

## **AGR 6233 - Tropical Grassland Agroecosystems – Fall 2023**

Dr. L.E. Sollenberger

Office: 3111 McCarty Hall B; Phone: 273-3420; Email: lesollen@ufl.edu

**Office Hours:** Tuesday and Wednesday: 1:00 p.m. - 2:30 p.m. (or by appointment)

**Class Meeting Times:**

Period 8-9 (3:00-4:30) Tuesday and Wednesday (426 McCarty Hall C)

**Course Description:**

Importance, ecology, ecosystems services, physiology, management, and utilization of sown grasslands in the tropics and subtropics. Emphasizes interactions between grassland plants and the environment, other plants, and grazing herbivores. Integrates a major effort to describe and compare several prominent production systems or alternative systems.

**Course Objectives:**

1. To learn the important anatomical, physiological, and morphological characteristics of forage plants and relate these characteristics to forage responses to management and to their performance in production systems.
2. To understand and integrate the important ecological concepts that determine relationships among forage plants, between forage plants and the environment, and between forage plants and the animals that consume them.
3. To recognize the potential and limitations of livestock production on planted and native tropical grasslands.
4. To be aware of the role of forages in integrated food crop-livestock and silvopastoral systems in warm climates and to understand how the needs of various systems impact choice of forage species.
5. To recognize the environmental impact of tropical forage-livestock systems and to be aware of the potential of good management to minimize negative environmental effects.
6. To delineate the ecosystem services provided by grasslands and their impact on the global environment.
7. To organize a volume of references that describes pertinent tropical plant-animal research.
8. To gain proficiency in synthesis and presentation of content from the scientific literature in oral and written forms.

### **Instructor's Approach:**

We cover a wide range and significant quantity of material. Most sources of information and assigned readings are review articles or original research papers. I assume significant interest in the subject matter area and willingness to put forth appropriate effort to learn the material. If you have not had an introductory forage course and some training in animal nutrition, you may need to do some extra reading to aid your progress in the course. The material provided on Canvas will aid you in organizing course material.

The course is not an applied management course. Because of the diversity of your interests and eventual work assignments, we will try to develop the important biological concepts, i.e., relationships that are true in, or can be adapted to, a wide range of situations and environments. Applied information will arise in classroom discussions and course handouts. Examples used from the literature will also highlight individual species, but these examples will not provide comprehensive coverage of each important tropical legume or grass.

### **Text:**

There is no text. Assigned readings and complete lecture outlines will be provided on Canvas by the instructor.

### **Other References of Interest (does not include journals; more recent listed first):**

Collins, M., C.J. Nelson, K.J. Moore, and R. F Barnes (eds.). 2018. Forages, Volume I - An introduction to grassland agriculture 7<sup>th</sup> ed. Wiley & Sons Ltd., West Sussex, UK.

Gordon, I.J., and H.H.T. Prins (eds.). 2019. The ecology of browsing and grazing II. Springer Publishers, Cham, Switzerland.

Moore, K.J., M. Collins, C.J. Nelson, and D.D. Redfearn (eds.). 2020. Forages, Volume II - The science of grassland agriculture. 7<sup>th</sup> ed. Wiley & Sons Ltd., West Sussex, UK.

Rouquette, F.M., and G.E. Aiken (eds.). 2020. Management strategies for sustainable cattle production on southern pastures. Elsevier Publishers, Amsterdam, Netherlands.

Nelson, C.J. (ed.). 2012. Conservation outcomes from pastureland and hayland practices: Assessment, recommendations, and knowledge gaps. Allen Press, Lawrence, KS.

Wedin, W.F., and S.L. Fales. 2009. Grassland: Quietness and strength for a new American agriculture. ASA/CSSA/SSSA, Madison, WI.

Moser, L.E., B.L. Burson, and L.E. Sollenberger. 2004. Warm-season (C<sub>4</sub>) grasses. ASA/CSSA/SSSA, Madison, WI.

- Sotomayor-Rios, A., and W.D. Pitman. 2001. Tropical forage plants: development and use. CRC Press, Boca Raton, FL.
- Lemaire, G. et al. (ed.). 2000. Grassland ecophysiology and grazing ecology. CABI Pub., New York.
- Mannetje, L. t', and R.M. Jones. 2000. Field and laboratory methods for grassland and animal production research. CABI Publishing, New York.
- Chapman, G.P. 1996. The biology of grasses. CAB International, New York.
- Fahey, G.C., M. Collins, D.R. Mertens, and L.E. Moser. 1994. Forage quality, evaluation, and utilization. American Society of Agronomy, Madison, WI.
- Jung, H.G., D.R. Buxton, R.D. Hatfield, and J. Ralph. 1993. Forage cell wall structure and digestibility. American Society of Agronomy, Madison, WI.
- Chapman, G.P., and W.E. Peat. 1992. An introduction to the grasses. CAB International, New York.
- Mannetje, L. t', and R.M. Jones. 1992. Plant resources of Southeast Asia 4: Forages. Prosea, Bogor, Indonesia.
- Humphreys, L.R. 1991. Tropical pasture utilisation. Cambridge Univ. Press, New York.
- Minson, D.J. 1990. Forage in ruminant nutrition. Academic Press, Harcourt Brace Jovanovich, New York.
- Marten, G.C. et al. 1989. Persistence of forage legumes. American Society of Agronomy, Madison, WI.
- Bogdan, A.V. 1977. Tropical pasture and fodder plants. Longman, New York.

