

Research Techniques in Forage Evaluation – Summer 2023

AGR 6237C - 3 credits

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Office Hours:

My schedule is somewhat variable during the summer due to travel and research responsibilities. Regular office hours are generally not possible. Thus, I suggest making appointments by email or text (352-213-1251) when scheduling a time to see me. I am happy to meet in person or by Zoom.

Meeting Times:

Lecture/Discussion – Days of the week vary – 3:00-4:30 (426 McCarty Hall C)
Lab – Field activities; To be arranged
Zoom link - <https://ufl.zoom.us/j/983854793>

Course Objectives:

1. To provide a working understanding of a systematic approach to forage evaluation.
2. To acquaint students with proper terminology and methodology in forage research.
3. To provide field experiences with forage research techniques.
4. To provide experience in organizing and manipulating data sets generated in field exercises.
5. To develop the student's skills in critical evaluation of research and in designing research projects.

Required handouts and lecture materials:

Reading assignments, lecture content, and in some cases, discussion questions will be provided for each class period using Canvas. Material will be available well in advance of its use in class. Students are expected to prepare for each class by carefully reviewing the lecture notes, reading the assigned material, and studying the discussion questions. Lecture periods will be used primarily to address any material from the notes that is unclear (based on questions from the class) and to discuss issues raised by the instructor's questions or by the students.

References:

Lectures will be supplemented with handouts and reading material from various sources. They will be provided to you in advance of the topic being discussed in class. There are some classical sources of information on this subject matter, and though most are quite old, they may be of interest to you. You are not required to access them for this course.

- Barnes, R. F., D. C. Clanton, C. H. Gordon, T. J. Klopfenstein, and D. R. Waldo (editors). 1970. Proceedings of the National Conference on Forage Quality Evaluation and Utilization. Nebraska Center for Continuing Education, Lincoln, Nebraska.
- Barnes, R.F., D.A. Miller, and C.J. Nelson. 1995. Forages: The science of grassland agriculture. Iowa State University Press, Ames, IA.
- Fahey, G.C., Jr., M. Collins, D.R. Mertens, and L.E. Moser (eds). 1994. Forage quality, evaluation, and utilization. American Society of Agronomy, Madison, WI.
- Hodgson, J., R. D. Baker, Alison Davies, A. S. Laidlaw, and J. D. Leaver (editors). 1981. Sward measurement handbook. Brit. Grassl. Soc. Hurley, Berkshire, England.
- Leaver, J. D. (editor). 1982. Herbage intake handbook. Brit. Grassl. Soc. Hurley, Berkshire, England.
- Mannetje, L. t', and R.M. Jones (editors). 2000. Field and laboratory methods for grassland and animal production research. CABI Publishing, New York.
- Marten, G.C. 1989. Grazing research: Design, methodology, and analysis. Crop Sci. Soc. Amer., Madison, WI.
- Shaw, N. H., and W. W. Bryan (editors). 1976. Tropical pasture research - principles and methods. Bull. 51, Commonwealth Agricultural Bureau (CAB) Hurley, Berkshire, England.
- Wheeler, J. L., and R. D. Mochrie. 1981. Forage evaluation: concepts and techniques. American Forage and Grassland Council and CSIRO, Lexington, Kentucky and Brisbane, Australia, respectively.
- Wilson, J. R. (editor). 1978. Plant relations in pastures (Proceedings of a Symposium). CSIRO, East Melbourne, Australia.

Course Requirements:

1. Attend all lectures and labs and arrive on time
2. Prepare for and participate actively in classroom discussions
3. Complete four problem sets, three of which are based on field activities
4. Participate in a group term project built around a scheme for forage evaluation
5. Complete midterm and final examinations

Grading:

There are a total of 400 possible points. The assignment of points and the basis for awarding grades are listed on the next page. The grading scale may be lowered, but you are guaranteed at least the grade shown if you obtain the appropriate number of points.

<u>Item</u>	<u>Points</u>	<u>Total points earned</u>	<u>Letter grade (grade points)</u>
Exam 1	100	372 - 400	A (4.0)
Exam 2	100	364 - 371	A ⁻ (3.67)
Problem sets (4)	100	356 - 363	B ⁺ (3.33)
Term project	<u>100</u>	348 - 355	B (3.0)
Total	400	340 - 347	B ⁻ (2.67)
		328 - 339	C ⁺ (2.33)
		300 - 327	C (2.00)

Term Project:

Each registered student will assume the role of a research scientist working as a member of a multi-disciplinary team. There will be approximately 3 students per team. Teams will be appointed by the instructor, with an attempt to balance M.S. and Ph.D. students and their primary discipline interests. The teams will be required to identify a forage-related production problem for which the most likely solution is the introduction of a new forage or forages into the existing production system. The problem need not be relevant to Florida, but it should be real to a production system somewhere in the world. After identifying the problem, the group should outline the general objectives for the overall project. Thereafter a scheme for evaluation (a series of experiments) should be identified that will lead to release to producers of a forage plant or plants that address the production problem identified.

Each team member will be responsible for at least one experiment within the overall project. Each student's experiment must have its own specific objectives. The general project objectives should be stated such that they cannot be met unless each of the individual experiments is completed, but each individual experiment should be such that it will result in a separate research publication (if we really were going to do the research). The individual experiments may be simultaneous and use the same resources of land, animals, etc., if this is desirable to meet objectives. On the other hand, experiments could be sequential. You should assume that land, animals, supplies, and equipment are available for use by the research team, i.e., you don't need to rent or buy those things. Also assume that breeding lines or forage plant introductions will be available to you at the beginning of this process, i.e., you need not get involved in plant breeding or plant collecting as part of this project.

