

ANNUAL REPORT (2013 to 2014)

Multistate Project NC1181: Sustaining Forage-based Beef Cattle Production in a Bioenergy Environment

Submitted by: Karla H. Jenkins

Date of Annual Meeting: August 13 & 14, 2014

Attendance:

Bruce Anderson – University of Nebraska, Lincoln
Jaymelynn Farney—Kansas State University, Manhattan
John Guretzky—University of Nebraska, Lincoln
Deborah Hamernik - University of Nebraska, Lincoln
Keith Harmony—Kansas State University, Manhattan
Karla Jenkins—University of Nebraska, Panhandle R&E, Scottsbluff
Lyle Lomas—Kansas State University, Southeast Ag. Res. Center, Parsons, KS
James MacDonald—University of Nebraska, Lincoln
Joe Moyer—Kansas State University, Southeast Ag. Res. Center, Parsons, KS
Jay Parsons – University of Nebraska, Lincoln
Daren Redfearn – University of Nebraska, Lincoln
Jason Rowntree – Michigan State University, East Lansing, MI
Walt Schacht – University of Nebraska, Lincoln
Aaron Stalker— University of Nebraska, West Central R&E, North Platte
Jerry Volesky – University of Nebraska, West Central R&E, North Platte

Meeting Summary:

Dr. Hamernik addressed the group and indicated the new NC-1181 project had been approved. She challenged the group to develop research and extension programs that were more cohesive and integrated the efforts of the NC-1181 project across the region. Jason Rowntree agreed to organize the meeting again for next year and Karla Jenkins agreed to write the annual report.

Objectives for the New NC-1181 Project:

1. Optimize the utilization of crop residues by grazing and harvesting and determine the effects on agroecosystems.
2. Evaluate strategies to increase efficient use and productivity of range and pasturelands through strategic timing and density of stocking and shifting species composition to more productive species.
3. Evaluate effects of integrating annual forage crops into year-round forage systems for beef production.
4. Develop innovative beef systems that match shifting forage resources.
5. Conduct multi-faceted education/extension program to disseminate research results, to include extension papers as well as regional conferences on the use of crop residues, annual forages, and range and pastureland by livestock.

Each objective for the new project was discussed, research ideas were planned, and several integrated concepts were developed. While some aspects of the research will be region specific, it was decided there were experiments where treatments could be imposed at multiple locations to determine location effects for the approved objectives. Additionally, the group discussed conducting webinars, extension programs on state borders, an e-newsletter, extension abstracts, and a symposium in addition to the more traditional state specific producer publications and reports.

The 2015 NC-1181 meeting will be held at the Buffalo County Fairgrounds in Kearney, NE on August 12 and 13th starting at 3:00 on August 12th.

Objectives for the Current NC1184 project:

List objective(s) worked on. The objectives listed in the project are:

1. Identify factors in the sub-humid and semi-arid regions of the central Great Plains that limit establishment, persistence, and production of interseeded legumes in grass pastures.
2. Compare forage and animal production of grass pastures in the sub-humid and semi-arid regions of the central Great Plains that are managed with different levels of nitrogen fertilization, legumes, and biofuel co-products.
3. Determine the influence of different mixtures of biofuel co-products and low quality forage (e.g., wheat straw) on nutrient availability, palatability, and utilization by beef cattle.
4. Determine optimum practices for storing and feeding different forms and mixtures of biofuel co-products.
5. Evaluate nutrient availability and cycling, botanical composition, and forage production and quality of range and pasture when feeding biofuel co-products to grazing cattle.
6. Determine the economic potential of using biofuel co-products as a supplement or forage replacement in cattle production systems with different resource or animal management systems.
7. Conduct multi-faceted education/extension program to disseminate research results, to include extension papers as well as regional conferences on the use of co-products in beef cattle production systems and on the practice of interseeding and managing legumes in grass pastures.

