Module Definition Form (MDF)

Module code: MOD011226	**Version:** 1 **Date Amended:** 17/Jun/2025

1. Module Title
Controlled Environment Agriculture

2a. Module Leader
Kambiz Baghalian

2b. School
Writtle School of Agriculture, Animal and Environmental Sciences

2c. Faculty
Faculty of Science and Engineering

3a. Level
7

3b. Module Type
Standard (fine graded)

4a. Credits
15

4b. Study Hours
150

5. Restrictions

Type	Module Code	Module Name	Condition
Pre-requisites:	None		
Co-requisites:	None		
Exclusions:	None		
Courses to which this module is restricted:	None		

LEARNING, TEACHING AND ASSESSMENT INFORMATION

6a. Module Description

Sustainable food production is crucial to meeting the needs of future generations. There is growing pressure to reduce the environmental impacts and carbon footprint throughout the agri-food chain.

In the UK, the Agricultural Act 2020 sets out to reward farmers for protecting the environment, increasing sustainable productivity, and contributing to the shift toward net zero. Similarly, the Farm to Fork strategy, published by the European Commission in May 2020, outlines ambitious 2030 targets:

- 50% reduction in chemical pesticide use
- 50% reduction in nutrient losses
- 20% reduction in fertiliser use
- 10% increase in landscape diversification

Achieving these targets requires innovative approaches to improve cropping intensity and resource efficiency, while ensuring food remains accessible and affordable. Controlled Environment Agriculture (CEA) offers a powerful toolkit to address these challenges. CEA involves growing crops under protected environments, such as highly controlled greenhouses or indoor spaces (e.g., vertical farms) to optimise inputs like water, crop protection products, energy, and labour. This method maximises crop quality and yield, extends the growing season, and reduces resource waste.

To effectively tackle climate change, it is vital that growers, researchers, and CEA technologists integrate their innovations within the broader food system. In this module, you'll gain in-depth knowledge of CEA technologies and tools, fostering an understanding of CEA's green potential, challenges, and emerging opportunities, including hybrid systems.

By completing this module, you'll build valuable expertise in CEA and its role in sustainable agriculture, preparing you to scale up solutions that align with the UK's sustainability goals.

6b. Outline Content

This module introduces students to the latest advancements in Controlled Environment Agriculture (CEA), emphasising the benefits of various controlled environments and their potential to enhance product quality, sustainability, and food security. The module comprises a series of lectures and guided learning activities focused on Exploring the potential of CEA, the driving factors behind its adoption, and its benefits for sustainable food production. It will Provide a comprehensive glossary of key terms in CEA and an overview of the technologies used in the field. During the course, we will be examining practices applied to CEA systems, including crop monitoring, plant phenotyping, advanced glasshouse technologies (both software and hardware improvements), field-scale precision farming, molecular diagnostics, environmental control technologies, biological control, and biosecurity measures. Areas such as resource efficiency, energy optimization, farm diversification strategies, urban agriculture, and hybrid systems to showcase the economic potential of CEA, will be covered.

Through this module, students will gain a comprehensive understanding of CEA technologies, their practical applications, and their role in addressing critical challenges in modern agriculture.

6c. Key Texts/Literature

The reading list to support this module is available at: https://readinglists.aru.ac.uk/

6d. Specialist Learning Resources
None

7. Learning Outcomes (threshold standards)		
No.	**Type**	**On successful completion of this module the student will be expected to be able to:**
1	Knowledge and Understanding	Demonstrate a conceptual understanding of principles and issues surrounding food security
2	Knowledge and Understanding	Critically evaluate a range of agricultural food systems and their ability to meet the needs of populations sustainably
3	Intellectual, practical, affective and transferrable skills	Develop and propose justified strategies at local, national and international levels to enhance sustainable food supply whilst maintaining and improving ecosystem services

8a. Module Occurrence to which this MDF Refers				
Year	**Occurrence**	**Period**	**Location**	**Mode of Delivery**
2026/7	ZZF	Template For Face To Face Learning Delivery		Face to Face

8b. Learning Activities for the above Module Occurrence			
Learning Activities	**Hours**	**Learning Outcomes**	**Details of Duration, frequency and other comments**
Lectures	30	1-3	The equivalent of 3 hours a week for 13 weeks (excluding the scheduled exam week) and individual and small online group tutorials, workshop or project work. Contact may be packaged into different delivery patterns across the semester(s) Independent study will be a combination of tutor directed and self- managed study to suit delivery patterns.
Other teacher managed learning	6	1-3	Collaborative group activities will encourage students to apply theoretical knowledge to practical situations. Students will work in teams to solve postharvest challenges, enhancing their critical thinking, collaboration, and problem-solving skills in the context of food systems.
Student managed learning	114	1-3	Background reading and study for seminar preparation. A combination of assigned readings and individual research on postharvest management topics and developing deeper understanding of course materials.
TOTAL:	150		

9. Assessment for the above Module Occurrence

Assessment No.	Assessment Method	Learning Outcomes	Weighting (%)	Fine Grade or Pass/Fail	Qualifying Mark (%)
010	Practical	1-3	100 (%)	Fine Grade	40 (%)

Students will work in groups of 2-3 to create a video or interactive presentation (up to 10 minutes) explaining a key concept or innovation in Controlled Environment Agriculture (CEA). Topics may include advancements in hydroponics, vertical farming, energy-efficient greenhouses, or emerging hybrid systems. In addition to the group presentation, each student must individually produce a script or accompanying notes (1,000 words) that detail their contribution, the research conducted, and the rationale behind the content and design of the presentation.

In order to pass this module, students are required to achieve an overall mark of 40% (for modules at levels 3, 4, 5 and 6) or 50% (for modules at level 7*).

In addition, students are required to:
(a) achieve the qualifying mark for each element of fine graded assessment as specified above
(b) pass any pass/fail elements

[* the pass mark of 50% applies for all module occurrences from the academic year 2024/25 – see Section 3a of this MDF to check the level of the module and Section 8a of this MDF to check the academic year]