budgeting and concepts of Adaptation and Mitigation (Core 3) as well as the principles underpinning a transdisciplinary approach (Core 2). They should also have a foundation in research literacy and some clarity on their own research topic (Core 2). Furthermore, the students will have developed foundational skills in academic writing (e.g. reports and essays); teamwork, including the ability to self-evaluate participation in groups; developing criteria for tasks, and assessing peer assignments.

Overview of Module

The module teaches the status and sustainability and drivers of change for agricultural production and food security in southern Africa. The module also explains the resilience of southern African agriculture to a changing climate, and discusses the various adaptation and mitigation challenges and opportunities available to ensure food supply. The other two aspects of food security, namely food accessibility and food utilisation are also considered in terms of their socio-ecological drivers, their vulnerabilities, and direct and indirect linkages to climate change, and possible adaptation and mitigation options.


Agriculture, Food Security and Climate Change
Learning Theme 1: Agriculture and Food Supply in Southern Africa: Status, Challenges and Opportunities
T1: Characterisation of agriculture in southern Africa
T2: Sustainability of agriculture and food supply
T3: Drivers of change for agriculture and food supply
Summative assessment
Learning Theme 2: Interaction between Climate Change and Agriculture in Southern Africa
T1: Impacts of climate change on agriculture and food supply
T2: Vulnerability of agriculture to climate change
T3: Impacts of agriculture on climate – GHG emissions
Summative assessment
Summative assessment
Learning Theme 3: Agricultural Adaptation and Mitigation in Southern Africa
T1: Concepts of adaptation and mitigation in agriculture
T2: Coping strategies and risk management
T3: Strategies for adaptation and mitigation
T4: The enabling environment for adaptation and mitigation
T5: Climate smart agriculture
Summative assessment
Summative assessment
Learning Theme 4: Climate Change and Food Accessibility and Utilisation
T1: Food accessibility in southern Africa
T2: Impacts of climate chagne on food utilisation
T3: Climate smart food systems
Summative assessment
Cross-cutting summative assessment for the module

Learning Theme 1: Agriculture and Food Supply in Southern Africa

Rationale for Learning Theme

This theme is essential for a good understanding of the agricultural landscape in southern Africa, particularly the different farming systems, and their susceptibilities to a changing climate. It is also essential for an adequate appreciation of the challenges of dealing with the diversity of farming systems in southern Africa and their sustainable development in the context of global, regional and local changes, including climate variability, and climate change. Following from comprehension of these topics, the challenges facing, and the opportunities offered to agricultural productions and food supply in southern Africa can be understood and critically evaluated, with the ultimate aim of minimizing the constraints and capitalising on the opportunities available.

Key concepts student should understand prior to activities in Learning Theme 1:

Agro-systems, farming systems, farmer typologies, food security; sustainable agriculture, food supply, food value chain

LT1. Topic 1: Characterisation of southern African agriculture

Outcomes

Specialist knowledge: Student is able to demonstrate: knowledge of different agro-systems and farmer categorisations

Stakeholder engagement: Student is able to engage effectively with farmer about farm practices

LT1	*Teaching-Learning-Assessment Activity*	*Hrs*	*Key resources*
T1.1	**Class activity: Introductory framing lectures** Lectures on agriculture and food security in southern Africa: Status, Challenges and Opportunities. This will introduce and overview topics from across the learning theme.	4	[2] Thornton & Herrero (2015) [7] Goulart et al. (2012)

T1.2	**Students: Read Key readings** Students to read the Key readings, taking note of: • Broad definition of 3 components of food security (food supply, food access, food utilisation) • Characteristics and specificities of agriculture, in southern Africa. • Different classifications of farming systems in southern	6	[6] Garrity et al. (2012)
	Africa (agro-climatic basis; agro-ecological basis – soil, crop, water; socioeconomic basis - subsistence, contract farming, large scale commercial farming, etc.), and farmer typologies.		
T1.3	**Students: Mini-essay/ summary** Based on the readings, student writes a 1000-word summary essay on southern African farming system characterization, which includes farmer typologies. **Criteria to be developed by class** • Critical discussion of the farming systems in southern Africa • Synthesis of information from various sources Peer feedback	4	
T1.4	**Class activity: Farm visit with individual report** Students undertake a farm visit to study and analyse the type of farming system. As part of the farm visit, students ask the farmer or farm manager questions about the practices on the farm.	6	
T1.5	**Students: Report on farming system from T1.4** The 2000-word report should contain analysis of the farming system and farmer typology observed. Criteria: Valid analysis, report rubric	6	

LT1. Topic 2: Sustainability of agriculture and food supply

Outcomes

Specialist knowledge: Student demonstrates knowledge of the linkages between agriculture, food availability and food supply in southern Africa;

Teamwork: Student is able to work democratically with peers, listening to other's perspectives and opinions, critically reflecting, and building on these with their own positionality and thinking.