Accomplishments

- (Objective 1) Legumes were successfully interseeded into tall fescue pasture when grass growth was suppressed by grazing or chemical means in southeast Kansas.
- (Objective 1) Legume establishment in western wheatgrass pastures was evaluated in western Kansas. Fall grazing and chemical suppression did little to aid legume establishment. Spring herbicide application was the most effective in suppressing grass. However, due to lack of precipitation, legume stands did not persist.
- (Objective 1) Various legumes were evaluated for establishment and persistence in central Kansas smooth brome pastures. Only purple and yellow alfalfa persisted after 4 years. These two legumes added digestibility and crude protein to the smooth brome pastures. Upland sites established better than lowland sites and non-fertilized pastures established legumes better than fertilized.
- (Objective 2) Dried distillers grains were supplemented either for the entire grazing season on cool season pastures or only during the latter part of the growing season when pasture quality declines. Supplemented steers gained more than non-supplemented steers but strategy of supplementation did not affect gain. However, late season supplementation did result in improved efficiency of gain. (Kansas)
- (Objective 2) Wet distillers grains (WDGS) were evaluated as an alternative to milo-soybean meal as a supplement for cattle grazing native range in western Kansas. Cattle supplemented WDGS in a bunk or on the ground gained better than non-supplemented cattle but similar to cattle fed milo-soybean meal, suggesting WDGS could replace milo-soybean meal as a supplement to cattle grazing low quality late season pasture in western Kansas.
- (Objective 2) Legumes were established in smooth brome pastures in eastern Nebraska. Legumes used were alfalfa, red clover, and birdsfoot trefoil. These pastures were grazed and pasture production as well as cattle performance were compared to Nitrogen-fertilized smooth brome pastures. Above ground forage production, grazing days, steer daily gain, and total season gain were greater for interseeded legume pastures than for fertilized pastures.
- (Objective 2) In Michigan, pastures interseeded with legumes and intensively managed did not result in greater GHG emissions than less intensively managed pastures without legumes.
- (Objective 3) Wet distillers grains and wheat straw were fed with sugar beet pulp to confined gestating beef cows in limit fed rations in western Nebraska. Cows fed either level of sugar beet pulp increased in body condition over the feeding period. Sugar beet pulp can replace a portion of the wheat straw

- when fed in combination with wet distillers grains in energy dense, limit fed rations while maintaining cow condition.
- (Objective 3) Varying levels of glycerin were fed to determine the impacts on low quality forage digestion. Experiments conducted in Illinois indicated that fiber digestion did not increase as level of glycerin increased but propionate production did. Methane production was measured on high and low forage diets. Total g of CH₄ and g CH₄ per kg BW were not different for the two diets. However, the high forage diet resulted in greater g CH₄ per kg DMI than the low forage diet. Urea was used as a means of increasing crude protein in corn silage based diets. Increasing urea decreased G:F and daily gain.
 - (Objective 3) An experiment was conducted in Kansas to determine the effects of CaOH treated crop residue on cattle performance. The cattle fed a diet containing 20% treated stover did not perform differently from the control cattle. Cattle fed the 40% CaOH treated stover did not gain as well as the other two treatments due to reduced energy of the diet.
 - (Objective 3) Gestating cows were limit fed a diet containing 20% wet distillers grains, 20% sugar beet pulp, and 60% wheat straw compared with 20% wet distillers grains, 45% sugar beet pulp, and 35% wheat straw in western NE. Cows on both treatments gained body condition suggesting sugar beet pulp can replace a portion of the wheat straw in limit fed diets when diets are formulated to meet cow requirements.
 - (Objective 4) In eastern NE condensed corn distillers solubles (CCDS) were applied to brome hay prior to baling at varying levels. Bales were ground and fed to growing steers. A linear increase in DMI, ADG, and final BW were observed as CCDS level increased indicating CCDS could be stored in hay bales for later use. Replacement heifers were fed bales of CCDS treated hay or fed hay and supplemented with DDGS. Although year by treatment interactions occurred, results would indicate that CCDS was effectively stored in the bales.
 - (Objective 5) In the Nebraska Sandhills diet quality and forage availability were evaluated in early spring grazing as impacted by grazing pressure. As stocking rate increased, even at light stocking rates, forage quality and availability declined, suggesting supplementation would be necessary for young cattle to meet their requirements. Grazing pressure was also determined to impact the quality of grazed subirrigated meadows in the summer. When cool season growth is limited, cattle are forced to eat older growth which is lower in quality. Diet samples of high quality forage collected with esophageally fistulated cattle may result in an underestimation of CP, but may not impact medium to poor quality forages.
 - (Objective 6) Supplementing monensin and modified distillers grains to cattle grazing smooth brome grass in eastern NE resulted in decreased DMI. This may be a way to increase stocking rate and improve efficiency. Supplementing dried distillers grains to calves grazing irrigated cornstalk residue resulted in a linear increase in gain. Steer gain can be maximized while optimizing residue use through DDGS supplementation. Commercial lick tubs were compared to DDGS as a supplement for calves grazing cornstalk residue. Cattle performance was similar on an organic matter basis but not better than commodity distillers grains. An alternative residue harvest method was evaluated in eastern NE. It was determined that cattle gain and efficiency improved when fed residue collected by the alternative method compared with traditional residue baling. New harvest technologies also have the potential to improve forage quality of harvested residues.
 - (Objective 7) Several producer programs were conducted across the NC-1181 region explaining the application of the by-product and residue research. Additionally, producer publications were developed as listed below in the publication section.

