FY2017 Annual Report
National Program 215—Pasture, Forage and Rangeland Systems

Introduction

The USDA-ARS National Program for Pasture, Forage and Rangeland Systems (NP215) had another productive year in 2017 in terms of scientific output, technology transfer activities and breadth of collaborations with partners and stakeholders across the US and around the world. Scientists in NP215 continue to make extraordinary impact in numerous diverse areas of research relating to the management of the Nation's natural resources, including the over 1B acres of rangelands and pasture lands.

In FY2017, NP215 continued implementing project plans that were developed from comprehensive stakeholder input gleaned from the NP215 national stakeholder workshop in 2012. The workshop brought stakeholders and the NP215 research community together to prioritize the scope and direction of research in NP215 and to discuss current and future areas of impact for stakeholders.

The overarching goal of NP 215 is:

> *To improve food and energy security while enhancing the natural resources base by developing and transferring economically viable and environmentally protective technologies for sustainable range, pasture, forage and turf production systems that are based on fundamental applications of ecological and agronomic processes, and that are flexible to mitigate and adapt to the uncertainties of changing climate and market conditions.*

Our Nation's range, pasture, and herbage-based forage and turf landscapes serve many critical functions. Farms and ranches produce high quality, nutritious, abundant, and safe food products, as well as fiber and wood products that are the basis of income for producers and their rural communities. Rural areas provide significant ecosystems services such as clean air, water, and wildlife habitat, and are a long-term repository for biodiversity. These systems comprise about half of the land surface of the United States and represent a large and diverse mix of ecological sites, including annual grasslands of California, tundra rangelands of Alaska, hot arid deserts of the Southwest, temperate deserts of the Pacific Northwest, semiarid cold deserts of the Great Basin, prairies of the Great Plains, humid native grasslands of the South and East, and pastures and hay fields within all 50 states from Hawaii to Maine and Alaska to Florida.

The United Nations estimates that two-thirds of the world's agricultural land is pasture, forage and rangelands that can sustainably produce high quality animal products, but are unsuitable for more sustained, intensive production of grains or vegetables for human consumption. Knowledge gained about the development of sustainable land management in the United States will aid people across the globe, and ARS research will be critical to meeting the food security demands of a projected 9+ billion people by 2050. In FY2017, the importance of these global applications was demonstrated by NP215 scientist collaborations with researchers in Argentina, Australia, Brazil, Canada, China, Colombia, Denmark, Ethiopia, France, Germany, Greece, Ireland, Jordan, Kazakhstan, Kenya, Mexico, New

Zealand, Russia, Ukraine, United Kingdom, and Uruguay. Many of these international interactions continue long term and productive scientific relationships.

The Nation's 30-40 million acres of turf lands are found around our homes, schools, municipal and commercial buildings, in our parks, greenbelts and recreational areas, and along our roadsides, airports and right-of-ways. These lands contribute to our well-being in many ways, including beautifying our towns and cities; enhancing property values; and providing vital environmental services such as erosion prevention, nutrient cycling, carbon sequestration and aquifer replenishment. These industries contribute an estimated $40 billion a year to the U.S. economy.

Pastures, forages and rangelands are the primary forage base for U.S. livestock grazing industries and are used by more than 60 million cattle and more than 8 million sheep and goats. Forage livestock systems contribute more than $100 billion in farm sales annually to the U.S. economy. The estimated value of alfalfa and other hay production is $13 billion, and is the third most valuable crop to U.S. agriculture, behind only corn and soybeans. In addition, hay exports from all U.S. ports has increased 34% during the 2002-2011 period to nearly 4M metric tons per year. The publicly owned rangelands in the western U.S. are also critically important, providing forage on 260 million acres for three million beef cattle and sheep raised on over 30,000 primarily family owned and operated ranches. Nearly 70% of dietary protein and 40% of dietary calories for the U.S. population are of animal origin, and forage resources are crucial for sustained efficient production of food animal products.