LT1	*Teaching-Learning-Assessment Activity*	*Hrs*	*Key resources*
T2.1	**Students: Read Key readings** Students to read the Key readings, taking note of: • Linkages among the different factors affecting agriculture, food availability and food supply in southern Africa; • Whether present southern African agriculture and food supply is sustainable?	6	*Readings:* [8] Lal (2013) [10] National Research Council (2010)
	Class activity: Lecture and discussion: Sustainability of agriculture and food supply and introduction to food value chain	2	[5] El-Beltagy & Madkour (2012)
T2.2	**Class activity: debate & SWOT analysis** As a group, the class discusses and debates the sustainability of agriculture and food supply in southern Africa. The lecturer facilitates the discussion, leading the debate towards a SWOT analysis of agriculture and food supply in southern Africa. Formative feedback on: • Student's ability to listen to other's perspectives and opinions, critically reflecting, and building on these with own positionality and thinking. • Relevance of ideas put forward – understanding of the linkages	2	

LT1. Topic 3: Drivers of change for agriculture and food supply

Outcomes

Specialist knowledge: Student is able to demonstrate knowledge of the internal and external drivers affecting agriculture and food supply in southern Africa

Teamwork: Student is able to work democratically with peers, listening to other's perspectives and opinions, critically reflecting, and building on these with their own positionality and thinking.

LT1	*Teaching-Learning-Assessment Activity*	*Hrs*	*Key resources*
T3.1	**Class activity: Framing Lecture and discussion** Lecture on the internal and external drivers of change for agriculture and food supply in southern Africa: Challenges and Opportunities Lecture followed by discussion with the class	3	[2] Altieri & Nicholls (2013) [39] Altieri et al. (2015) [9] Mwalusepo et al. (2014) [4] Bohlen & House (2009) [13] Thornton et al. (2010) Students to identify local case studies
T3.2	**Students: Reading** Students to read the Key readings and identify local case studies.	6	
T3.3	**Students: Peer group discussions** In peer groups, students discuss the following topics: • Internal and external factors affecting agriculture and food supply systems in selected countries in southern Africa • Challenges facing agriculture and food supply in southern Africa. The discussion should include, for example, changing demographics; climate variability and climate change; natural disasters; declining availability and quality of natural resources such as land, water, soil, energy, biodiversity; pest and disease burden, globalisation; land grabs; insufficient technologies; unfavourable international and regional trade policies; labour issues, poverty and gender issues, etc. Opportunities available in the field of	2	

	agriculture and food supply in southern Africa. The discussion should include, for example, new farming areas; improved access to technologies; new products; new international and regional trading markets; climate financing e.g. REDD+; spread of urban and periurban agrosystems; etc. Here the student learns that these are the possible opportunities that exist for Africa. The actual technologies/mechanisms to realise these opportunities form part of LT3		
T3.3	**Class activity: debate** Two groups debate the challenges and opportunities facing southern Africa in the context of a climate variability and climate change (drawing from the readings and discussions). The lecturer facilitates the discussion. Formative feedback on • Relevance of ideas put forward	2	

Outcomes

LT1. Summative assessment activity

***Specialist knowledge**:* Student is able to demonstrate understanding of the principles, components and practices of sustainability and agroecology in crop and livestock production, and is able to integrate and apply these with critical analysis

Summative assessment activity for LT1	*Hrs*	*Key resources*
Students: Report: Design an ideal, sustainable farming system Report on the design of a hypothetical, ideal, sustainable farming system that would be minimally impacted by climate change. The report illustrates the characteristics of a climate resilient, sustainable farming system. Report rubric **Summative assessment by lecturer**	6	

Learning Theme 2: Interactions between Climate Change and Agriculture

Rationale for Leaning Theme

This learning theme is essential in order to provide knowledge and understanding of the interactions between climate and agriculture, namely the impacts of a changing climate on agricultural production, and the impacts of agricultural activities on climate processes and climate change. It also teaches students about the tools and methods that can be used to estimate greenhouse gas (GHG) emissions from various agricultural activities and processes. This learning theme is essential for enabling an understanding of adaptation and mitigation options, which is the next theme in this module.

