

Feeding the billions: Challenges and Innovation in Food and Water Security



SYLLABUS

VU Amsterdam Summer School

8- 19 JULY 2024



Any general questions for the Summer School support team? Contact amsterdamsummerschool@vu.nl.

Course Details

Title	Feeding the billions: Challenges and Innovation in Food and Water Security
Coordinator / Lecturer	Coordinator / lecturer: <ul style="list-style-type: none"> • Dr Denyse Snelder (Centre for International Cooperation, CIS-VU) d.snelder@vu.nl ;
Other lecturers	<ul style="list-style-type: none"> • Ms Sabina Di Prima (CIS-VU) sabina.diprima@vu.nl • Dr Ben Sonneveld (Athena/Amsterdam Centre for World Food Studies - VU) b.g.i.s.sonneveld@vu.nl • Dr Marthe Wens (Institute for Environmental Studies, VU) marthe.wens@vu.nl
Study credits	3 ECTS
Form(s) of tuition	On campus, lectures, discussions, group work, videos, excursion
Approximate contact hours	45
Approximate self-study hours	39

Course description

There are 7.8 billion people to feed today, and this number is expected to increase to about 10 billion by 2050. This implies that more food is needed, and more food means more water for crops and livestock to grow. But, what is the status of food and water security in the world? What is the connection between food security, water security and poverty? Agriculture is the biggest user of water on the globe, requiring large quantities of water for irrigation and production processes. There is a clear need to take into account the impact of climate change and assess how processes of migration and urbanization add to the pressures and problems associated with food, nutrition and water security. Food production must be efficient without compromising the environment and various stakeholders may play a role in the innovation processes needed to accomplish sustainable food production.

This course is evidence-based and addresses food and water challenges and innovative interventions from various disciplinary perspectives and socio-cultural contexts, using real-life examples. Interactive theoretical lecture sessions are alternated with debates, group work and a field visit. Students will benefit from discussions with their peers from different disciplinary backgrounds and countries of origin. At least the following topics will be covered:

- Food system challenges and opportunities

- Drivers of food and water security
- Drought impacts and water management for food production
- Food (and water) prices and food economics
- Interventions to feed the world more sustainably

We bring practice to the classroom by using real-life examples from the Netherlands and from projects in Africa and Southeast Asia. Assessment is based on student participation in an in-class debate and a group preparation.

Learning objectives

By the end of this course, students will be able to:

- Better understand food and water security, its context (local to global), major challenges, innovative solutions and policies.
- Understand and can explain major concepts and theories in this field.
- Be able to select and apply appropriate transdisciplinary approaches in food and water security research
- Have acquired skills to evaluate research and do critical reading of the literature.
- Possess the communication skills needed to participate in current debates in the field of food and water security.

Assignments and Assessment

Group presentation

The main assignment (80% of your final grade) for this course includes the preparation of a group presentation on a topic of your choice, but related to food and water security, to be delivered in class on the last day of the course. In groups you will acquire a good understanding of the food-and-water-security challenges and opportunities by consulting online sources, e.g., peer-reviewed articles and other, non-academic, yet societal relevant articles, related to the selected topic. You will identify stakeholders in the public and private sector and discuss how they are related to (and affected by) the identified challenges and opportunities. Your group could for example choose a specific challenge to focus on and propose an intervention that will support positive change towards a sustainable solution. You can use tools such as the Theory of Change framework and explain why this intervention is the most acceptable compared to other possible interventions available.

The presentation is in the form of a 15-minute PowerPoint. The presentation should not exceed 15 slides including cover page and references. Kindly also prepare 2 statements for

the plenary discussion with your peers in class. An important factor for the grading is that everyone has to have an equal part in both the preparation of the presentation and the presentation itself. The group receives a grade. This means that you have a responsibility to each other, so make sure all your group members contribute, but also that you are not the one responsible for failing your other group members on the assignment. More information about this assignment will be provided during the first class and in the document with group work descriptions placed on Canvas (under “modules” / session 1 Introduction).