The ecosystem services provided by these lands are of increasing importance. Watersheds in upland range and pasture regions are essential sources of clean water for urban areas, irrigated agriculture, and recreation. These lands provide forage and habitat for numerous wildlife species, including 20 million deer, one-half-million pronghorn antelope, 400,000 elk, 55,000 feral horses and burros, and hundreds of additional animal and bird species. An array of additional demands are also placed on these natural resources, including mining, oil and natural gas production, camping, hiking, fishing, hunting, and other recreational activities. For example, Bureau of Land Management rangelands, primarily in the western U.S., supported over 1.5M hunters and over 40M visitors in 2011. Meeting these many demands requires an improved understanding of how basic ecological processes are affected by grazing livestock production, drought, climate change, forage management and harvest, and other conservation practices.

Of particular significance is the continued close working relationship between NP215 Scientists and technical staff with the Natural Resource Conservation Service. The NRCS provides technical support to the management of ~1 billion acres of private grazing lands. ARS scientific support in the development of conservation practices deployed by the NRCS, and the quantitative techniques employed in evaluation their effects, is critically important to the management of these natural resources.

Harvested and conserved forages provide a dietary resource for continuity of livestock production that is especially important during periods of cold or drought when nutrient rich plants are not available. Harvested and conserved forages also provide an important source of roughage and nutrients for dairy cattle in confined animal feeding operations. To meet this demand, nearly 200 million tons of forage

crops are harvested each year from 73 million acres in the U.S., which is 24% of the cropland - providing about half the forage requirements of dairy cattle. The remainder, along with rangeland and pasture, supplies the forage needs of beef cattle, sheep, goats, horses, and other livestock. Increased forage and food animal production efficiencies are needed to ensure the competitiveness and sustainability of food animal producers and to improve domestic and international food security.

During FY 2017, 91 full-time scientists working at 20 locations across the U.S. actively engaged in 24 ARS-led and 178 cooperative research projects in NP215. ARS-lead projects were approved through the ARS Office of Scientific Quality Review in 2012, making FY2017 the final year of implementation of these five-year projects. The gross fiscal year 2017 funding for NP215 was $42 million.

Personnel news in FY2017

New additions to the NP215 team in 2017 were:

- **Dr. Dannele Peck** was selected as the Director of the USDA Northern Plains Climate Hub, Fort Collins, CO. Dr. Peck was formerly an Agricultural Economist with the University of Wyoming. Her expertise is decision-making under risk and uncertainty including drought preparedness, increasing farm/ranch resilience to weather variability and changing climate, and disease prevention and management in livestock and wildlife.
- Ecohydrologist **Dr. David Hoover** joined the Rangeland Resources and Systems Research Unit, Ft. Collins CO, after a post-doctoral position with the U.S. Geological Survey in Moab, UT. His expertise is carbon and water dynamics through the soil-plant-atmosphere continuum at multiple temporal and spatial scales, ranging from plant-level ecophysiology through ecosystem-level exchange, to landscape-level patterns of water movement, storage and use.
- **Dr. Alessandra Favero**; a visiting scientist from Embrapa's, Southeast Livestock Center, Sao Carlos, SP, Brazil; has been working with the Crop Germplasm Research Laboratory, College Station TX, on breeding and genetics of forage grasses.
- The Wheat, Sorghum and Forage Research Unit, Lincoln NE, had two visiting scientists in 2017: **Dr. Chris Chastain**, Professor in the Biology Department of Minnesota State University at Moorhead, is working on a collaborative project on cytosolic PPDK—an enzyme implied in switchgrass rhizome dormancy metabolism. **Dr. Lisa Baird**, Professor in the Biology Department at University of San Diego, CA is collaborating with WSFRU on aspects of cell wall lignification and switchgrass-aphid interactions.
- **Dr. Chowda Reddy,** Molecular Biologist, also joined the WSFRU as a postdoctoral research associate in 2017. Dr. Reddy's work focuses on understanding the gene/protein networks involved in switchgrass-virus interaction for disease resistance/susceptibility.
- **Dr. Charles Hawkins**, with a Ph.D. from the University of Maryland in Cell Biology and Molecular Genetics, joined the Plant Germplasm Introduction and Testing Research Unit, Prosser WA, as a postdoctoral research associate. His current research project focuses on the use of quantitative genetics and bioinformatics leading to enhanced resistance to biotic and abiotic stresses in alfalfa.