Key concepts student should understand prior to activities in Learning Theme 2:

climate risks, vulnerability, adaptive capacity, resilience

LT2. Topic 1: Climate risks and impacts on agriculture and food supply

Knowledge literacy: Student is able to collate and summarise information from different resources on the impacts of climate change on agriculture and food supply

LT2	*Teaching-Learning-Assessment Activity*	*Hrs*	*Key resources*
T1.1	**Class activity: Framing Lecture** Introductory lecture on climate risks and impacts on agriculture and food supply in Southern Africa. This lecture broadly outlines the rest of the topics under this theme.	2	[19] Slotterback (2011) [21] Knox et al. (2012).
T1.2	**Students: Preparatory readings and Summary** Students to read the Key readings (and identify their own suitable readings) to summarise the impacts of climate change on agriculture and food supply, including the entire food value chain, focusing on the following areas: • Temperature • Rainfall • Soil moisture • Humidity • CO_2 • Extreme Events • Pests and diseases Peer Assessment: Students compare the information obtained under each point with their own.	6	[11] Sietz, D.; Choque, S.E.M.; Ludeke, M. (2012) Video [55] Video on the effects of climate change on food security: Students to identify further suitable readings.

LT2. Topic 2: Vulnerability and adaptive capacity of farms

Outcomes

Specialised knowledge: Student is able to engage with advanced research relating to vulnerability and adaptive capacity of agriculture to climate change

Methods and procedure: Student is able to evaluate, select and apply an appropriate process for assessing vulnerability to climate change impacts on farms

Producing and communicating information: Student produces a report and presentation

Transdisciplinary thinking: Student is able to demonstrate an integration of socioeconomic and bio-physical systems to identify areas of vulnerability

LT2	*Teaching-Learning-Assessment Activity*	*Hrs*	*Key resources*
T2.1	**Students: Preparatory Key readings** Students to read the Key readings, making notes on the following: • Types of vulnerability • Indices of vulnerability • Adaptive capacity	6	[20] Wiréhn et al. (2015) [15] Diouf & Gaye (2014)
T2.2	**Students: Research: desk study on vulnerability and adaptive capacity** Students undertake a desk study to identify the vulnerability and adaptive capacity of the selected crop/ farm to the impacts of climate change.	4	[14] Bizikova et al. (2009) [17] Fussel (2010) [22] Garcia et al. (2012)
T2.3	**Class activity: Group presentations**: Each group will present findings to class (5 minutes per student) presentation Formative feedback by peer groups, using report rubric	4	
T2.4	**Students: Group report on vulnerability and adaptive capacity** Student groups must produce a written report on the vulnerability of the chosen crop/ farm to climate change, based on specific socio-economic and characteristics and associated interactions Summative assessment using presentation rubric	2	

LT2. Topic 3: Impacts of agriculture on climate – GHG emissions

Knowledge of applications: Demonstrate knowledge of appropriate tools and methods for estimating GHG emissions from agricultural activities
Producing and communicating information: Student is able to summarise different sources of GHG emissions graphically through the development of a flowchart; student develops report writing skills
Problem solving: Student is able to use specialised knowledge to identify and recommend methods to limit GHG emissions in a farming system

LT2	*Teaching-Learning-Assessment Activity*	*Hrs*	*Key resources*
T3.1	**Students: Pre-readings** Students to read the key readings, noting the different types and levels of GHG emissions	6	*Readings:* [23] FAO (2014a) [16] FAO (2014b) [18] Pandey & Agrawal (2014)
T3.2	**Class activity: discussion** In groups, students discuss the different types and levels of GHGs, and how these are estimated.		
T3.3	**Students: Flowcharts** Students in pairs develop a flowchart showing relevant steps for estimating GHG emissions from a selected crop/ farm. Criteria: clarity, relevance, scientific basis	5	
T3.4	**Students: Readings: Local case study analysis** Students in groups to undertake a case study analysis to identify practices that increase food production while minimising carbon footprint of the production system.	3	Class to identify local case studies
T3.5	**Students: Summative assessment: Mitigation report** Student to produce a report on a programme for the maintenance of a productive farming system that increase food production while minimising carbon footprint of the production system, and to recommend farming system(s) that reduces GHG emissions. Criteria: Level of integration; likelihood of adoption by farmers **Summative assessment based on report rubric**	4	