In-class debate

Another assignment is about the organization of an in-class debate on 4 statements selected from the topics addressed during the morning sessions of this course. The assessment of this assignment counts for 20% of your final grade. For more information see the document with the group work descriptions placed on Canvas.

Final assessment / Grading

You need to attend all lectures, workshops, and the excursion and complete the group assignment. The table below presents how the overall assessment will be done. You need complete attendance and at least “mediocre” for the assignment to obtain the certificate.

Course item	% of final score	Assessment (pass/ fail or grade*)
Attendance in 8 lectures and workshop / discussion sessions, 1 excursion, if any)	0	Pass / fail Note: Attendance in <u>all</u> lectures, workshops, excursion and game is mandatory; missing one class = one extra assignment (essay on missed lecture)
Active participation in the in-class debate	20	Excellent / Very good (10 – 9.5 - 9) (Very) good (8.5 – 8.0 – 7.5) (More than) sufficient (7.0 – 6.5 - 6.0) Mediocre (5.5) Fail (<5.5)
Group presentation	80	Excellent / Very good (10 – 9.5 - 9) (Very) good (8.5 – 8.0 – 7.5) (More than) sufficient (7.0 – 6.5 - 6.0) Mediocre (5.5) Fail (< 5.5)
TOTAL:	100	
To receive the certificate: complete attendance (pass) and grade of 5.5 or higher for both group presentation and active participation. *: In the Netherlands, grades from 1.0 up to 10.0 are used, with 1 being worst and 10 being best; see https://en.wikipedia.org/wiki/Grading_systems_by_country#Netherlands		

Reading list

Session 1, 2 and 3

- Conijn J G, Bindraban P S, Schröder J J, Jongschaap R E E 2018. Can our global food system meet food demand within planetary boundaries? *Agriculture, Ecosystems & Environment* 251: 244-256
- Godfray, H.C.J., Beddington, J.R., Crute, I.R., Haddad, L., Lawrence, D., Muir, J.F., Toulmin, C., 2010. Food security: the challenge of feeding 9 billion people. *Science* 327 (5967), 812–818.
- Di Prima, S., Wright, E. P., Sharma, I. K., Syurina, E., & Broerse, J. E. W. (2022). Implementation and scale-up of nutrition-sensitive agriculture in low- and middle-income countries: a systematic review of what works, what doesn't work and why. *Global Food Security*, 32, 1-35. [100595]. <https://doi.org/10.1016/j.gfs.2021.100595>

- Di Prima, S., Dinh D., Reurings D., Wright, E. P., Essink D. & Broerse, J. E. W. (2022). Home-Grown School Feeding: Implementation Lessons From a Pilot in a Poor Ethnic Minority Community in Vietnam. *Food and Nutrition Bulletin* 43(3):3795721221088962. <http://dx.doi.org/10.1177/03795721221088962>
- Kopainsky, B., Hager, G., Herrera, H., & Nyanga, P. H. (2017). Transforming food systems at local levels: Using participatory system dynamics in an interactive manner to refine small-scale farmers' mental models. *Ecological modelling*, 362, 101-110. <https://www.sciencedirect.com/science/article/pii/S0304380017303721>
- Seto, K. C., & Ramankutty, N. (2016). Hidden linkages between urbanization and food systems. *Science*, 352(6288), 943-945. <https://science.sciencemag.org/content/sci/352/6288/943.full.pdf>

Session 4

- Van Loon (2015) Hydrological drought explained. *WIREs*. (22 pages excluding references) <http://onlinelibrary.wiley.com/doi/10.1002/wat2.1085/epdf> (accessed online 15 July 2019)
- UNDRR GAR SR on drought (2021) (Summary for policymakers) <https://www.undrr.org/publication/gar-special-report-drought-2021>

