

BI1295, Sustainable Plant Production - from Molecular to Field Scale, 15hp, 2023

	Day	Month	Time		most connected ILO	Type	Session	Summary of the content	Reading/Preparation	Teacher	hrs		
Week 12	Wed	22	3	09:00 - 12:00	Preparation for group work		Compulsory attendance	Course introduction and arrangements for the group project	General course idea, grading criteria, presentation of the projects, election of the student representative	AM	3		
	Thu	23	3	13:00 - 14:30		4,5	L/E	Compulsory attendance	The scientific method	The process of scientific investigation from idea to publication is explored with special focus on the role and importance of hypothesis	Grogan 2005	RG	1.5
				14:30 - 17:00		4,5	L/E	Compulsory attendance	Group project introduction	Introduction to the group project		AM	2.5
	Fri	24	3	13:00 - 16:00		4,5	L/E	Compulsory attendance	Critical thinking		PS	3	
Week 13	Mon	27	3	13:00 - 14:30	Introduction	L	Compulsory attendance	Sustainable intensification, land sparing land sharing	Finch 2019, <i>Further reading:</i> Folberth 2020 and FAO 2011	FS	1.5		
				14:30 - 16:00		L	Compulsory attendance	The concept of sustainability across scales	Clark 2020	AM	1.5		
	Tue	28	3	13:00 - 16:00	Basics of plant physiology and modelling	2	L	Photosynthesis from scratch to plant production in northern latitudes	Photosynthesis at single cell scale; effects of external factors on leaf-level and stand-level photosynthesis with focus on the opportunities for crop yield improvements. Opportunities and limitations for sustainable crop production under Northern-European conditions	Lambers 2008 (part of chapter 2); Larcher 2003 (p111-119); Peltonen-Sainio 2009; Xu 2002. Supporting: Open StaxBiology Ch8; Additional: Eisenhut 2019; Weih 2003	MW	3	
	Wed	29	3	09:00 - 10:00		1	S	Compulsory attendance	"Meet the author" session: Climate change	Paper discussion with the author	Bonosi 2013 (to be read before the seminar, please prepare your questions)	MW	1
				10:00 - 12:00		2	L		Effects of climate change on plant production	Two case studies: Sensitivity of available germplasm of wheat and biomass willow to extreme weather (i.e. drought). Discussion of major climate change impacts on agriculture and forestry, based on climate effects on crops at field scale	Bonosi 2013; Lavalle 2009; Mäkinen 2018	MW	2
	Thu	30	3	09:00 - 12:00		2	L/E		Modelling - the basics	Why do we model? What is (not) a model? Mass and energy balance; Empirical exponential biomass growth model	Ludwig 2010 (to be read before class); Smith 2007 (ch 1 and 2)	GV	3
				13:00 - 16:00		2	L		Modelling - leaf to plant-level	Process-based modeling of leaf level C fixation; upscaling to plant level in trees and arable crops; linkage of plant traits to the parameter of the empirical exponential growth. Growing degree days as a simple model for tree and crop phenology.	Revise literature relative to photosynthesis (read for 28/03); additional: Abrahamsen 2000	GV	3
Fri	31	3											
Week 14	Mon	3	4										
	Tue	4	4										
	Wed	5	4					Easter break					
	Thu	6	4										
	Fri	7	4										
Week 15	Mon	10	4										
	Tue	11	4	13:00 - 16:00	Breeding and crop domestication	1	L	Where do cultivated plants come from? Breeding "Dugga" (diagnostic test)	overview on the history of crop domestication, modern tools for breeding and approaches used to adapt both annual and perennial plants for climate resilience and sustainable agriculture	Prepare the "dugga" before class. Readings: compulsory: Doebley 2006; Kole 2015; supporting: selected chapters from Klug (available at SLU libraries)	PI	3	
	Wed	12	4	09:00 - 12:00		1	L	Where do cultivated plants come from? Summary of plant breeding	continued from 11/04	as for 11/04	PI	3	
	Thu	13	4	13:00 - 16:00		1	L	Basics of genome editing and plant transformation			PH	3	
	Fri	14	4	09:00 - 12:00		1	L	Basics of genome editing and plant transformation			PH	3	
13:00 - 16:00				1		S	Compulsory attendance	Research insights: Jonathan Cope	Overview of the different gene pools and how that germplasm can be used in breeding more sustainable crops. This will cover Primary, Secondary, and Tertiary gene pools, as well as germplasm resources.	JC	3		