- **Dr. Paulo Vieira** joined the Molecular Plant Pathology Laboratory, Beltsville MD, as a postdoctoral research associate as part of an agreement with Virginia Tech University.
- **Dr. Lea Condon** is a USGS postdoctoral research associate from Corvallis, Oregon being hosted by Great Basin Rangelands Research Laboratory, Reno NV. Dr. Condon is working with GBRR on restoration of degraded Great Basin rangelands through the use of native mosses to stabilize soils and enhance success of grasses and shrubs being reintroduced on post-fire disturbed sagebrush steppe ecosystems.
- **Dr. Kristan McElligott** joined the Dairy Forage Research Laboratory, Madison WI, as a postdoctoral research associate. Dr. McElligott's research focuses on landscape-scale assessment of grassland, forest, and shrub biomass and association with spectral data.
- The Dale Bumpers Small Farms Research Center, Booneville AR, welcomed two Oak Ridge Institute for Science and Education (ORISE) postdoctoral research associates in 2017: Soil Scientist **Dr. Jenny Richter**, and Animal Scientist **Dr. Christine Nieman**.

The following scientists retired from the ranks of NP215:

- **Dr. Laj Ahuja**, an internationally-recognized modeler, retired from the Rangeland Resources and Systems Research Unit, Ft. Collins, CO.

The distinguished record of service of Dr. Ahuja is recognized world-wide, and he will be missed in NP215.

The following scientists in NP 215 received prominent awards in 2017:

- **Dr. Fred Pierson** of the Watershed Management Research Laboratory, Boise ID, and **Dr. Mark Weltz** of the Great Basin Rangelands Research Laboratory, Reno NV, were recognized as part of the Rangeland Hydrology and Erosion Model (RHEM) team, which was awarded the 2017 Federal Award for Customer Service. This award annually recognizes, promotes, and rewards service excellence, professionalism, and outstanding achievements by federal employees, including teams working on initiatives with a direct impact on customers. The RHEM team was specifically recognized for outstanding innovation and teamwork in designing, producing, and transferring a new generation of rangeland hydrology and erosion prediction technology to user agencies.
- **Dr. Chad Boyd,** Research Leader of the Range and Meadow Forage Management Research Laboratory, Burns OR, received a "Distinguished Service Award" from the Oregon Cattleman's Association. RMFM also celebrated the news that former Research Leader **Dr. Tony Svejcar** (retired) will receive a "Sustained Lifetime Achievement Award" from the Society for Range Management.

- **Dr. Michael Casler** of the Dairy Forage Research Laboratory, Madison WI, received the Medallion Award from the American Forage and Grassland Council for lifetime scientific achievement and contributions to the forage and grassland discipline.

The quality and impact of NP 215 research was further evidenced in 2017 by following:

- Over 185 refereed journal articles published;
- four new patents applications filed and one new patent granted;
- five new invention disclosures;
- a new cooperative research and development agreement, and 11 new material transfer agreement with stakeholders.