Session 6

- Bouma, J., Hegde, S.E., Lasage, R. (2016). Assessing the returns to water harvesting: A meta-analysis. *Agricultural Water Management* 163, 100-109. <https://www.sciencedirect.com/science/article/pii/S0378377415300780?via%3Dihub>
- Ward et al (2020) The need to integrate flood and drought disaster risk reduction strategies <https://www.sciencedirect.com/science/article/pii/S2468312420300109>

Session 8

- O'Connell S A and Smith C 2016. Economic growth and child undernutrition. *Lancet Glob Health* 4(12): e903
- Satoru Shimokawa 2015. Sustainable meat consumption in China. *Journal of Integrative Agriculture* 14(6): 1023-1032
- Vollmer S et al 2014. Association between economic growth and early childhood undernutrition: evidence from 121 Demographic and Health Surveys from 36 low-income and middle-income countries. *Lancet Glob Health* 2(4): e225–
- What is the cost of the food we waste and how can we change behaviours to address this growing challenge? | Water, Land and Ecosystems (cgiar.org): <https://www.iwmi.cgiar.org/archive/wle/thrive/2021/11/12/what-cost-food-we-waste-and-how-can-we-change-behaviours-address-growing-challenge/>

Session 9

- Debuschewitz, E., Sanders, J. Environmental impacts of organic agriculture and the controversial scientific debates. *Org. Agr.* 12, 1–15 (2022). <https://doi.org/10.1007/s13165-021-00381-z>
- Etana Dula, Denyse J. Snelder, Cornelia F.A. van Wesenbeeck, Tjard de Cock Buning (2020). Climate Change, In-situ Adaptation, and Migration Decisions of Smallholder Farmers in Central Ethiopia, *Migration and Development*, DOI: 10.1080/21632324.2020.1827538. <https://doi.org/10.1080/21632324.2020.1827538>
- Houessou M D (2021) Why urban agriculture matters. Allotment gardens at the service of food security in the urban areas of Benin — PhD dissertation, Vrije Universiteit Amsterdam (vu.nl); <https://research.vu.nl/en/publications/why-urban-agriculture-matters-allotment-gardens-at-the-service-of>
- Houessou Mawuna D., Ben G.J.S. Sonneveld, Augustin K.N. Aoudji, Fréjus S. Thoto, Denyse J.R.M. Snelder, Anselme A. Adegbidi, and Tjard De Cock Buning (2023). The urban poor: profile and constraint affecting their participation in allotment gardens. *Development in Practice* 33(3): 301-316. <https://www.tandfonline.com/doi/full/10.1080/09614524.2022.2066066>
- Ruolph M, Evans M, Kroll F (2020). Use of Urban Agriculture in Addressing Health Disparities and Promotion of Ecological Health in South Africa. *International Journal of Natural Resource Ecology and Management* 5(1): 26-30. <http://dx.doi.org/10.11648/j.ijnrem.20200501.14>

Debate:

UN 2023 Water Conference last 22-24 March 2023. See: [UN 2023 Water Conference | Department of Economic and Social Affairs](#)

COP28: <https://unfccc.int/process-and-meetings/conferences/un-climate-change-conference-united-arab-emirates-nov/dec-2023/about-cop-28>

UNEP: <https://www.unep.org/publications-data>

UN SDGs summit 2023: <https://www.un.org/en/conferences/SDGSummit2023/SDG-Action-Weekend/food-systems-transformation>