Learning Theme 3: Agricultural Adaptation and Mitigation

Rationale for Learning Theme

This learning theme is critical as it forms the crux of the module, where the students learn about "what to do" to meet the challenges of climate change, namely the various strategies and technologies available to adapt to, and mitigate, climate change, including the policy and institutional instruments and mechanisms needed. The theme also explains the barriers to adaptation and mitigation in food and agricultural production systems.

Key concepts student should understand prior to activities in Learning Theme 3:
Climate smart Agriculture

LT3. Topic 1: Concepts of adaptation and mitigation in agriculture

Outcomes

Specialist knowledge literacy: understanding of principles and concepts of mitigation and adaptation in agriculture

LT3	*Teaching-Learning-Assessment Activity*	*Hrs*	*Key resources*
T1.1	**Students: Key readings** Students to read the Key reading and identify their own from the additional readings, taking notes on the concepts and principles of climate change adaptation and mitigation in agriculture	3	[30] Waha et al. (2013) [29] Folberth et al. (2014)
T1.2	**Class activity: Framing Lecture and discussion** Lecture on Climate Change Adaptation and Mitigation in Agriculture and Food Supply Systems in southern Africa. This lecture will introduce all the topics under this learning theme	3	

LT3. Topic 2: Coping strategies and risk management

Outcomes

Specialised knowledge: Student is able to demonstrate specialised knowledge on the coping strategies of small-scale farmers in southern Africa

Research literacies: Student is able to design an appropriate survey on coping strategies and risk management in selected communities.

LT3	*Teaching-Learning-Assessment Activity*	*Hrs*	*Key resources*
T2.1	**Students: Pre readings and seminar** Students to read the Key reading and selected additional readings and to identify empirical studies on coping strategies and risk management in communities and evaluate the methods used.	3	[31] Di Falco et al. (2011)
T2.2	**Class activity: discussion** Lecturer to facilitate discussion around these points: • Living with uncertainty and managing risks. • Coping strategies.	2	
T2.3	**Survey design and presentation** Step 1: In groups, students to design a survey on coping strategies and risk management in selected communities. Groups must prepare a presentation on their survey methodology, their field approach and how they would scientifically analyse the data. Step 2: Presentation to class Criteria: Peers to assess the presentation and provide feedback.	6	

LT3. Topic 3: Strategies for adaptation and mitigation

Knowledge literacy: Demonstrate ability to identify suitable adaptation and mitigation strategies for farming
Knowledge of applications: Student demonstrates specialised knowledge on the variety of biotic and abiotic technologies for climate change adaptation and mitigation in agriculture
Stakeholder engagement: Student is able to produce a report that uses appropriate language and takes into account the values and experiences of farmers
Problem solving: The Student is able to draw from multiple sources of information (literature, a farm visit) to design a suitable package of adaptation and mitigation strategies for crops/livestock products.
Producing and Communicating Information: Student is able to communicate, in writing, the synergies and conflicts between adaptation and mitigation in agriculture in southern Africa.

LT3	***Teaching-Learning-Assessment Activity***	***Hrs***	***Key resources***
T3.1	**Students: Key readings on practices and technologies for climate change adaptation** Students to read the Key readings noting the varieties of technologies for climate change adaptation in agriculture: Drought resistant crop varieties, pest/disease resistant crop varieties, heat tolerant animal breeds, mulching, change in crops, change in geographical regions, change in planting and harvesting dates, mulching, pest/disease/weed control, rainwater harvesting, agri-forestry.	3	*Readings:* [25] Dobermann & Nelson (2013) [32] Claessens et al. (2012)
T3.2	**Students: Key readings on technologies for climate change mitigation** Students to read the Key readings, noting mitigation strategies: Fertiliser management, crop and grazing land management, irrigation management, energy management, restoration of cultivated land.	3	*Readings:* [33] Lybbert & Sumner (2010) [50] FAO (2009)