NP 215 Accomplishments for FY2017

This section summarizes significant and high impact research results that address one of the 4 specific components of the FY 2013 – 2018 action plan for the NP 215. Each section summarizes accomplishments of individual research projects in NP 215. Of particular note are the many high impact accomplishments that address key problems facing management of the Nation's grazing lands. Units in the NP215 program have been nimble in directing research to develop conservation practices and pasture/forage management systems that solve critical problems, including controlling wildfire and erosion, enhancing habitat values for critical species including sage grouse, controlling invasive species such as cheatgrass, and development of ecologically based techniques for quantitatively assessing and monitoring land. Many of the programs summarized for FY 2017 include significant domestic and international collaborations with both industry and academia. These collaborations provide extraordinary opportunities to leverage funding and scientific expertise for USDA - ARS research by rapidly disseminating technology, which enhances the impact of ARS research programs.

Component 1. Improved Rangeland Management for Enhanced Livestock Production, Conservation, and Ecological Services

Grazing after a fire does not detrimentally affect production or plant communities. The 17 western states in the contiguous U.S. averaged 4.6 million acres burned in each of the last 5 years. In addition to costs ranchers face in replacing infrastructure, natural resource agencies often require removal of grazing for 1-3 years after fire. Resulting annual costs in rented pasture alone exceed $54 million. ARS scientists in Miles City, Montana, in cooperation with the U.S. Forest Service, determined northern mixed prairie can be grazed the first growing season after spring wildfire without loss in plant production or negative changes in the plant community. Fire increased plant production 56% the year of the wildfire and yielded slightly more or similar production as nonburned sites with a history of light to moderate grazing the second and third years after fire. A companion study demonstrated that plant response to fire was similar whether sites were mowed in June, August, October or not mowed after fire. Neither complete rest nor seasonal delays in grazing are necessary for maintenance of plant productivity and species composition in northern mixed-grass prairie following spring wildfire. Results were similar to recent research from the same lab indicating northern mixed prairie is resistant to grazing after summer fire. Results are assisting natural resource agencies with grazing management decisions after fire and reducing pasture costs for ranchers affected by wildfire. Resulting research papers have been used for popular articles in Ag Research, The Furrow, and On Pasture magazines.

Enhanced winter grazing through cultivar development and research on tall statured forage kochia. Winter feeding can account for up to 70% of the annual costs of livestock production in the western U.S. These costs can be reduced by extended grazing into the fall and winter, but grasses that become dormant in the fall lack the protein needed for ruminants such as cattle. Forage kochia is a semi-shrub that has been seeded on rangelands for fall and winter forage, and previous research showed that the cultivar 'Immigrant' provided needed protein and reduced winter feed costs by 25 percent; however, it has been limited by poor establishment and short stature. 'Snowstorm' a new forage kochia cultivar was developed and released in 2012 by ARS scientists in Logan, Utah. In field comparisons to

Immigrant, Snowstorm was 64 percent taller, produced 68 percent more forage, and had increased protein and digestibility. Snowstorm has quickly impacted private and public rangeland seedings, as evidenced by the Bureau of Land Management exclusively bidding for Snowstorm in the 2016 seed buy, purchasing 4000 pounds valued at $101,500.

Weather tools for rangeland restoration planning. Rangeland restoration efforts in the Intermountain Western U.S. have historically had relatively low success rates, primarily due to the general aridity of this region, and the extremely high variability in weather. These dry landscapes often require multiple iterations of applied restoration practices in order to re-establish resilient perennial vegetation that can support wildlife communities and livestock grazing. ARS researchers and collaborators in Boise, Idaho; Burns, Oregon; Moscow, Idaho; Logan, Utah; Provo, Utah; and Woodward, Oklahoma collaborated in developing a general strategy for adapting rangeland restoration planning and management to accommodate weather variability and help establish diverse plant communities on Great Basin rangelands that have been severely disturbed by wildfire and are dominated by introduced annual weeds. Efforts are underway to work with federal land management agencies to implement this weather-based landscape restoration strategy in the development of programmatic management plans on public rangelands in southern Idaho. Implementation of these plans could improve rangeland restoration success rates on millions of acres of disturbed rangeland throughout the Intermountain Western U.S.

