In which department should forages be taught?

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ABSTRACT

Forages as a discipline and forage workers in general are declining nationwide. Why is this? Could it be the department in which forage courses are taught? This paper will take a brief look at the history of forage/livestock grazing research, who currently teaches a forage course and where forages are currently taught at various land grant institutions. Finally, the question and a potential answer is provided regarding where might the forage discipline be taught to increase their exposure to undergraduate students.

Key words: forages, ruminants, teaching

INTRODUCTION

Pasturelands are lands devoted to production of both native and introduced forages and used for grazing, hay production, or both (Allen et al., 2011). In the United States, pasturelands comprise approximately 48.5 million ha devoted primarily to grazing and another 25.1 million ha used for hay and conserved forage production (Sanderson et al., 2012). Forages, as a discipline and as a biological entity, perform many roles and ecological services. Besides serving as the primary source of nutrients for grazing animals, forage plants have long served as the original soil health guardians sequestering, enhancing the hydrologic cycle, and protecting valuable soil resources from water and wind erosion. Additionally, forages provide shade and ameliorate the effects of solar radiation for many species of wildlife; provide structure, and thus, different types of habitat and escape cover for bird species and small mammals; diminish negative effects of noise and heat sinks associated with urban pollution; improve air and water quality; protect and enhance soil resources and reduce soil erosion; and capture carbon, reducing the atmospheric concentration of the number one greenhouse gas, carbon dioxide. In fact, perennial pasturelands capture and store many times more carbon in the soil than row crop systems. Certain forages, legumes specifically, in a symbiotic relationship with host-specific Rhizobium spp. bacteria, fix atmospheric nitrogen into forms utilized by plants, thus decreasing the need for inorganic nitrogen fertilizers in certain grazed pasture ecosystems. Forages also provide a complementary aspect to silvopastoral systems in concert with timber production.

Despite the valuable role forages perform for livestock agriculture, wildlife, and urban society, forages as a discipline and as a biological entity garner little attention or financial support from commodity groups and federal funding. Those who are working in the forage discipline have long recognized the limited appreciation for forages and management techniques to improve forage productivity by stakeholders, colleagues, and administrators, but have continued their research, extension, and teaching efforts. Today, however, the number of forage scientists is decreasing at an alarming rate. A question was raised prior to the 2021 annual meeting of the American Society of Animal Scientists held in Louisville, KY. “In which department should forages be housed?” At first, the answer appeared obvious, Plant Science. At Texas A&M University, forages are taught and always have been taught in a plant science department, currently the department of Soil and Crop Sciences. However, was a plant science department the correct response? And was that even the most appropriate question? The assigned task was to discuss the issue at a special forage symposium on 17 July, 2021, and those are the objectives of this review.

DISCUSSION

Forages and Pastures

The history of forages and its related topic, grazing management, has been noted and discussed for many years. Livestock owners and managers have long known green typically is better than brown, a standing crop of forage was better than bare ground, and they concluded that forage regrowth following a fire must have been better than the previous standing crop because all manner of grazing ungulates were attracted to the area. Actual research on forages began in earnest in the 20th century as noted by Burns (2006). Burns noted a symposium conducted during the annual meeting of the American Society of Agronomy in 1924 evaluated pasture techniques and utilization as described by Carrier (1924) and Fain (1924). This was followed by the first replicated grazing trial with statistical analysis (Kincaid, 1945) in Virginia and another study by Petersen (1947) at Iowa State University. Prior to these reported studies, only non-replicated demonstrations projects...
had been published. However, Burns noted an apparent separation between plant science and animal science regarding the forage discipline. As investigations progressed and matured, there appeared to be a growing disconnect between the disciplines. Studies conducted by plant science departments traditionally had large numbers of support courses related to soils, soil fertility, etc. However, these studies sometimes failed to capture the interaction between the forage and the animal, thus providing little information on forage utilization or animal performance. Conversely, while studies conducted within animal science departments focused on animal nutrition and performance and forage utilization, there was little attention given to soils and soil fertility or plant physiology and plant breeding. Essentially creating two methods of researching the same topic with little collaboration.

In a review on the nutritive value of forage crops, Raymond (1969) stated that “nutritionists can treat the animal and forage it eats in isolation. However, the agronomist must also consider the problems that arise when the animal and its feed are brought together in practical systems of forage production and utilization.” Hence, Raymond was highlighting the importance of a multidiscipline approach to the research and education aspects of forages. Forage nutritive value and quality have long been studied by both animal and plant scientists. In the 1960s, new techniques of partitioning plant components into readily and partially digestible fractions determined by the detergent methodology were developed by Van Soest and associates (1963, 1967). Research in forage-quality evaluation and utilization was highlighted in 1969 at the National Conference on Forage Evaluation and Utilization in Lincoln, NE (Barnes et al., 1970). This subject was updated and emphasized 25 yr later at the National Conference in Lincoln, NE (Fahey et al., 1994). Obviously, the study of forages should integrate soils, plants, associated disciplines, and the animal within specific environments. However, as time progressed, faculty hired within each of those departments more often than not were scientists with more and more specific training in one area or the other. This departmental focus created a segregation of the disciplines, and with a few notable exceptions, the disconnect still exists today.