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Week 16	Mon	17	4	13:00 - 16:00	Plant-insect & plant-microbe interaction	3	L	Integrated Pest Management and sustainable management of insect pests	Concept of IPM, components of IMP strategies illustrated by examples showing both complexity & multifunctionality. Discuss advantages and disadvantages of strategies. Discussion of sustainability in pest management context	Godfray 2010; additional readings: Khan 2014; Prinsloo 2007	RG	3
	Tue	18	4	13:00-15:00		3	L	Integrated pest and pollinator management	Integration of pollinators in each level of the IPM pyramid. Concept and case studies.	Lundin et al. 2021	OL	2
				15:00 - 16:00		3	S	Compulsory attendance "Meet the author" session: Intercropping effects on multi-functionality		Boetzl et al. 2023 (to be read before the seminar, please prepare your questions)	FBÖ	1
	Wed	19	4	09:00 - 12:00		3	L	Plant microbe interactions - plant defense	Plant defense and perception of microbes, MAMP-PAMP-DAMP & TLR, PTI-ETI, structural-chemical-cellular barriers, defense signalling, cost of resistance-resource allocation, how to improve crop resistance (group exercise)	Pieterse 2014 Supporting reading: Han 2019	MD	3
	Thu	20	4	13:00 - 16:00		3	L	Plant microbe interactions - beneficial interactions	Natural microbiota; microbiome; ecosystem services: single strains or consortia or microbiota as biostimulants, growth promoters, biofertilizers, biocontrol agents, remediators; microbes in agriculture - pros-cons (group exercise)	Lugtenberg 2009, Finkel 2017 Supporting reading: Bhattacharyya 2012	MD	3
	Fri	21	4	09:00 - 12:00		2	L	Soil microbial nitrogen cycling	Introduction to nitrogen (N) cycle and microbial transformations of N compounds, N cycling in rhizosphere, microbial controls of N loss and retention, plant-microbe interactions in relation to N; competition for N, plant breeding to inhibit microbial N transformations	Coskun 2017; Philippot 2011; Supporting: Robertson 2014; Additional: Kuypers 2018; Philippot 2013	SH	3
13:00 - 16:00					S	Compulsory attendance Research insights: Fede Berckx	Nitrogen fixation in legumes		FB	3		
Week 17	Mon	24	4	13:00 - 14:30	Nutrient use efficiency	2	L	Plant nutrient use efficiency across scales - Part 1	Nutrient use efficiency across scales with main focus on nitrogen – assessment of mechanisms determining the efficiency of nutrient use at molecular, tissue, whole-plant and field scales	Lopez-Arredondo 2017; Weih 2017	MW	1.5
				14:30 - 16:00		2	L	Plant nutrient use efficiency across scales - Part 2	Nutrient use efficiency across scales with main focus on nitrogen – assessment of mechanisms determining the efficiency of nutrient use at molecular, tissue, whole-plant and field scales	Lopez-Arredondo 2017; Weih 2017	POL	1.5
	Tue	25	4	13:00 - 16:00	Crop-weed interaction	3	L	Weed biology and ecology	Functional traits of weeds and their implications for the sustainability of plant production.	Monaco TJ, Weller SC, Ashton FM (2002). Weed Science – Principles and practices, Wiley (Ch 1 and 2)	AM	3
	Wed	26	4	09:00 - 12:00		S	Compulsory attendance Research insights: Darwin Hickman	What allelopathy is, how it can be explored, and what potential it has for weed management.	Further reading: Hickman 2021	DH	3	
	Thu	27	4	13:00 - 15:00		3	S	Compulsory attendance "Meet the author" session: Sustainable weed management	Paper discussion with the authors	MacLaren et al. 2020 (to be read before the seminar, please prepare your questions)	CML	2
	Fri	28	4	13:00 - 16:00		S	Compulsory attendance Research insights: Eirini Daouti	Weed seed predation. Can many little shiny predators help us to sustainably combat weeds?	Further reading: Daouti et al. 2020	ED	3	
Week 18	Mon	1	5		Sustainable plant production systems			Public holiday				
	Tue	2	5	13:00 - 16:00		S		Grain legume production systems		Watson et al. 2017, Zander et al. 2016	FS	3
	Wed	3	5					Free, (re-exam date for courses in period 2 and 3 on campus Alnarp)				
	Thu	4	5	09:00 - 12:00		L		Crop rotations and break crop effects		Kirkegaard 2017. Further reading: Reckling 2016	FS	3
				13:00 - 16:00		L		Sustainable plant production systems: Agroecology	Agroecology		GC	3
Fri	5	5	09:00 - 12:00	L		Sustainable plant production systems: Intercropping	Intercropping		GC	3		
			13:00 - 16:00	S	Compulsory attendance Research insights: James Ajal	Intercropping		JA	3			

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Week 19	Mon	8	5	10:00 - 11:00			Exam Q&A session via Zoom		AM	1
	Tue	9	5							
	Wed	10	5				Study week			
	Thu	11	5							
	Fri	12	5							
Week 20	Mon	15	5	08:00 - 11:00			Exam		AM	3
	Tue	16	5							
	Wed	17	5				Finalising group projects			
	Thu	18	5							
	Fri	19	5							
Week 21	Mon	22	5				Finalising group projects			
	Tue	23	5							
	Wed	24	5							
	Thu	25	5							
	Fri	26	5	16:00		P	Hand in final project report by 16:00 in Canvas			
Week 22	Mon	29	5	13:00 - 17:00		P	Mandatory attendance Project presentations + course evaluation		AM	4
	Tue	30	5							
	Wed	31	5				Preparation for re-exam if needed, finalising group projects			
	Thu	1	6							
	Fri	2	6	13:00 - 16:00			Re-exam if needed		AM	3

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Type

L Lecture
E Exercises
S Seminars
P Project

Clarification of teachers' initials

AM Alexander Menegat
CML Chloe MacLaren
DH Darwin Hickman
ED Eirini Daouti
FB Fede Berckx
FS Frederick Stoddard
FBÖ Fabian Bötzl
GC Georg Carlsson
GV Giulia Vico
JA James Ajal
JC Jonathan Cope
MD Mukesh Dubey
MW Martin Weih
OL Ola Lundin
PH Per Hofvander
PI Pär Ingvarsson
POL Per-Olof Lundquist
PS Per Sandin
RG Robert Glinwood
SH Sara Hallin

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