Isoflavones in red clover can boost average daily gain of beef calves and mitigate fescue toxicosis. ARS researchers in Lexington, Kentucky, determined that over-seeding toxic endophyte-infected tall fescue with red clover increased steer average daily gain 72 percent as compared to those grazing tall fescue without over-seeded red clover. Ergot alkaloid-induced vasoconstriction was less for steers grazing the fescue-red clover mixture. Over-seeding red clover into toxic endophyte-infected tall fescue is an effective management tool for enhancing weight gain performance and mitigating fescue toxicosis.

Detection of pyrrolizidine alkaloids in herbal products. ARS scientists in Logan, Utah, in cooperation with American Herbal Pharmacopoeia, analyzed about 70 samples purported to be from the herbal plant “boneset” (Eupatorium perfoliatum) for the presence of dehydropyrrolizidine alkaloids. These alkaloids are potentially toxic, associated with liver and lung damage, congenital anomalies and various cancers. The results clearly showed that the “boneset” samples contained dehydropyrrolizidine alkaloids. Further, there was misidentification of plants by some collectors, revealed by the difference in the alkaloids detected. Tinctures and water infusions of “boneset” also contain the alkaloids. Pyrrolizidine alkaloids presence in these samples suggest potentially serious negative impacts on human heath, particularly liver toxicity, are possible. They also suggest variability in the correct identification of this plant. These findings will provide valuable information to the herbal products industry and consumer to reduce safety concerns and toxicity problems in humans.

Herbicidal control of cheatgrass. A key component to rehabilitate cheatgrass-degraded rangelands is the use of soil-active herbicides. ARS researchers at Reno, Nevada, have tested the herbicides Plateau®, LandMark® and Matrix®. Cheatgrass densities were reduced over 96 percent, which significantly decreased seeded species seedling competition for limited resources. Herbicide plots

increased soil moisture by more than 40 percent greatly benefitting the establishment of newly seeded species by more than 600 percent. Increased establishment of seeded species decreased cheatgrass associated fuels by more than 900 percent reducing the potential for catastrophic wildfires and loss of life and property.

Novel low dose herbicide control of medusahead. Medusahead is among the most ecologically and economically damaging invasive weeds of the western U.S. Research led by ARS scientists in Miles City, Montana, collaborating with industry and university partners, has discovered a completely novel approach for managing this invasive annual grass. The herbicide aminopyralid applied at a very low rate just prior to medusahead flowering drastically reduced seed production in the current generation of plants and reduced cover to nearly zero in the subsequent generation of plants. Controlling medusahead with this treatment increased production of desired forage grasses, sometimes dramatically. Results were consistent across eight sites distributed across a wide geographical area. Compared to other treatment options, this new approach is less expensive, provides better control of the invader and is more beneficial to desirable forage species.

Dual nitrite reduction pathways in bacteria. Denitrification and ammonification are important components of the nitrogen cycle. Denitrification leads to nitrogen loss from soils while ammonification leads to nitrogen retention. Researchers at the Desert Research Institute and ARS scientists in Reno, Nevada, cooperated on basic research to decipher the regulatory mechanisms for denitrification verses ammonification in a bacterial isolate that possess both genetic pathways in the same genome. Intrasporangium calvum, a unique Actinobacteria isolated from nitrate contaminated soils, was grown over a range of carbon to nitrate ratios, nutrient concentrations, and nitrite versus nitrate. We found that irrespective of concentration or ratio, excessive production of nitrite induces the ammonification pathway. These results are important because soil productivity could be enhanced if land management practices aim to promote bacterially-mediated retention of nitrogen using the ammonification pathway over the denitrification pathway.

