Multistate Project (NC1181): Enhancing Resiliency of Beef Production under Shifting Forage Resources

Date of Annual Meeting: August 12-13, 2015


Participant List
Bruce Anderson – University of Nebraska, Lincoln
Mary Drewnoski – University of Nebraska, Lincoln
Jaymelynn Farney – Kansas State University, Manhattan
Walt Fick – Kansas State University
John Guretzky – University of Nebraska, Lincoln
Debora Hamernik - University of Nebraska, Lincoln
Keith Harmoney – Kansas State University, Western KS Ag. Res. Center, Hays, KS
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
Martin Massengale – University of Nebraska, Lincoln
Joe Moyer – Kansas State University, Southeast Ag. Res. Center, Parsons, KS
Jay Parsons – University of Nebraska, Lincoln
Rick Rasby – University of Nebraska, Lincoln
Daren Redfearn – University of Nebraska, Lincoln
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

Brief Summary of Minutes of Annual Meeting
Dr. Deb Hamernik (Administrative Advisor) addressed the group and explained that some groups invite USDA-NIFA personnel to attend these meetings by conference call or adobe connect. The consensus of the group was that we should invite Dr. Steve Smith, the program coordinator for USDA-NIFA systems work in the beef cattle area to join the 2016 meeting.

Preliminary results of studies related to each objective were discussed by each group member. One of the experiments implemented this year to address objective 2 was implemented in 3 locations in Kansas and 3 locations in Nebraska. The preliminary results of this collaborative project were very different across locations. Additional collaborative project ideas were discussed for objectives 3 and 5.

The meeting next year will be held in Hays, KS and will likely be held after the Grazing Conference in Kearney, NE.

Accomplishments

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

Accomplishments
Nebraska

Short-term outcomes:
• Objective 1
  o Beef producers can graze corn residue as a low cost feed option to improve
    sustainability without detrimental effects on subsequent corn grain productivity.
  o Average daily gains of calves grazing residue and supplemented with distillers
    grains can be predicted with reasonable accuracy.
  o Metabolizable protein supplementation with rumen undegradable protein is a key
    determinant in gains of growing calves grazing corn residue.
  o Harvesting methods which leave stems in the field result in higher quality residue
    bales.
• Objective 2
  o Measured dry forage mass of 4226 kg ha⁻¹ in unfertilized smooth bromegrass
    stands on 2 June 2015 before interseeding annual warm-season grasses on 9 June
    2015. The value is similar to other forage mass data we have collected in
    unfertilized smooth bromegrass pastures at this location.
  o Soil moisture content at depths of 0-15 and 15-45 cm average 19% 1 d after
    planting on 10 June 2015.
  o Annual warm-season grass establishment success varied with species. Seedlings
    m⁻¹ row measured 30 d after planting on 7 July 2015 averaged 4 for corn, 18 for
    forage sorghum, 27 for sudangrass, 28 for sorghum-sudangrass, and 58 for pearl
    millet.
  o After 5 years of treatment application on Sandhills meadow, there is no difference
    in botanical composition and aboveground plant production among grazing
    systems (mob grazing, simple rotation grazing, and continuous grazing); and
    trampling of standing live vegetation is the greatest and harvest efficiency and
    yearling weight gain are the lowest for mob grazing.
  o On upland Sandhills range, grazing treatments (season-long continuous, 4-pasture
    deferred rotation, and 50-pasture rotation) have resulted in significant differences
    in grazing distribution with the 50-pasture rotation resulting in the most uniform
    distribution and continuous grazing the least. Effect of a heavy stocking rate (vs.
    moderate) is trending towards lower annual plant production. Length of grazing
    period (150 vs. 40 vs. 3 days) has not affected aboveground plant production.
• Objective 3
  o Late summer planted double cropped annual forages comprised of a mix of cool
season grasses and brassicas can be a source of high quality forage and be used to background growing calves. Steers weighing 250 to 300 kg appear to gain 0.68 to 1 kg/d in Nov and December. However, herbicide strategy has a major impact on success of double crop forages, especially brassica species.

- **Objective 4**
  - Pregnancy rates of cows wintered on corn residue while nursing calves were adequate (90 – 100%), but additional numbers are needed to determine real effects of wintering system on reproductive performance.
  - Preliminary data suggest that wintering summer-calving pairs on cornstalk residue as part of an intensively managed system may result in cow BW and BCS losses compared to feeding pairs in a drylot.
  - Any negative changes in BW or BCS may be less of a hindrance on reproduction provided losses occur well after the breeding season and cows are in adequate BCS (≥ 5.0) prior to calving.
  - Daily gains for calves wintered on cornstalks with their dams may be similar to or less than those managed in a drylot, but delaying weaning beyond a conventional age (205 d) may increase weaning weight.
  - Complete sugarbeets can be mixed into a complete diet with wheat straw and wet distillers grains to maintain gestating beef cows on a limit fed diet.