Outputs

- *Producer meetings have been conducted in Nebraska, Kansas, and Illinois to disseminate the results of this research. Additionally, research has been presented at scientific*

meetings, published in scientific journals, and published in producer oriented publications.

Impacts

- *Results of research on using by-products and residues in light of limited forage availability has resulted in many producers increasing the use of these products to maintain cows and grow calves. In less arid areas, interseeding legumes has been favorable.*

Publications (list in separate sections)

Peer-reviewed Journals and Book Chapters

1. Kim, Minseok, **Tara L. Felix**, Steve C. Loerch, and Zhongtang Yu. 2014. Effect of haylage and monensin supplementation on ruminal bacterial communities of feedlot cattle. *Current Microbio*. Published online before print March 30, 2014, doi: 10.1007/s00284-014-0564-1.
2. **Felix, T.L.**, S.C. Loerch, and F.L. Fluharty. 2013. Protein supplementation for growing cattle fed a corn silage based diet. *Prof. Anim. Sci. (In press)*
3. **Felix, T.L.**, C.J. Long, S.A. Metzger, and K.M. Daniels. 2014. Adaptation to various sources of dietary sulfur by ruminants. *J. Anim. Sci.* Published online before print March 26, 2014, doi: 10.2527/jas.2013-7156.
4. Duckworth, M.J., A.S. Schroeder, D.B. Faulkner, G.C. Fahey, and **T.L. Felix**. 2014. Effects of feeding calcium oxide treated wet distillers grains with solubles or treated corn stover to cattle on growth performance, carcass characteristics, and ruminal metabolism. *Prof. Anim. Sci. (In press)*
5. Schroeder, A.R., M. Iakiviak, and **T.L. Felix**. 2014. Effects of feeding dry or modified wet distillers grains with solubles with or without supplemental calcium oxide on ruminal metabolism and microbial enzymatic activity of beef cattle. *J. Anim. Sci. (In press)*
6. Schroeder, A.R., M.J. Duckworth, D.W. Shike, J.P. Schoonmaker, and **T.L. Felix**. 2014. Effects of calcium oxide treatment of dry and modified wet distillers grains plus solubles on growth performance and apparent digestibility of feedlot steers. *J. Anim. Sci. (In press)*
7. Moyer, J. L. and D. W. Sweeney. 2014. Responses of eastern gamagrass [*Tripsacum dactyloides* (L.) L.] forage quality to nitrogen application and harvest system. *J. Plant Nutr.* 37: (In Press).
8. Watson, A.K., B.L. Nuttleman, T.J. Klopfenstein, L.W. Lomas and G.E. Erickson. 2013. Impacts of a limit-feeding procedure on variation and accuracy of cattle weights. *J. Anim. Sci.* 91:5507-5517.
9. Harmoney, KR. 2014. Cool-season Grass Biomass in the Southern Mixed-grass Prairie Region of the USA. *BioEnergy Research.* (in press) DOI: 10.1007/s12155-014-9514-9.
10. Jenkins, K.H., S. A. Furman, J. A. Hansen, J. J. Buttle, T. J. Klopfenstein. 2014. Limit feeding high energy by-product based diets to late gestation beef cows in confinement. *Prof. J. Anim. Sci.* In Press.

Abstracts/Posters/Professional Presentations

1. Duckworth, M.J., A.R. Schroeder, D.B. Faulkner, D.W. Shike, and **T.L. Felix**. 2013. Effects of feeding CaO treated WDGS or treated corn stover to cattle on performance, carcass characteristics, and ruminal

metabolism. Sect. Mtg. Abstracts. J. Anim. Sci. 91 (E-Suppl. 2): 11-12.