T3.3	**Class activity: Farm visit** Students to visit to a farm to evaluate the potential opportunities for integrating new adaptation and mitigation strategies in a given agrosystem. Students will not produce a report for this activity but should take extensive notes	7	
T3.4	**Class activity: Presentations:** Each student is given a particular technology/ practice to briefly explain (5 minutes) to the class Formative feedback by students	2	
T3.5	**Students: Summative assessment: Report on strategies for adaptation and mitigation** **Strategy design** Student to design a suitable package of adaptation and mitigation strategies (conventional, traditional and indigenous) for a given farm. The strategies should be relevant to the scale of production. Criteria: the report should be technically correct and contextualised; likelihood of adoption by farmers; and appropriate language used. **Summative assessment by lecturer**	4	

LT3. Topic 4: The enabling environment for adaptation and mitigation

Specialist knowledge: student demonstrates specialised knowledge on the different structures and processes needed for ensuring climate resilience in a given agro-ecosystem in southern Africa
Stakeholder engagement: Student is able to produce a discussion paper that uses appropriate language and information for the target audience (extension services and farmers support organisations) taking into account their interests and mandates.

LT3	*Teaching-Learning-Assessment Activity*	*Hrs*	*Key resources*
T4.1	**Students: Key readings** Students read the Key reading material and identify their own suitable sources, taking notes on the enabling environment for adaptation and mitigation in agriculture, including: Infrastructure, markets, institutions, legislation, policies, human resources	3	*Readings:* [28] Wibblemann (2013) [27] Tyle et al. (2013)
T4.2	**Class activity: Framing Lecture:** The enabling environment for adaptation and mitigation	2	
T4.3	**Group discussion paper and presentation** Part 1: Students in groups to write a discussion paper for extension services and farmers support organisations on the key constraints and opportunities for climate adaptation and mitigation in agriculture in a given context. They summarise findings in a presentation (3 hours) Part 2: Each group has 10 minutes to present their findings and answer questions from the class (2 hours) Criteria: Presentation rubric	5	

LT3. Topic 5: Climate smart agriculture

Specialist knowledge: Student is able to demonstrate specialist knowledge and engage with, discuss and critique advanced research and thinking related to climate smart agriculture and its components.
Research literacy: Student is able to choose an appropriate process of enquiry to identify a suitable case study of climate smart agriculture in a selected region
Producing and communicating information: Student is able to write concisely, building up and supporting an argument.
Stakeholder engagement: Student is able to apply and integrate knowledge gained across the learning theme to develop policy recommendations for sustainable and climate smart food production, using appropriate language for policy makers and taking into account their priorities

LT3	*Teaching-Learning-Assessment Activity*	*Hrs*	*Key resources*
T5.1	**Students: Key reading and Seminars** Students to read the Key readings and attend a 2-hour seminar facilitated by the lecturer, with discussion structured around these topics: • Principle and concept of Climate Smart Agriculture (CSA) Linking adaptation and mitigation within climate policy mechanisms. Changing the decision environment. Policy and institutional options and mechanisms. Trade-offs. National awareness and capacity in food production. • Components of Climate Smart Agriculture (CSA) • Gender-responsiveness of Climate Smart Agriculture (CSA) **Criteria:** As this is a group activity, students' should be evaluated on their contribution to class discussions. The lecturer can clarify points and provide feedback on involvement of student and relevance of ideas put forward**.**	6	*Readings:* [34] FAO (2013) CSA Sourcebook [35] Nelson & Huyer (2016) [26] FAO (2012) *Website:* **https://csa.guide/**

T5.2	**Case study analysis and presentation** Part1: Students to identify and analyse a case study of Climate Smart Agriculture in a selected region (2 hours). Part 2: Student to present a 10-minute overview of the lessons learned from the case study to the class (2 hours) Criteria: Presentation rubric	4	
T5.3	**Students: Summative assessment: Policy brief** Student to prepare a 4-page brief for policy makers motivating for the development of Climate Smart Agriculture for a given region, based on an evaluation of the impact, vulnerability and appropriate adaptation and mitigation options. Criteria: Relevance, evidence base, strength of the argument, scientific rigour, conciseness, and use of appropriate language. Summative assessment	4	Student to identify resources

Learning Theme 4: Climate Change and Food Accessibility and Utilisation

Rationale for Learning Theme

This learning theme covers food accessibility and food utilisation, the other aspects of food security, (after food supply). The socioeconomic, infrastructural, legislative and policy drivers affecting food accessibility and food utilisation at regional, national, subnational and household levels are different from those affecting food production and food supply systems. This requires a different package of strategies and technologies to adapt to climate change.