Course Schedule

Date / Lecturer	Time	Topic (what)	Location
Monday 8 July D Snelder S Di Prima	10:00 – 13:00	Session 1: Introduction <ul style="list-style-type: none"> Getting to know each other Introduction to programme, canvas, topics Introduction to group assignment Intro to SDGs, food and water security 	On Campus HG-1G13
D Snelder / S Di Prima	1 hrs	Group work 1: Getting to know each other further...	On Campus HG-1G13
	15:00	Social programme	On Campus
Tuesday 9 July B Sonneveld	09:30 – 12:30	Session 2: Drivers of food and water security (includes introduction to preparatory work for session 8: Collection of food prices on Monday 10 July)	On Campus HG-1G13
D Snelder / S Di Prima	2 hrs	Group work 2: Formation of teams Group work 3: Introduction to in-class debate	On Campus HG-1G13
Wednesday 10 July S Di Prima / D Snelder	09:30 – 12:30	Session 3: Food system challenges and opportunities	On Campus HG-1G13
	No class	Social programme	
Thursday 11 July M Wens	09:30 – 12:30	Session 4: Drought impacts and water security	On Campus HG-1G13
S Di Prima	13:30 – 14:30	Session 5: Tips for effective communication (in group presentation and in-class debate)	On Campus HG-1G13
	Rest of afternoon	Group work 3: Preparing in-class debate	On Campus HG-1G13
Friday 12 July M Wens	09:30 – 12:30	Session 6: Water management for food production in dryland areas	On Campus HG-1G13
D Snelder	13:30 – 16:00	Session 7: In-Class Debate With representatives of NGO(s), African Universities' and GO(s) on the role of water in food systems	On Campus HG-1G13

Monday 15 July			At different locations On Campus
D Snelder	09:30 – 10:30	Session 10: Critical reading and research evaluation	
D Snelder / S Di Prima	10:30 – 12:30	Q&A session Preparation for Group work 4 Preparatory work for session 8: Collection of food prices	
Tuesday 16 July	09:30 – 12:30	Session 8 Food prices and food economics	On Campus
B Sonneveld			
	2 hrs	Group work 4: prepare group presentation	On Campus
Wednesday 17 July	09:30 – 12:30	Session 9: Strategies to address food systems and climate change in Benin, Kenya, South Africa, and / or Uganda*	On Campus
D Snelder			
	No class	Social programme	
Thursday 18 July	09:30 – 12:30	Group work 4: Preparing group presentation	On Campus
Multiple			
	Afternoon	Group work 4: Preparing group presentation	
Friday 19 July	09:30 – 12:30 (possibly longer)	Session 11: Group presentations	On Campus
D Snelder S Di Primah		<ul style="list-style-type: none"> • Graduation ceremony • Evaluation 	

Session 1: Introduction

Lecturer: Dr Denyse Snelder (in collaboration with Sabina Di Prima)

The first lecture will be an Introduction into the course. We will start with an introduction of all participants, followed by a discussion of the main questions and concepts addressed in the course. The course programme will be introduced, and the assignments will be explained

Session 2: Drivers of food and water security

Lecturer: Dr Ben Sonneveld

The impact of drivers like climate change, deforestation and population on the environment in general and food and water security in particular, is hotly debated in literature, broadly

following a Malthusian and a Godwinian perspective. According to Malthus, overpopulation leads to depletion of natural resources and will wreak havoc on society, resulting in hunger, starvation and political instability. Godwin refuted the idea that man would succumb to imminent natural scarcities and pointed out that technological progress and self-regulation would counter this threat. The modern era seems to follow the Godwin line, yet, scarcities on vital micronutrients like Zinc are a reason to fear that the Malthusian prediction might come true sometime in the future. The Malthusian/Godwinian controversy also dominates the debate on agricultural developments that prosper in growth and quality of food production in western hemispheres but leaves large parts of Asia and Africa untouched. Even today millions of people do not meet daily required food demands; mired in poverty, their future prospects seem bleak. Hence, understanding the factors that affect food insecurity is a first step to design policy interventions that strengthen the pillars of food security management. In this lecture, we will evaluate drivers and mitigating responses that cope with the external shocks that are given to the food security system.