2. Nunez, A.J. C., **T.L. Felix**, S.C. Loerch, R.P. Lemenager, and J.P. Schoonmaker. 2013. Effects of calcium oxide inclusion in beef feedlot diets containing 60% dried distillers grains with soluble on performance and carcass characteristics. Sect. Mtg. Abstracts. J. Anim. Sci. 91 (E-Suppl. 2): 53.
3. Nunez, A.J. C., **T.L. Felix**, S.C. Loerch, R.P. Lemenager, and J.P. Schoonmaker. 2013. Effects of calcium oxide inclusion in beef feedlot diets containing 60% dried distillers grains with soluble on rumen pH, volatile fatty acids, and nutrient digestibility. Sect. Mtg. Abstracts. J. Anim. Sci. 91 (E-Suppl. 2): 55.
4. Long, C.J., **T.L. Felix**, and S.C. Loerch. 2013. Effects of dietary sulfur source on hydrogen sulfide gas concentrations in feedlot lambs. Sect. Mtg. Abstracts. J. Anim. Sci. 91 (E-Suppl. 2): 5.
5. Segers, J.S., **T.L. Felix**, and D.W. Shike. 2013. Effects of energy source and dietary fat concentration from corn coproducts, during the growing phase, on beef cattle performance, carcass traits, digestibility, and ruminal metabolism. Joint Mtg. Abstracts. J. Anim. Sci. 91(E-Suppl. 2): 683.
6. Chapple, W.P., D.B. Faulkner, M.J. Cecava, P.H. Doane, A.H. Grusby, and **T.L. Felix**. 2013. Effects of feeding treated corn stover and distillers grains to beef cattle on performance, carcass traits, digestibility, and ruminal metabolism. Joint Mtg. Abstracts. J. Anim. Sci. 91(E-Suppl. 2): 692.
7. Schroeder, A.R., M. Iakiviak, I.K.O. Cann, and **T.L. Felix**. 2014. Effects of feeding dry or modified wet distillers grains with solubles with or without supplemental calcium oxide on ruminal metabolism and microbial enzymatic activity of beef cattle. Sect. Mtg. Abstracts. J. Anim. Sci. 92(E-Suppl. 2): 91.
8. Schroeder, A.R., M.J. Duckworth, D.W. Shike, J.P. Schoonmaker, and **T.L. Felix**. 2014. Effects of calcium oxide treatment of dry and modified wet distillers grains plus solubles on economics, feed intake pattern, and growth and carcass performance of feedlot steers. Sect. Mtg. Abstracts. J. Anim. Sci. 92(E-Suppl. 2): 28.
9. Long, C.J., and **T.L. Felix**. 2014. Effects of dietary glycerin on rumen metabolism of beef cattle fed 50% dried distillers grains with solubles. Sect. Mtg. Abstracts. J. Anim. Sci. 92(E-Suppl. 2): 168.
10. Reitz, N., E. Sacks, and **T.L. Felix**. 2014. Determination of forage quality and post cutting recovery of miscanthus at different cutting times. Sect. Mtg. Abstracts. J. Anim. Sci. 92(E-Suppl. 2): 171.
11. Lehman, B., A.R. Green, **T.L. Felix**, B.C. Ramirez, L.F. Rodriguez, and D.W. Shike. 2013. Effects of diet on intake and methane emissions of beef steers. Sect. Mtg. Abstracts. J. Anim. Sci. 92(E-Suppl. 2): 169.
12. Long, Chloe, and **Tara Felix**. 2014. Effects of dietary glycerin on rumen metabolism of beef cattle fed 50% dried distillers grains with solubles. Undergraduate Research Symposium. The Ohio State University.
13. Bremer, M. L., D. B. Burken, A. K. Watson, J. C. MacDonald, and G. Erickson. 2014. Energy value of de-oiled modified distillers grains plus solubles in a forage-based diet. J. Anim. Sci. 92(E-Suppl 2):93 (abstr.).
14. Jones, M., J. C. MacDonald, G. Erickson, T. J. Klopfenstein, and A. K. Watson. 2014. Effect of distillers grains on average daily gain of cattle grazing corn residue. J. Anim. Sci. 92(E-Suppl 2):92 (abstr.).
15. Sudbeck, K. M., J. C. MacDonald, C. R. Calkins, G. E. Erickson, T. P. Carr, and K. Varnold. 2014. Effects of feeding distillers grains in a yearling beef system on meat quality. J. Anim. Sci. 92(E-Suppl 2):49 (abstr.).

Extension and Technical Reports

1. Jenkins, K.H., M.K. Luebke, T.J. Klopfenstein. 2015. Using sugar beet pulp to replace wheat straw when limit feeding late gestation beef cows. Nebraska Beef Report MP101.

