

BI1295, Sustainable Plant Production - from Molecular to Field Scale, 15hp, 2022

Unless otherwise noted ('additional' and 'supporting'), the literature is compulsory. Refer to the course literature list and Canvas for details on the literature

	Day	Month	Time	most connected ILO	Type	Session	Summary of the content	Reading/Preparation	Teacher	hrs	
Week 12	Thu	24	3	13:00 - 15:00	P	Mandatory 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	
	Fri	25	3	13:00 - 14:30	4,5	E	Mandatory 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
Week 13	Mon	28	3	09:00 - 12:00	4,5	L/E	Mandatory attendance	Bibliometric analysis	Advanced tools for literature search and bibliometric analysis; introduction in bibliometric analysis with R Aria 2017	AM	3
				13:00 - 14:30	4,5	L/E	Mandatory attendance	Tools for group project		MW	1.5
	Tue	29	3	13:00 - 16:00	4,5	L/E	Mandatory attendance	Critical thinking		PS	3
	Wed	30	3	09:00 - 12:00		S	Mandatory attendance	Introductory seminar: The concept of sustainability across scales	Clark 2020	AM	3
	Thu	31	3	13:00 - 16:00	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
	Fri	1	4	13:00 - 14:00	1	L	Mandatory attendance	"Meet the author" session: Climate change	Paper discussion with the author	Bonosi 2013 (to be read before the seminar, please prepare your questions)	
14:00 - 16:00				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	
Week 14	Mon	4	4	13:00 - 16:00	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
	Tue	5	4	13:00 - 15:00	3	S	Mandatory 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/AM	2
	Wed	6	4	09:00 - 12:00	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
	Thu	7	4	13:00 - 16:00	1	L		Where do cultivated plants come from? Summary of plant breeding	continued from as for 14/04	PI	3
Week 15	Fri	8	4								
	Mon	11	4								
	Tue	12	4								
	Wed	13	4								
	Thu	14	4								
	Fri	15	4								
Week 16	Tue	19	4	09:00 - 12:00	3	L/E	Mandatory attendance	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
				13:00 - 16:00	3	L		Plant microbe interactions - harmful effects	Introduction to plant pathology with a focus on the ecology of plant pathogens Raaijmakers 2008, Ritpitakphong 2016 Supporting reading: Guest 2017, Tör 2017	IK	3
	Wed	20	4	09:00 - 12:00	3	L/E	Mandatory attendance	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	MK	3
	Thu	21	4	09:00 - 11:00	3	S	Mandatory attendance	The Swedish strategy for reducing the use of pesticides in agriculture.	The Swedish strategy for reducing the risks associated with the use of pesticides in agriculture. https://jordbruksverket.se/jordbruket-miljon-och-klimatet/giftfri-miljo#h-Risknamedvaxtskyddsmedelskaminska	AL/AM	2
				13:00 - 16:00	3	L/E	Mandatory attendance	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	MK	3
Fri	22	4	13:00 - 16:00	2	L		Soil microbial nitrogen cycling	Introduction to nitrogen (N) cycle and microbial transformations of N compounds, N cycling in rizosphere, 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	

	Day	Month	Time	most connected ILO	Type	Session	Summary of the content	Reading/Preparation	Teacher	hrs	
Week 17	Mon	25	4	09:00 - 12:00	2	L/E Mandatory attendance	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	Revise literature relative to photosynthesis (read for 08/04); additional: Abrahamsen 2000	GV	3
	Tue	26	4	13:00 - 14:30	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	POL	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	MW	1.5
	Wed	27	4	09:00 - 12:00	3	L	Field scale implications - environmental, genetic and management effects on crop performance - Temperate regions	Discuss implications on field scale and in particular relate environmental and genetic effects on crop performance to management	Slafer 2014; Cassman 2002	GB	3
	Thu	28	4	13:00 - 14:30		L	Summary session - plant physiology			MW	1.5
Fri	29	4	13:00 - 15:00	3	L	Field scale implications - environmental, genetic and management effects on crop performance - Tropical and sub-tropical regions	Discuss implications on field scale and in particular relate environmental and genetic effects on crop performance to management	Altieri 2015	ML	3	
			15:00 - 16:30	3	L Mandatory attendance	"Meet the author" session: Agroecology	Paper discussion with the authors	Altieri 2015 (to be read before the seminar, please prepare your questions)	ML	1.5	
Week 18	Mon	2	5	13:00 - 14:30		L	Summary session - plant breeding		PI	1.5	
	Tue	3	5				Free (re-exam date for courses in period 2 och 3 on campus Umeå and Alnarp)				
	Wed	4	5								
	Thu	5	5	13:00 - 15:00		L	Summary session - sustainability from a system perspective, modelling		Springmann 2018 p 1-9 only; Weiner 2017	GV	2
	Fri	6	5	13:00 - 14:30		L	Summary session - plant-microbe/insects interactions			MK	1.5
Week 19	Mon	9	5				Study week				
	Tue	10	5								
	Wed	11	5	09:00 - 10:30			Mandatory attendance	Q&A session for exam preparation		AM	1.5
	Thu	12	5								
	Fri	13	5								
Week 20	Mon	16	5	tbd			Exam		AM		
	Tue	17	5								
	Wed	18	5								
	Thu	19	5								
	Fri	20	5								
Week 21	Mon	23	5								
	Tue	24	5								
	Wed	25	5								
	Thu	26	5								
	Fri	27	5	16:00		P		Hand in final project report by 16:00			
Week 22	Mon	30	5	13:00 - 17:00		P Mandatory attendance	Project presentations + course evaluation		AM	4	
	Tue	31	6								
	Wed	1	6					Preparation for re-exam if needed			
	Thu	2	6								
	Fri	3	6	tbd				Re-exam if needed			

Type

- L Lecture.
- E Exercise with **obligatory attendance**. An extra assignment is usually given if you miss the class.
- S Seminars with **obligatory attendance**.
- P Project. Introductory project presentation and the final mini-symposium are **obligatory** sessions. The rest of the scheduled project time is used in agreement between project tutor and group

Clarification of teachers' initials

AM Alexander Menegat
AL Anders Lindgren, Swedish Board of Agriculture
CML Chloe MacLaren, Rothamsted Research
GB Göran Bergkvist
GV Giulia Vico
IK Ida Karlsson
MK Magnus Karlsson
ML Marcos Lana
MW Martin Weih
PI Pär Ingvarsson
POL Per-Olof Lundquist
PS Per Sandin
RG Robert Glinwood
SC Sun Chuanxin
SH Sara Hallin

Emails

alexander.menegat@slu.se
anders.lindgren@jordbruksverket.se
chloe.maclaren@rothamsted.ac.uk
goran.Bergkvist@slu.se
giulia.vico@slu.se
ida.karlsson@slu.se
Magnus.Karlsson@slu.se
marcos.lana@slu.se
martin.weih@slu.se
par.ingvarsson@slu.se
per-olof.lundquist@slu.se
per.sandin@slu.se
robert.glinwood@slu.se
chuanxin.sun@slu.se
sara.hallin@slu.se

Course segments

Breeding and Crop Domestication

Basics of plant physiology and nutrient cycling
General Introduction, Exam, Evaluations etc.
Group work
Scientific work
Weed Biology/Ecology
Examples across scales and summary sessions

Participating teachers

PI, SC, MPA
GV
MW, SH
AM
Students
AM, MW, RG
AM
MW, PO, GB, GV, PI, AM, JM, ML, PC

Colour code