**Course Requirements:**

1. Regular attendance at class meetings (in person or online).
2. Completion of two exams (11 October and 6 December). Exams will cover material from the lectures and related discussions indicated in the class schedule.
3. Completion of 15 reading briefs.
4. Lead one 20-minute classroom discussion and regularly prepare for and participate in classroom discussions

## **Grading:**

There will be a total of 400 possible points. The basis for assigning grades is indicated below. The grading scale may be lowered, but you are guaranteed at least the grade listed if you obtain the appropriate number of points.

<u>Item</u>	<u>Points</u>	<u>Total Points</u>	<u>Grade</u>
First exam	100	372-400	A
Second exam	100	364-371	A <sup>-</sup>
Reading briefs	150	356-363	B <sup>+</sup>
Discussion leadership	20	348-355	B
Discussion participation	<u>30</u>	336-347	B <sup>-</sup>
		320-335	C <sup>+</sup>
Total	400	308-319	C
		292-307	C <sup>-</sup>

## **Reading Briefs:**

The purpose of the reading briefs is to provide a framework that encourages greater synthesis of the assigned readings by the students and greater integration of this content into the course by the instructor.

Reading briefs will be due the day the content will be discussed in class. Each student must submit at least 15 reading briefs via Canvas during the semester. Assigned readings will be made available at least one week in advance of the day that they will be discussed in class and when the reading brief will be due. There will be many more than 15 assigned readings (~ 30), so you need submit only a subset of the possible reading briefs. Briefs will be graded on a scale of 0 to 10 points each. In nearly all cases, your brief will be a response to questions I pose for you to answer based on your reading of the assignment.

Reading brief assignments will be posted on Canvas, and your brief should be submitted using Canvas. In most cases, a one-page response (double spaced text, 12-point font) will suffice. You can choose the readings from which you wish to prepare a brief, but by the end of the semester you must have submitted at least 15. If you submit more than 15, I will count only the 15 highest scores. Remember that the briefs are due by class meeting time the day of the lecture on that topic.

## **Discussion Leadership and Participation:**

During some class periods we will have a designated period for group discussion. Each student must lead one discussion during the semester. The intent is that you choose the content for which you wish to lead the discussion, based on the topic being covered. The discussion will be based on the paper(s) I have assigned for that specific lecture, or alternatively you may choose to

discuss one or more related papers you have found. If you choose a non-assigned paper or papers, they must be made available to the instructor at least one week in advance of the discussion period so that they can be distributed to the other members of the class. **Please note that a discussion is not a lecture.** The leader is asked to prepare a series of thought-provoking questions or prompts for the group that will direct the discussion and help to draw out the most important points in the paper. The remainder of the class will be expected to respond to your questions with informed discussion based on having read the assigned papers. Twenty points will be awarded based on your leadership of the discussion period, and 30 points will be allocated based on your participation in discussions during the entire semester.

### **Excused Absences and Make-up Exams:**

Absences will be excused and make-ups scheduled in the case of illness and conflicting academic/professional activities. Except for illness, the instructor should be notified in advance. The instructor reserves the right to require documentation of the reason for the absence.

### **Grades and Grade Points:**

For information on current UF policies for assigning grade points, see <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

### **Online Course Evaluation Process:**

“Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.”

### **In-Class Recording:**

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited.

Specifically, students may not publish recorded lectures without the written consent of the instructor. A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

### **Academic Honesty:**

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.” You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment."

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code>.

### **Use of Library, Personal References, PC Programs, and Electronic Data Bases:**

These items are university property and should be utilized with other users in mind. Never remove, mark, modify nor deface resources that do not belong to you. If you're in the habit of underlining text, do it only on your personal copy. It is inconsiderate, costly to others, and dishonest to use common references otherwise.

### **Software Use:**

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

### **Campus Helping Resources:**

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere

with their academic performance.