Session 3: Food system challenges and opportunities

Lecturer: Ms Sabina Di Prima / D Snelder

Despite decades of targeted investments, food and nutrition insecurity remains a persistent problem in our society. How is this possible? To address this question, it is important to go to the roots of the problem and understand the system in which the problem is embedded. This lecture is aimed at understanding what food systems are, how they have evolved (are evolving) and what changes need to occur to address complex problems which are deeply rooted in the system and reproduced by the system itself. Food systems are complex adaptive systems characterized by a large diversity of agents (or actors), contexts and organizational configurations. Systems tend to have specific ways of solving problems based on their unique combination of cultures, structures and practices. Transdisciplinary and deliberative governance approaches are therefore the best way in which the persistent problem of food and nutrition security can be addressed. These approaches are grouped under the heading of 'system innovation'.

Session 4: Drought impacts and water security

Lecturer: Dr Marthe Wens

In this session, we will explore the occurrence of drought impact cascades and drought risk. Its' effect on blue, green and grey water security, and food security will be discussed. We will adopt a holistic, system perspective to understand how drought risk and its impact emerge and dynamically change over time.

The lecture covers the various ways in which droughts are characterized and can be monitored, including by the use of satellite observations. Furthermore, we will learn how drought impacts develop and which conditions lead to crop losses, and eventually famines. During the second part of the lecture you will learn about drought forecasts, and how these forecasts can be used to steer anticipatory adaptation measures. Moreover, drivers for vulnerability to drought-induced food insecurity will be uncovered through a group exercise. The session ends with a computer practical to evaluate drought propagation to increase drought modelling skills.

Session 5: Tips for effective communication (in group presentation and in-class debate)

Lecturer: Ms Sabina Di Prima

Session 6: Water management for food production in dryland areas

Lecturer: Dr Marthe Wens

In this lecture, existing frameworks for integrated water management and drought risk reduction will be discussed. Examples from field studies will be used to show which (community-based) adaptation measures are available to reduce the impacts of droughts on farmer households. Student will be asked to critically assess potential drought adaptation measures and water management strategies, through interactive group discussions. A holistic perspective will be adopted, allowing students to uncover the wider context of the need for and pitfalls of integrated water management and drought risk reduction.

The session ends with a computer practical, in which the students will assess the effect of implementing water harvesting techniques to increase drought resilience, in relation to the investment costs.

Session 7: In-class Debate:

Facilitator: Dr Denyse Snelder

Debate with invited representatives of African Universities (present on location), for more information see the document with the group work descriptions placed on Canvas.

Session 8: Food prices and food economics

Lecturer: Dr Ben Sonneveld

Concerning the lecture on food economics, we concentrate in the first part of the lecture on the impact of undernutrition on the malnutrition status of children and adults. Examples are

given at the global levels and for various case studies. Next, we turn to the inventory made by each of you on the various prevailing prices of agricultural commodities. During the lecture we compare and discuss the findings and we aim to explain prices differences.

Based on the lecture on food economics, students will make an inventory of the various prevailing prices of agricultural commodities. During the lecture we compare and discuss the findings and we aim to explain the prices differences.

Session 9: Strategies for sustainable land and water management

Lecturer: Dr Denyse Snelder with academic experts from South Eastern Kenya University and Maseno University in Kenya, and Mbarara University of Technology and Makerere University in Uganda

Nutrition-sensitive agriculture, agroforestry and organic agriculture are proposed as promising strategies to achieving sustainable food systems, yet their feasibility is also contested. In this lecture, we look into these and other strategies and their underlying concepts and theories. We will discuss advantages and disadvantages of implementation, as brought forward by scientists and practitioners from Africa who will be present during this session. Using 2 video with examples based agro-ecology and organic agriculture, we will discuss the (potential) role of agricultural strategies in food and nutrition security for different environmental settings.

Session 10: Critical reading and research evaluation

Lecturer: Dr Denyse Snelder

Session 11: Group presentations

Facilitators: Dr Denyse Snelder, Ms Sabina Di Prima

For more information on the group presentations: see the document with the group work descriptions placed on Canvas.