- **Objective 5**
  - Research update articles have been disseminated to producers on forage cocktail mixtures.

**Accomplishments**

**South Dakota**

*Short-term outcomes:*
- **Objective 1**
  - 45 corn hybrids were evaluated for yield and quality for corn and beef production.

- **Objective 3**
  - Experiments were initiated to evaluate impacts of stocking rate on performance and N excretion while grazing cover crops
  - An experiment was initiated evaluating cover crop mixtures for grazing cattle.

- **Objective 5**
  - Producer tours were given to show the progress of the cover crops.

**Nebraska**

*Outputs:*
- 6 peer-reviewed journal articles
- 4 professional presentations
- 9 scientific abstracts
- 21 research reports or proceedings
- 1 popular press article
- 7 webinars

*Accomplishments*

**Illinois**

*Short-term outcomes:*
- **Objective 1**
Four methods of processing corn stalk residue were determined to have similar impacts on cattle performance

Objective 4
- MaxQ and KY-31 tall fescue were determined to have similar digestibility. Differences in cattle performance when grazing the two cultivars are not due to digestibility differences.

Objective 5
- Two field days were conducted to share the research results from Objectives 1 and 4 so producers could implement best management practices based on research.

Milestones:
- Research has been initiated and economic evaluation is ongoing. Project results have been presented at scientific meetings.

Impacts:
- Additional means of harvesting corn stover will be available for producers to determine the best practice for within their system. Producers are already incorporating these results.

Accomplishments

Kansas

Short-term outcomes:
- Objective 2
  - Intensive early stocking rates were compared to continuous stocking rates on native pasture. Cow body condition score and calf weights were similar for both treatments. Yearling heifers also had similar gains regardless of treatment.
  - Legumes were interseeded into four tall fescue cultivars with varying endophyte status. Grazing will begin in 2016.
  - Warm season annual grasses were seeded into cool season perennial western wheatgrass and tall fescue at three locations across Kansas as part of a joint project with Nebraska where annuals were interseeded into cool season grasses across three locations.
- Objective 5
  - Extension meetings were conducted on research results of cover crop utilization for cattle and integrating crops and livestock. Approximately 450 producers attended.

Kansas

Outputs:
Webinar for Kansas agriculture agents about fall annual forages for cattle production. 10 listened live, but the webinar is posted on the internal website for future agent visits.
- Potentially toxic forage crops for livestock extension publication – MF3244, currently in publication department with estimated online publication date of October 2015
- AgToday radio interview about fall forage for cattle.

Kansas Project Impacts:
Interseeding warm-season annuals in cool-season grass pastures can improve their utility during the “summer slump” that typically occurs. Forage production and nutritive value could increase animal production and performance without requiring conversion of cropland to pasture. The potential of several forages needs to be evaluated for use in improving perennial pasture to extend the effective grazing season. The economic impact of beef production has been estimated from $1850 to $5200 per cow, depending on whether or not the economic impact of the feeder and finishing sector is separated from the cow/calf sector. If expansion of the forage resource on the same area were to enable the cowherd to expand from 29 million to 33 million head as a result of improved utilization for forage resources through the proposed strategy, the economic impact would be estimated at $7.4 billion for the cow-calf sector, and over $20 billion for the beef industry as a whole.

Nebraska  
Activities:  
- Objective 1  
  - Ongoing work at the West Central Water Research Field Laboratory near Brule, NE and at the Monsanto Water Learning Center near Gothenburg, NE continues where research experiments aims to determine the effects of corn residue by grazing and baling.  
  - The impacts of grazing cornstalk residue in 3 tillage methods on subsequent crops of corn, dry edible beans, and sugarbeets were evaluated. One year of data is collected. Subsequent yield was not different in any crop between grazing or not grazed. However, yield was greater for conventional tillage and zone tillage compared to no tillage.  
  - Harvesting methods which collect different proportions of plant parts were evaluated.  
  - Supplementation strategies of calves grazing residue were evaluated.  
  - Collaborated with Iowa State University to submit a NIFA-CAP grant focused on integrating cropping and livestock systems using corn residue (Objective 1), double crop annual forages (Objective 3), and summer confinement of cows (Objective 4).  
- Objective 2  
  - Establishment of a project to evaluate success of interseeding annual warm-season grasses into existing cool-season grass pastures at three locations in Nebraska (Mead, North Platte, and Sidney) and three locations in Kansas (Parsons, Manhattan, and Hays).  
  - Establishment of the multi-state experiment on interseeding annual warm-season grasses into existing cool-season grass pastures at Mead, Nebraska.  
  - Collected and analyzed data from the first year of the interseeding experiment at Mead including measurements of forage production from smooth bromegrass before interseeding, soil moisture before planting, soil moisture 45 days after planting, annual warm-season establishment 30 days after planting, forage mass 45 days after planting, and forage functional composition (seeded species, cool-season grasses, and other species) 45 days after planting.  
  - Established the interseeded annual warm-season grass experiment at Mead with a Great Plains No-Till Drill. Great Plains Ag is a Salina, Kansas based company that specializes in seeding equipment.  
  - Continued the grazing studies on meadow and upland range at UNL’s Barta
Brothers Ranch. The sixth year of field data is being collected in 2015.