**University Counseling & Wellness Center**, 3190 Radio Road, 352-392-1575,  
[www.counseling.ufl.edu/cwc/](http://www.counseling.ufl.edu/cwc/)

Counseling Services  
Groups and Workshops  
Outreach and Consultation  
Self-Help Library  
Wellness Coaching

**Career Resource Center**, First Floor JWRU, 392-1601, [www.crc.ufl.edu/](http://www.crc.ufl.edu/)  
**U Matter, We Care**

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

**Services for Students with Disabilities:**

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation

0001 Reid Hall, 352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)

**Student Complaint Process:**

[https://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf)

**Communication Methods for Online Students:**

Please feel free to email, text (352-213-1251), or message the instructor through Canvas regarding any course-related issues or concerns. Likewise, if you have any technical issues with course content, please contact the instructor immediately.

## AGR 6233 - Tropical Grassland Agroecosystems

### Class Schedule – Fall 2023

<u>Month</u>	<u>Date</u>	<u>Topic</u>
August	23	Course introduction
		Overview of Lectures 1-3 (highlighting of most important points; students should read through the lecture content outside of class)
		Lecture 1 - Description of warm-climate environments
		Lecture 2 - Centers of origin of tropical forages, plant introduction, and evaluation
		Lecture 3 – The importance of tropical grasslands
	31	Lecture 4 - Factors limiting livestock production in warm-climate grasslands
		Discussion - The future of grassland agroecosystems: What do we need and can it be achieved?
		Topics include multi-functionality, resilience, and landscape design
September	05	Examples of Grassland Systems
		Planted Grassland Monocultures in Brazil (Dr. João Vendramini)
		Planted Grassland Monocultures in Florida (Dr. Sollenberger)
		Native Grasslands/Rangeland in Uruguay (Nicolas Caram)
	06	Discussion - Is intensification the answer, and if so, what does it look like? Topics include sustainable intensification, species-rich grasslands, integrated crop-livestock systems, and silvopasture.
	07	Examples of Grassland Systems (Continued)
		Lecture 5 – Contributions of legumes to grass-based forage systems in warm climates
		Integrating Forage Legumes into Grass-Based Systems in Australia and Florida (Dr. Sollenberger)



- 12 Examples of Grassland Systems (Continued)
- Lecture 6 - The case for integration of crop and livestock production
- Lecture 7 – Examples of integrated food-crop and forage-livestock systems in warm climates (limited in-class time; read over outside of class)
- Integrated Crop-Livestock Systems in Kenya (Kenneth Oduor)
- 13 Examples of Grassland Systems (Continued)
- Discussion: Cover crops in integrated systems
- Lecture 8 - Silvopastoral Systems (Dr. Jose Dubeux)
- 19 Lecture 9 - Leaf anatomy of grasses
- 20 Lecture 10 - Carbon fixation pathways
- 26 Lecture 11 - Nitrogen fixation (covered in limited detail in class)  
Lecture 12 – Mycorrhizae (covered in limited detail in class)
- 27 Lecture 13 - Moisture effects on forage plant growth and development  
Lecture 14 - Temperature effects on forage plant growth and development
- October 03 Lecture 14 - Temperature effects on forage plant growth and development (continued)  
Lecture 15 - Light effects on growth, morphology, development, and seed production
- 04 Lecture 16 – Effects of shade on forage plants  
Lecture 17 – Role of fire in grasslands
- 10 **Exam 1 – Lectures 1-17**
- 11 Lecture 18 - Climate change and grassland ecosystems
- 17 Lecture 19 - Ecosystem services of grasslands  
Discussion – Amelioration of greenhouse gases
- 18 Discussion - Wildlife habitat and pollinators  
Discussion - Soil carbon

	24	Lecture 20 – Characteristics of tropical soils and plant responses to fertilization Lecture 21 - Nutrient competition and allelopathy among forage plants  Lecture 22 - Pasture establishment (Provided as content for student review; opportunity for questions in class but not covered in detail)
	25	Lecture 23 - Animal effects on pastures: Defoliation, selection, and treading Lecture 24 – Excreta deposition and nutrient cycling
	<b>31</b>	<b>No Class – Crop Science National Meeting</b>
November	<b>01</b>	<b>No Class – Crop Science National Meeting</b>
	07	Lecture 25 - Plant-animal interactions and factors affecting intake (outline provided; covered only minimally in class)
	08	Lecture 26 - Forage quality: Definition and factors affecting forage quality
November	14	Lecture 27 - Forage quality: Laboratory measures to predict forage quality Lecture 28 - Cell wall structure, composition, function, and role in forage utilization
	15	Lecture 29 - Forage antiquality factors
	20	Lecture 30 - Grazing systems and grazing management ( <b>Meeting on Monday and Tuesday because of Thanksgiving holiday</b> )
	21	Lecture 31 - Grazing intensity and frequency
	28	Lecture 31 - Grazing intensity and frequency (cont.)
	29	Lecture 32 - Hay and silage production from C <sub>4</sub> Grasses
December	05	Lecture 32 - Hay and silage production from C <sub>4</sub> grasses (cont.) Lecture 33 - Supplementation of forage diets and use of forage banks
	06	<b>Exam 2 (Lectures 18-33)</b>