LT4. Topic 1: Food accessibility in southern Africa

Producing and communicating information: Demonstrate ability to integrate gained knowledge to make a flowchart of the supply chain of a given staple food in a given region.

LT4	*Teaching-Learning-Assessment Activity*	*Hrs*	*Key resources*
T1.1	**Students: Pre-readings:** Students read the Key readings to see how food accessibility forms part of food security	2	[41] Committee on World Food Security (2012)
	Class activity: Introductory Lecture and Debate Food Accessibility in southern Africa: food price volatility; distribution networks; infrastructure; access to credit; biofuel crops; food supply chains. The class collectively chooses a staple food in the region to focus on, and students research the value chain of this commodity. Facilitated by the lecturer, the group discusses the entire supply chain of a selected staple food in a given region.	3	[44] World Investment Report (2013) [45] Engel (2011)
T1.2	**Students: Reading and Discussion / Preparation for flowchart assignment** Students read additional readings to develop an understanding of the concept of a supply value chain from global, regional, national, sub-national to household levels.	4	
T1.3	**Students: Essay and flowchart** Student to write a paper describing the factors affecting the accessibility of a selected staple food in a given region. The paper should include a flowchart. Criteria: The paper and the flowchart are technically correct and represent the supply chain accurately Summative assessment	3	

LT4. Topic 2: Impacts of climate change on food utilisation

Research literacy: Student is able to choose appropriate sources of literature and conduct a review of climate change impacts on a selected staple food

Transdisciplinary thinking: Demonstrate ability to integrate gained knowledge (academic, local and indigenous) to debate the impacts on the utilisation of a selected food

LT4	*Teaching-Learning-Assessment Activity*	*Hrs*	*Key resources*
T2.1	**Students: Pre-reading** Students read the Key readings on the impacts of climate change on food utilisation and the Disease, Poverty and Hunger nexus.	4	[42] Wheeler & von Braun (2013) [46] Aberman & Tirado (2014)
T2.2	**Class activity: Framing Lecture** Lecture on Impacts of climate change on food utilisation; climate vulnerabilities in southern Africa; the disease, poverty and hunger nexus; livelihood vulnerability	2	
T2.3	**Students: Find and review literature** Students find and review additional relevant readings to develop an understanding of these concepts	2	
T2.4	**Class activity: debate** Class to debate the impacts of climate change on the food utilisation of a selected food Criteria: Lecturer to assess based on: • Evidence of preparation/reading • Involvement of student • Relevance of ideas put forward	2	

LT4. Topic 3: Climate smart food systems

Specialised knowledge: Student is able to demonstrate knowledge of different strategies for supporting climate smart food systems in southern Africa

Problem solving: Apply and integrate gained knowledge to design methodologies for technology diffusion for climate smart food systems.

LT4	*Teaching-Learning-Assessment Activity*	*Hrs*	*Key resources*
T3.1	**Students: Pre-readings** Students to read the Key readings and identify empirical studies.	3	[47] Tyle et al. (2013) [33] Lybbert & Sumner (2010)
T3.2	**Class activity: Lecture and discussion** Framing Lecture on Climate Smart Food Systems Lecturer to facilitate the discussion relating to: Maintaining food security in a changing climate; Diffusion and uptake of technologies; Environmentally and socially effective policies, measures and instruments; National awareness and capacity for food security; Integration of adaptation and mitigation frameworks into sustainable development planning, institutions, legislation, policies. The discussions should include key constraints, trade-offs and opportunities.	3	
T3.3	**Summative assessment: Group presentation on strategy for technology diffusion** Part 1: In groups, students design a suitable strategy for the diffusion and uptake of technologies for Climate Smart Food Systems (3 hours). Part 2: Each group presents their work to the class (10 minutes) for peer assessment (2 hours) Criteria: Relevance of ideas put forward and likelihood of uptake	5	

Cross-cutting summative assessment task for the module

Teaching-Learning-Assessment Activity	*Hrs*	*Key resources*
Students: Summative assessment: Analytical essay Student to write a discussion paper (3000 words) on the synergies and conflicts between adaptation and mitigation in agriculture in southern Africa. Criteria: The discussion paper should discuss different and relevant adaptation and mitigation strategies, and their respective trade-offs and benefits. **Summative assessment by lecturer,** using essay rubric	10	Key and additional resources from the module

Possible exam questions

If the institution requires it, the module can end with a summative final exam task, which should provide an opportunity for the student to demonstrate achievement of some of the module-level outcomes. Examples of integrated questions are provided below.