• Objective 3
  o Summer annual forage mixtures (forage cocktails) were compared to monoculture species in a semi-arid region in a dryland cropping rotation. Forages were evaluated for dry matter yield, crude protein, and total digestible nutrients. One year of data has been collected. There were no statistical differences in any mixtures or monocultures in tonnage produced, total digestible nutrients or acid detergent fiber. Crude protein was improved in the mixtures compared to the monocultures.
  o Collaborated with Kansas State University to submit a NCR-SARE grant focused on strengthening management guidelines for use of double cropped annual forages including species selection and grazing management.

• Objective 4
  o A second year of comparing summer calving cows wintered in a dry lot or wintered on corn residue was initiated.
  o Gestating beef cows were limit fed energy dense diets containing wheat straw, complete sugar beets and wet distillers grains or wheat straw, corn, and wet distillers grains. Diets were balanced to be isoenergetic. No differences in BCS change or BW were detected after a 47-d trial.

• Objective 5
  o Research from Objective 4 has been presented at 10 producer meeting and 3 producer conferences.
  o 2 field days related to Objective 1 were held at the West Central Water Research Field Laboratory.
  o Research results from the grazing strategy studies in Objective 2 have been presented at the 2015 Barta Brothers Field Day, the 2014 Gudmundsen Sandhills Laboratory Open House, the 2014 Nebraska Grazing Conference, and multiple producer meetings.
  o Collaborated with University of Nebraska-Lincoln Extension to submit a USDA-Risk Management Agency Risk Management Education Partnership proposal to provide comprehensive risk management education to livestock and forage producers in 2015-16.

Milestones:
  • Objective 1
    o Fields were established or evaluations of established fields continued where residue was removed either by grazing or baling. Soil samples were collected from fields.
  • Objective 2
    o Multistate interseeding projects were initiated as described in the Activities section above.
    o Data on the long-term impacts of grazing strategy on vegetation productivity and utilization, harvest efficiency, and rangeland health continues to be collected on meadow and upland range at the Barta Brothers Ranch.
  • Objective 3
    o Purchased seed for the interseeding annual warm-season grass project, which is used across all locations, from Green Cover Seed in Bladen, Nebraska, a local
source specializing in no-till cover crop seed and cover crop seed mixes.
- Baseline soil measurements were taken on fields where cover crop research will be occurring.

- **Objective 4**
  - Two treatments were imposed on multiparous, cross-bred beef cows that calve in July:
    - Cows and cow/calf pairs are managed in a drylot 365 days.
    - Cows and cow/calf pairs are managed in a drylot and graze corn residue.
    - At least three years of pregnancy data needs to be recorded.
    - Based on year one data, supplementation strategy may need adjusted to get comparable cow and calf performance.

- **Objective 5**
  - Received funding ($26,316) from the North Central Extension Risk Management Education Center to provide market risk management and cost of production training to cattle producers in Nebraska in 2015-16.

**Nebraska Impacts**

- Effects of wintering system on cow-calf performance and reproduction in a summer-calving intensively managed cowherd were evaluated at two locations. Cow body condition change was not different between treatments in western Nebraska, but was greater for pairs fed in a drylot in eastern Nebraska. In western Nebraska, calf gain and weights were not different between treatments, but were greater for drylot calves in eastern Nebraska. Initial data indicate that wintering pairs on cornstalks may decrease cow performance and calf gain. If reproduction is adequate and grazing is not impeded, wintering pairs on cornstalks may be viable for later-calving cowherds.