We will use the following schedule for submitting elements of the term project. Deadlines are Friday at midnight of the week indicated unless a specific date is indicated. Submit your work as a Word file by email. I will review your submission, make suggestions, and return them to the group. None of these interim submissions are graded. They are simply to make sure you are on track.

Week of 16 May – Teams appointed

Week of 5 June - Project title and objectives (rough draft)

Week of 3 July - Project title and objectives (revised draft), and outline of experiments (experiment outlines should include objectives, treatments, and response variables [do not need to provide detailed methodology at this stage])

2, 8, and 9 August - Group oral presentations (45 minutes total for each team; 30-35 minute presentation, 10-15 minute discussion)

10 August - written group project due at noon

The written project report should include:

1. A title page
2. A table of contents
3. A one page abstract
4. An introduction to the problem including justification and a list of experiments to be conducted
5. A statement of overall project objectives
6. A separate section for each experiment containing:
 - a. A list of specific objectives
 - b. Materials and methods (treatments and experimental design, management practices, response variables, measurement procedures, and statistical analyses)
 - c. A general budget (categories can include equipment, materials and supplies, labor, and graduate students/postdocs; assume a working lab is in place and that you need only purchase reagents and supply technical assistance).

Your grade on the project will be based on:

1. Your team grade - 40 out of 100 points is based on the quality of the overall project (oral and written components), the degree of organization and flow of the project, the integration of all team members into the overall planning process and into the presentation of the project
2. Individual grade - 60 out of 100 points will be based on the instructor's evaluation of each individual's portion of the project as well as their oral presentation

Laboratory Problem Sets:

1. Measuring DM Harvested and Botanical Composition In Small Plots (due **3 July by 5 p.m.; 20 points**)
2. Calculation of Herbage Mass of Grazed Pastures Using Double Sampling Data (**due 10 July by 5 p.m.; 20 points**)
3. Calculation of Botanical Composition of Grazed Pastures Using Double Sampling Data (due **17 July by 5 p.m.; 20 points**)
4. Calculation of Animal Responses in a Grazing Trial (due **31 July at midnight; 40 points**)

NOTE!! For all assignments, a 10% penalty will be assessed for each day that it is late.

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.ua.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.ua.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/

- 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/
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 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/

Student Complaint Process:

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.

Topic and Activity Schedule - Summer C - 2023

A. Overview, Statistical Considerations, and Measurement of Plant Responses

<u>Date</u>	<u>Topic</u>
9 May	Course Overview Lecture 1 - Terminology for Forage and Grassland Research Lecture 2 - Measures of Grassland Production
10 May	Discussion of Lectures 3 and 4: View content prior to class and come prepared with questions/ideas for discussion Lecture 3 - Options in Agricultural Research Programs Lecture 4 - Challenges, Opportunities, and Applications of Grazing Research (available as the Powerpoint and as a <i>Crop Science</i> paper [see reference list])
11 May	Lecture 5 - Field Designs in Forage Research Lecture 6 - Schemes for Forage Evaluation
Week of 14 May – International Grassland Congress (No class)	
23 May	Lecture 6 (continued) - Schemes for Forage Evaluation Lecture 7 - Evaluation of Genetic Lines (Phase 1)
24 May	Lecture 8 - Quantifying Dry Matter Harvested and Botanical Composition in Small Plot Experiments (Phase 2)
25 May	Lecture 9 - Quantifying Productivity of the Grazed Sward
30 May	Lecture 10 - Quantifying Canopy Botanical Composition in Grazed Grasslands
31 May	Lecture 10 (continued): Quantifying Canopy Botanical Composition in Grazed Grasslands; Lecture 11 - “Big Data” and Forage and Grazinglands Research
6 June	Lecture 12 - Characterization and Evaluation of Forage Regrowth Mechanisms Lecture 13 - Post-harvest Handling of Forage Samples
8 June	Exam 1 (Covers Lectures 1-13)
13 June	Field Exercise (time to be announced) - Measuring DM Harvested and Botanical Composition in Small Plot Clipping Experiments (UF-IFAS Plant Science Research and Education Unit) – also available at Marianna this week
14 June	Field Exercise (time to be announced) - Determining Herbage Mass in Grazed Swards (UF-IFAS Beef Unit) – also available at Marianna this week

Field Exercise (time to be announced) - Determining Botanical Composition in Grazed Swards (UF-IFAS Beef Unit) – also available at Marianna this week

B. Measuring Animal Responses on Grazed Swards

- 19 June Lecture 14 - Research Techniques to Describe Relationships at the Plant-Animal Interface
- 20 June Lecture 15 - Response Variables in Animal Production Studies
Lecture 16 - Fixed and Variable Stocking Rate Experiments

Week of 25 June – Summer Break

- 5 July Lecture 17 - Stocking Rate and Forage Allowance
- 6 July Lecture 18 - Interrelationships Among Forage Nutritive Value, Forage Quantity, and Animal Performance
- 11 July Lecture 19 – Calculation of Animal Responses in Grazing Trials
Lecture 20 - Experimental Design and Errors in Grazing Trials
- 12 July Lecture 21 - Weighing Errors in Liveweight Gain Experiments on Pasture

Week of 17 July – Animal Science Society National Meeting

- 25 July Lecture 22 - Measuring Intake on Pasture
- 26 July Lecture 23 - Supplementation Trials on Pasture
- 1 August Exam 2 – Lectures 14-23**
- 2 August Team Project Presentation (45 minutes per team; two teams)**
- 8 August Team Project Presentation (45 minutes per team; two teams)**
- 9 August Team Project Presentation (45 minutes per team; one team)**