- Food security is a complex sustainable development issue, linked to socio-economic development, environment and trade. Argue for or against one of the following positions:
  - There is enough food in southern Africa to feed everyone adequately; the problem is distribution.
  - National food security is paramount because of global trade.
  - Globalization may lead to the persistence of food insecurity and poverty in rural communities in southern Africa.

- Discuss the usefulness of planned agricultural adaptation or mitigation interventions at national/ regional level.

Summary of summative assessment in the module

The student's grades are compiled from summative individual and/ or group tasks across the module.

Summative assessment measures the student's achievement by comparing it against standard criteria (i.e. the desired module outcomes). Because summative assessment is for marks, it is 'high stakes' and has a motivational effect on student engagement. To avoid contention, it is recommended the lecturer and an independent assessor provide summative assessment, based on clear, explicit and transparent criteria. Standard rubrics are found in the *Assessment Guidelines and Tools* on the ePlatform and can be adapted and weighted as necessary. Careful proactive consideration must be given to ensuring that plagiarism is avoided.

It is recommended that summative tasks account for about 20% of the student notional hours of a module and do not place too big a burden on the lecturer.

LT	Topic	Task	Subject	Hrs	Group/ individual	Weight
LT1		Report	Sustainable farm system	6	Individual	
LT2	T2.4	Report	Vulnerability to climate change	4	Group	
	T3.5	Report	Mitigation opportunities	4	Individual	
LT3	T3.5	Report	Adaptation & mitigation strategies at farm level	4	Individual	
	T5.3	Policy brief	Climate Smart Agriculture	4	Individual	
LT4	T1.3	Essay with flowchart	Food accessibility & supply chain	3	Individual	
	T3.3	Presentation	Technology diffusion for climate smart food systems	5	Group	
Cross-cutting		Analytical essay (3000 words)	Synergies and conflicts between adaptation and mitigation in agriculture	10	Individual	
40 hours of summative tasks						

Additional activities for institutions requiring more hours

LT	*Teaching-Learning-Assessment Activity*	*Hrs*
LT1	**Students: Group work: Crop map and presentation** **Step 1. Devise a crop suitability map based on existing and projected climate data.** Each group should produce a map that contains the following types and sources of data: An existing map of an area (subnational or national) with overlays showing present climate, projected climate (obtained from meteorological services) and a layer showing which crops can be grown in the different regions (based on information obtained from the agricultural/extension services on soil types, and water availability). **Step 2**. Present the map to the class for formative feedback Class to develop criteria	5
LT2	**Student: Essay** Students to write an essay, making a critical, comparative evaluation of the adaptive capacity of southern Africa's farming systems to climate change. Formative feedback based on essay rubric	8
LT2	**Students: Group work: Flowchart for estimating GHG emissions** **Step 1. Key readings and discussion** Students to re-read the Key readings, ([23] FAO (2014a); [16] FAO (2014b); [18] Pandey & Agrawal (2014), noting the different types and levels of GHGs from crop and livestock production activities. Then discuss the different types and levels of GHGs, and how these are estimated (2 hours) **Step 2. Design a Flowchart and presentation** Each group to develop a flowchart showing all relevant steps for estimating GHG emissions from a selected food supply chain (5 hours)	7

	Step 3. Present the flowchart to the class for formative feedback Criteria to be developed, including: relevance, scientific basis	
LT3	**Students: Group work: Site visit and report** Class visits a farm and then groups of students write a report providing a package of mitigation and adaptation measures for increasing climate resilience and sustainability. Formative feedback based on adapted Report rubric	20
LT4	**Student: Supply chain report** Design a process to conduct an evaluation of the supply chain of a chosen food commodity for its climate resilience, and propose strategies for climate change adaptation and mitigation in the value/ supply chain. Formative feedback based on adapted Report rubric	10

Note for printing:

This TLA Plan has been formatted to be printed as an A5 booklet, with a gutter margin. Ensure that you select 'Booklet' on your Printer Settings, under the 'Layout' tab.

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Programme for Climate Change Capacity Development
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Programme de développement des capacités face au changement climatique

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