- Data from previous studies (2015 Nebraska Beef Cattle Report, pp. 14-15 & 16-18) indicate that intensive management (confinement) of cowherds may be a viable alternative when forage resources for grazing are limited. Cornstalk residues represent a valuable forage resource for fall/winter grazing and may complement an intensive cow-calf production system because areas with fewer traditional forage resources also tend to favor grain crop production. Results from economic analyses of alternative cow-calf systems suggest that incorporating cornstalk grazing may decrease production costs (2015 Nebraska Beef Cattle Report, pp. 19-21). Gestating spring-calving cows have acceptable performance grazing cornstalk residue, yet few data are available regarding a lactating female and her calf when grazing the same forage resource.

- Although mob grazing, using ultrahigh stocking density during the growing season, is commonly reported to increase aboveground plant production and to increase soil organic matter and soil depth, we have found no improvement in vegetation characteristics or soil properties relative to other grazing strategies after 5 years on Sandhills meadows. Furthermore, mob grazing has not resulted in an increase in harvest efficiency, carrying capacity, or livestock performance. The additional infrastructure and human resource requirements of mob grazing compared to other grazing strategies does not appear to be justified.

- The length of grazing period during the growing season on upland Sandhills rangeland
does not affect aboveground plant production, botanical composition, or soil organic matter content after 5 years of treatment application. Stocking rate appears to be the principal management factor affecting vegetation cover regardless the length of grazing period.

Nebraska

Publications (list in separate sections)

Peer-reviewed Journals


Abstracts/Posters/Professional Presentations


Book Chapters
None to report at this time.

Curricula/Educational Materials


Extension Reports/Publications


Articles in the Popular Press (non-peer reviewed)

Webinars/Videos and URL for online access
1. Dry Lotting and Confinement Cows Series
   - Part 3: 42 Years of Research (April 2015) http://beef.unl.edu/confinement-cows-series-part-3-42-years-of-research
   - Part 4: Economics (April 2015) http://beef.unl.edu/confinement-cows-series-part-4-economics
   - Part 5: Pricing Feeds (April 2015)
Student theses and/or dissertations
None to report at this time.

South Dakota
Extension Reports/Publications

Grings, E. and R. Gates. Fall grazing of cover crops, July 24, 2014 SDSU Extension iGrow Website


Articles in the Popular Press (non-peer reviewed)


Illinois Publications:
Peer-reviewed Journals


Posters/Professional Presentations
Fiber Conference, Champaign, IL. “Use of chemical treatments to increase the energetic value of fiber”. September 1, 2014
Abstracts


Extension Reports/Publications


Articles in the Popular Press (non-peer reviewed)

Student theses and/or dissertations
Chapple, Wesley, M.S., November 1, 2011 to December 14, 2014, “Utilization of chemically treated cornstalks and co-products to finish cattle”, now at UIUC, Orr Agricultural Research and Development Center, Beef Farm Manager

Kneeskern, Samantha, In progress, August 16, 2013 to June 2015, “Effects of Cr Supplementation During Gestation on Beef Cow Performance and the Interaction with Cr During Finishing on Progeny Growth Performance and Carcass Characteristics”, now at ASAS as Journalist Intern

Edenburn, Bailey, In progress, August 16, 2013 to September 2015, “Effects of Zinc, Chromium, and Beta-agonist Supplementation to Feedlot Steers on Growth Performance, Carcass Characteristics, and Meat Quality”

Kansas Publications:


Lomas, L. W. and J. L. Moyer. 2015. Effects of supplementation with corn or dried distillers grains on gains of heifer calves grazing smooth bromegrass pastures, pp. 33-34. In: SEARC


Nebraska
Funding (include grants and contracts)
Source, amount, start/end dates, title of project, Project Director, Co-Project Director(s)

1. Eng Foundation, $100,000/year for 5 years, 2013-2018, Alternative Cow/calf Systems, Klopfenstein, Jenkins, Rasby
South Dakota

**Funding (include grants and contracts)**

*Source, amount, start/end dates, title of project, Project Director, Co-Project Director(s)*


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**Funding (include grants and contracts)**

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<th>Source, amount, start/end dates</th>
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<tr>
<td>Tara L Felix (PI) and Mike Cecava 2014</td>
<td>Nutritive value of biomass feedstuffs for livestock. ADM</td>
<td>$11,411</td>
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<tr>
<td>Allen Bridges, Tara L. Felix (PI), Ryan Cox, Alfredo DiCostanzo, Eric Mousel, and Travis Meteer 2014-2016</td>
<td>Enhancing the feeding value of corn residues to improve beef cattle production. Minnesota Corn Research &amp; Promotion Council</td>
<td>$228,923</td>
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