2. Jenkins, K.H. 2014. Using Sugarbeet Pulp in Rations for Beef Cows. G2239. University of Nebraska. <http://www.ianrpubs.unl.edu/epublic/live/g2239/build/g2239.pdf>
3. Jenkins, K.H. and R. Rasby. 2014. Management Considerations for Beef Cows in Confinement. G2237. University of Nebraska. <http://www.ianrpubs.unl.edu/epublic/live/g2237/build/g2237.pdf>
4. Felix, Tara L. 2013. Alternative Feedstuffs and Changing Co-products: Feedlot Cattle. Driftless Region Beef Conference. January 31, 2013.
5. Felix, Tara L. 2013. New information on corn co-products: Implications for ration formulation. Mn Nutr. Conf. September 17, 2013.
6. Lomas, L. W. and J. L. Moyer. 2014. Distillers grains supplementation strategy for grazing stocker cattle, pp. 28-37. In: SEARC Agricultural Research 2014, Report of Progress 1105. Kansas State Univ. Agric. Exp. Stn. and Coop. Extn. Serv., Manhattan, KS. 94p. <http://www.ksre.ksu.edu/bookstore/pubs/SRP1105.pdf>
7. Lomas, L. W. and J. L. Moyer. 2014. Effect of cultivar and distillers grains supplementation on grazing and subsequent finishing performance of stocker steers grazing tall fescue pasture, pp. 8-22. In: SEARC Agricultural Research 2014, Report of Progress 1105. Kansas State Univ. Agric. Exp. Stn. and Coop. Extn. Serv., Manhattan, KS. 94p. <http://www.ksre.ksu.edu/bookstore/pubs/SRP1105.pdf>
8. Lomas, L. W. and J. L. Moyer. 2014. Effect of frequency of dried distillers grains supplementation on gains of heifers grazing smooth bromegrass pastures, pp. 1-7. In: SEARC Agricultural Research 2014, Report of Progress 1105. Kansas State Univ. Agric. Exp. Stn. and Coop. Extn. Serv., Manhattan, KS. 94p. <http://www.ksre.ksu.edu/bookstore/pubs/SRP1105.pdf>
9. Lomas, L. W. and J. L. Moyer. 2014. Effects of various forage systems on grazing and subsequent finishing performance, pp. 13-17. In: SEARC Agricultural Research 2014, Report of Progress 1105. Kansas State Univ. Agric. Exp. Stn. and Coop. Extn. Serv., Manhattan, KS. 94p. <http://www.ksre.ksu.edu/bookstore/pubs/SRP1105.pdf>
10. Moyer, J. L. and L. W. Lomas. 2014. Use of legumes in wheat-bermudagrass pastures. pp. 38-40. In: SEARC Agricultural Research 2014, Report of Progress 1105. Kansas State Univ. Agric. Exp. Stn. and Coop. Extn. Serv., Manhattan, KS. 94p. <http://www.ksre.ksu.edu/bookstore/pubs/SRP1105.pdf>
11. Bremer, M. L., A. K. Watson, D. B. Burken, J. C. MacDonald, and G. E. Erickson. 2014. Energy value of de-oiled modified distillers grains plus solubles in a forage-based diet. Neb. Beef Cattle Rep. MP 99:32-33.
12. Gillespie, K. L., T. J. Klopfenstein, J. C. MacDonald, B. L. Nuttelman, and C. J. Schneider. 2014. Effect of winter supplementation level on yearling system profit across economic scenarios. Neb. Beef Cattle Rep. MP 99:36-38.
13. Gillespie, K. L., T. J. Klopfenstein, J. C. MacDonald, B. L. Nuttelman, C. J. Schneider, J. Volesky, and G. E. Erickson. 2014. Distillers grains supplementation in a forage system with spayed heifers. Neb. Beef Cattle Rep. MP 99:32-42.
14. Gillespie, K. L., T. J. Klopfenstein, J. C. MacDonald, B. L. Nuttelman, C. J. Schneider, G. E. Erickson, and J. Volesky. 2014. Economics of distillers grains supplementation in a forage system with spayed heifers. Neb. Beef Cattle Rep. MP 99:43-45.
15. Hasenauer, T. L., T. J. Klopfenstein, J. MacDonald, C. J. Schneider, and D. B. Burken. 2014. Effect of distillers grains plus solubles supplementation on grazing cattle performance. Neb. Beef Cattle Rep. MP 99:46-47.
16. Jones, M., J. C. MacDonald, G. Erickson, T. J. Klopfenstein, and A. K. Watson. 2014. Effect of distillers grains supplementation on calves grazing irrigated or non-irrigated corn residue. Neb. Beef Cattle Rep. MP 99:48-49.