Curriculum

The forage discipline is multifaceted and individuals with the breadth of knowledge required to teach a comprehensive forage course are becoming fewer in number. Topics covered in a typical forage course include, but are not limited to: Genetics, Physiology, Ecology, Pathology, Entomology, Soils and Soil Fertility, Crop Production, Microbiology, Animal Science including Beef and Dairy cattle, small ruminants, Equine, Rangeland and Forestry, Wildlife Science, Agricultural Economics, and Finance, etc. The “accepted text” for forage classes has been “Forages: The Science of Grassland Agriculture” with editions in 1951, 1962, 1973, 1985, 1995, 2007, and 2020. In the 2020 edition, there were 93 contributing authors who had written 48 Chapters with sub-divisions of Forage Plants, Forage Ecology, Forage Species, Forage Systems, Forage Production and Management, Forage Improvement, Forage Quality, Harvesting and Utilization, and Pasture Management (Moore et al., 2020). The nature of forages is that of plant sciences and related, dependent supportive commodities all integrated with production, harvesting as stored forages, and grazing management. More recently, groups such as USDA, NRCS, ARS, AFGC, NCBA, and others have encouraged and promoted the inclusion of conservation and sustainability as primary factors in soil-forage-animal research and education (Nelson, 2012). Additionally, management strategies for sustainable pastures and livestock have been introduced as guidelines for the soil-plant-animal-social interface (Rouquette and Aiken, 2020).

Who Will Teach the Forage Courses?

As interesting a question as to which department could or should teach the forages course, maybe the larger issue is WHO will teach or instruct forage focused courses? Teaching such a course in a single semester is not an easy task. Thus, whether Forages is to be a one- or two-semester course, a best approach may involve either team-teaching or guest lecturers to cover various associated disciplines. But, one of the questions today is “who is actually given the role as instructor of record for teaching forage courses today?” In many instances, the “teaching opportunity” is given to the new assistant professor, who may or may not have any experience in forage selection, establishment, management, and utilization. Sometimes, the instructor is a graduate teaching assistant who may be working on a degree totally apart from forages and has little knowledge or experience with forages. Obviously, neither scenario is ideal and faculty who teach forages should be trained in the forage discipline.

Rouquette et al. (2009) documented the loss of teaching, research, and extension faculty members whose primary discipline was forages (Figures 1 and 2). A review of the data indicated there were only half of the forage researchers in 2004 compared with 1984 and only 60% of the teaching FTEs.

Redmon, Larry and Monte Rouquette (2014, unpublished data) noted further losses within the ranks of extension forage specialists, which was only 42% of the number reported in 1984 (Figure 3). The decline in Texas extension forage faculty, however, was much worse than the mean of the surveyed states (Figure 4) and only 17% of the number reported in 1984 (Redmon, Larry 2021, unpublished data). From an administrative standpoint, one would think that all the forage selection, establishment, management, and utilization questions had been answered. Thus, this may be the apparent explanation for the continued decline in investment in faculty with forage expertise. We realize, however, all of
those questions have not been answered and new questions continually arise.

**Which Department Should Forages be Taught?**

In which department should forages be taught? To determine the current state of the discipline, a cursory survey of various land grant institutions was conducted. The limited review provided the information contained in Table 1. The term “Plant Science” does not necessarily indicate the department name, but the type of department. The same is true for “Animal Science.” As the data immediately indicated, all but one of the states surveyed teach forages in a plant science department. The University of Arkansas is an outlier in that not only is the forage course taught in Animal Science, but the extension forage specialist is also a member of the Animal Science faculty.

There are essentially two confounding issues associated with where forages are taught. One is the faculty member who teaches. Rarely are faculty experiences such that they are trained and/or experienced in both the plant side and the animal utilization side of the equation. Additionally, there is the question of which department gets credit for the student credit hours associated with the class. Departments can be possessive regarding weighted student credit hours. And although forages are typically taught as a service course benefitting multiple departments, who gets credit can be an important issue for administrators. One alternate approach could be offering a cross-listed course team-taught by members of both the plant science and animal science departments. Using this approach, both departments would get credit for the student credit hours, albeit the total number may be divided, but this could result in better integration of the two disciplines.

**CONCLUSION**

In conclusion, most land grant institutions house the forage discipline in a plant science department. There are still broken linkages between the traditional plant science emphasis on soils, plant physiology, and genetics and the animal science focus on forage utilization and animal performance. Some integration of the two disciplines, with input from entomology, plant pathology, and agricultural economics would seem to be warranted and a cross-listed, team-taught course could provide a path forward. In the final analysis, it may not matter as to the department where forages are taught as much as it does who will conduct the research, teach the courses, and extend the science-based information to the students. Perhaps some of the most important considerations for a Forages Course includes the student interests in the subject matter and how to “fit in”
such a course with a downsized number of required hours for graduation. At some point, Universities need to re-assess the objectives between moving students through the process in 4 yr vs. providing a baseline of information that can be retrieved in their career paths.

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