Kentucky bluegrass control strategies. Kentucky bluegrass is an invasive grass that is present on over half the rangelands in the Northern Great Plains and often dominates the species composition. While adequate forage is available for livestock in wet years, during droughts it becomes dormant and unpalatable. ARS researchers in Mandan, North Dakota, evaluated six different fire and herbicide combinations and a control on areas that had three different levels of Kentucky bluegrass invasion on the Sheyenne National Grassland near Lisbon, North Dakota. Burning in the fall and applying glyphosate in the spring resulted in dramatic reductions in amounts of Kentucky bluegrass while increasing native grasses, especially on sites with a moderate or high level of Kentucky bluegrass in the stand. In sites that were less invaded by Kentucky bluegrass, a fall burn and applying imazapic in the spring was also effective. Treatment effects moderated by the second year after treatment which indicates that while combining fire and herbicides to reduce Kentucky bluegrass can be effective; these areas need either repeated treatments or changes in management to continue reducing Kentucky bluegrass.

Component 2: Develop Improved Pasture Technologies and Management Systems

Modified lignin derivatives to improve utilization of biomass and forage crops. Plant cell walls in crops are potentially an abundant source of carbohydrates for ruminant livestock and biofuel production, but their utilization is restricted because they are enmeshed in a vital structural component known as lignin. ARS researchers at Madison, Wisconsin are testing ways to modify lignin formation in plants to improve cell wall carbohydrate digestion. In this study, they artificially lignified cell walls from corn with normal precursors plus a wide variety of phenolic compounds that are naturally produced by plants, but not normal components of lignin. The modified lignins improved the ruminal and enzymatic digestibility of cell wall carbohydrates by up to 30% compared to conventional lignin formed with normal precursors. These results suggest some of these derivatives would be promising genetic engineering targets for modifying lignin in forage and biomass crops.

Developing improved pasture technologies for efficient nutrient use. Poultry litter is an excellent organic fertilizer, but the usual practice of spreading litter on the surface of pastures results in substantial nutrient losses because much of the valuable litter nitrogen evaporates as ammonia, and other nutrients are transported by storm runoff into nearby streams and lakes. This problem is economically costly for farmers and can be harmful to soil and water quality. ARS scientists in Booneville, Arkansas, led the development and testing of a tractor-drawn implement that applies dry poultry litter below the soil surface of perennial pastures and other no-till systems. When results were compared to traditional surface spreading of poultry litter, this new technology decreased nutrient losses by 53-99%, increased available nitrogen in the soil by 52-99%, and significantly increased protein content of pasture grasses. When commercially released, the subsurface-application technology can provide an effective management option to help farmers improve economic returns, decrease nutrient losses, increase nitrogen recovery in forage crops, and improve soil and water quality.

Improved genetics to combat gastrointestinal parasites in sheep. Gastrointestinal parasites limit maximal sheep production in the U.S. leading to reduced weight gains and death. Research demonstrates that genetic selection for parasite resistance in sheep with heritability as high as 0.5 can eliminate the need for most deworming and reduce mortality and morbidity, especially with good nutrition and pasture management. As lead for a multi-institutional, multi-disciplinary team funded by NIFA's Organic Agriculture Research and Extension Initiative, ARS scientists from Booneville, Arkansas, along with colleagues from Louisiana State University, Virginia Tech, Fort Valley State University, and the University of Arkansas, and cooperation from several farmers, have developed selection tools to aid in the control of gastrointestinal nematodes for organic and conventional production of small ruminants. After selecting replacement stock from parasite-resistant parents (determined by fecal egg counts around and after the time of lambing), fewer animals within the flocks required deworming. The research has resulted in farmer-friendly publications available through the National Center for Appropriate Technology and the website of the American Consortium for Small Ruminant Parasite Control, and improved accuracies of Estimated Breeding Values for parasite resistance reported by the National Sheep Improvement Program, resulting in increased value of breeding stock and increased use by commercial farms.

Winter annual cover crops provide variable returns when grazed in spring. Winter wheat, cereal rye, and triticale are important cool-season annual forages and cover crops throughout the Great Plains and Midwest. However, there is little information available that compares the profit from grazing these three cover crops. ARS scientists at Lincoln, Nebraska and university colleagues compared steer performance in a 3-yr grazing trial by no-till seeding winter wheat, winter rye, and winter triticale into soybean stubble in the autumn, then grazing the following spring. Each pasture was continuously stocked in spring with four crossbred yearling steers for 17, 32, and 28 d in the three grazing years. Spring forage production was variable, but generally, cereal rye had greater growth than either triticale or wheat. No single forage provided superior steer performance across all years. Based on the 3-year average animal gains per acre and $0.60 per pound of animal gain, however, triticale had a 3-year mean net return of $25.15 per acre per year, followed by wheat at $9.13 per acre per year, while cereal rye lost money at -$11.70 per acre per year. As these small grains provide ecosystem services in addition to forage, grazing cover crops could serve as a mechanism for recovering costs and adds additional value to the crop-livestock system. This effort gives livestock producers information to select the most profitable cover crop for eastern Nebraska.

Component 3: Improved Harvested Forage Systems for Livestock, Bioenergy and Bioproducts

Sustainable protein for aquaculture from alfalfa. The growing demand for fish and seafood products is accelerating development of aquaculture nationwide and alternative feed ingredients are needed to meet these demands. Some alternative proteins extracted from crop plants lack essential nutrients or have anti-nutritional components. ARS scientists in St. Paul, Minnesota and collaborators at the University of Minnesota tested a protein concentrate made from alfalfa foliage as a replacement for fishmeal in the diet for yellow perch and found that growth of fish was equivalent, indicating that alfalfa protein concentrate can substitute for this feed ingredient. Several methods were tested for producing the protein concentrate from leaves of a biomass type of alfalfa and a simple heat treatment after juicing was found to result in the highest yield of protein concentrate. Alfalfa stems, the press cake resulting from leaf juicing, and the de-proteinized juice have potential as additional value-added products in biorefining of alfalfa. High value products derived from alfalfa will increase the value of the crop and farm gate revenue.

Release of Coastcross II forage bermudagrass. One of the advantages of Coastcross II (CC II) over Tifton 85 is the smaller stem diameter which allows hay producers to dry and bale CC II slightly sooner after cutting than Tifton 85. Also, horse customers prefer a finer-stemmed forage. Another very important advantage to CC II over Tifton 85 and other bermudagrass cultivars is the greater tolerance to bermudagrass stem maggot (BSM), which has become a major pest throughout the South. Researchers in Tifton, Georgia, found that BSM is now present in all areas of the Southeast where bermudagrass is grown for pasture or hay. In Georgia, the incidence and damage from this pest has increased over the past 3 years and can decrease yields by over 50%. The yield decrease of CC II was significantly less than for all other genotypes in the September harvest, including Tifton 85. CC II offers an alternative forage bermudagrass and has already been adopted by numerous hay producers in the southeast.

Assessment of energy cane at two locations in Georgia. Energy cane has been considered as a viable biomass crop for the Southeast. Five energy cane varieties were tested at Athens, Georgia, and Tifton, Georgia, for seven years as part of the SunGrant Regional Energy Cane Yield Trials by researchers in Tifton, Georgia. Plots were planted during the fall of 2010 in a four replicate randomized complete block design (RCBD). The plots were grown under rain-fed conditions with recommended fertilizer applied at the beginning of each season. Estimates of free usable sugars were recorded monthly, and prior to harvest, stalks were cut and squeezed by a roller mill to determine juice content. Finally whole plots were harvested after killing frost each year and weighed for biomass. Dry matter yields peaked in year four, declined, then increased again over the past two years. Sugar and juice volume varied greatly among the five genotypes. The highest biomass yields were from Ho (US) 96-9001 and 96-9002 at both locations. Sugar from Ho (US) 02-144 was significantly higher than all other genotypes and peaked at around 17 in December. The highest yield of juice was from Ho (US) 72-114. This information will be useful for growers of sugarcane or energycane in non-traditional sugarcane growing areas in the southeast.