North Dakota State University

Hettinger Research Extension Center

2010 Annual Report

NDSU | HETTINGER RESEARCH EXTENSION CENTER

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NORTH DAKOTA **AGRICULTURE EXPERIMENT STATION**

Hettinger Research Extension Center

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NDSU HETTINGER Research Extension Center

The Hettinger Research Extension Center (HREC) was established from a gift of 160 acres by the residents of Adams County and the city of Hettinger in 1909. Original work at the HREC involved converting native prairie to farm land for the purpose of agronomic research. In 1912, through cooperation with the United States Department of Agriculture, a dry land farming trial began. In 1913 a herd of Guernsey and Jersey cows and bulls was purchased to aid local producers in the production of replacement dairy cattle. Following a brief closure during the Depression, the HREC continued to grow the research programs, focusing on agronomy and sheep breeding. In 1947, an option was secured for the purchase of an extra quarter of land to continue and expand sheep and agronomy research. In the 1980's the research programs were solidified with the addition of land bringing the total owned land to 1130 acres, and the hiring of an agricultural economist and an agronomist.

The HREC is a semi-arid site located in southwest North Dakota, providing the most southerly NDSU location in the non-glaciated portion of North Dakota as a site for its agronomy research program. The HREC also is located at the center of the North Dakota sheep industry, the focus of one of its animal research programs. Furthermore, the HREC is located an area of rapidly growing livestock feeding ventures, another focus of animal research at the HREC. Additionally, the HREC is located in a region where much of the land base is in the Conservation Reserve Program and Forest Service lands, which has resulted in additional research evaluating potential changes in the CRP program and how these changes may affect upland native and game bird populations. A new research program evaluating low-cost rangeland monitoring strategies on U.S. Forest Service lands has resulted in a significant increase in the quantity of rangeland, livestock, and wildlife interaction research conducted at the HREC throughout the Western Dakotas. Research at HREC involves the disciplines of animal science, range and wildlife science, agronomy, and agri-business and applied economics. Collaboration is with Main Station scientists, Branch Station scientists, U.S. Forest Service, grazing associations, university scientists from WY, SD, and MT, and USDA research entities in these research disciplines to improve the productivity of livestock and cropping systems and economic development of the region. Through these efforts, the center's research program has gained a national reputation for its involvement with sheep production systems as well as a strong regional and state reputation for its research in agronomy, multiple-land use, and applied economics.

AGRONOMY

- Distributed foundation seed produced at NDSU research centers, making new varieties available to southwest North Dakota producers.

- Conducted crop variety, forage, plant disease, and herbicide trials as well as off-station variety testing at Regent, Scraton, New Leipzig, Selfridge, Reeder, and Mandan.
- Conducted biofuel trial in conjunction with other REC's.
- Evaluate new varieties and technologies for drought tolerant corn and wheat and preventing damage from wheat stem sawfly.

RANGE AND LIVESTOCK

- Conducted trials across western North Dakota evaluating remote sensing technologies on the Grand River and McKenzie National Grasslands, and Medora Ranger District with the USDA-Forest Service and the respective Grazing Associations.

HREC Crops, Livestock, Range and Economics

- Conducted multiple research projects evaluating environmental and economic consequences of multiple-use management of agricultural lands in the Northern Great Plains including nesting success of upland birds, telemetry of upland chicks, and land transfer patterns in the region during the past 20 years.

- Continued research in “Value Added Animal Production”; a research program focused on evaluating forage, grain, byproduct, and marketing alternatives in calf backgrounding and lamb finishing. New projects are targeting “Natural” based production of meats, contributing to research for the Beef Systems Center of Excellence.

- Conduct two Producer Ram Tests annually. The Spring Performance Ram Test targets terminal sire type rams for a 111 day test, and the Dakota Fall Performance Ram Test targets the 140 day Rambouillet Certificate of Merit program, one of three Rambouillet Ram Tests in the nation.

- Conduct annually the HREC Beef Day, Shepherd’s Clinic, Crops Tours, Crops Day, and Sportsmen's Night Out.

ECONOMICS

- Evaluation of opportunities and constraints created by changing land ownership patterns in the Northern Great Plains.

- Expanding Ruminant Livestock Production in the Northern Great Plains: An Assessment of Resources, Opportunities and Constraints.

HREC Research Faculty

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NDSU HETTINGER Research Extension Center

Agronomy Research

Agronomy Department
Hettinger Research Extension Center

Eric Eriksmoen - Agronomist
Nels (Rick) Olson - Technician
Caitlin Pearson & Alix Pearson- Summer Labors

2010 Field Research Projects

Variety Trials

Drill Strips, HRSW - 44 cultivars, Durum - 48 cultivars, Barley - 21 cultivars, Oat - 34 cultivars. Drill strips are grown to increase seed for future use at the research center and harvested seed is sent to the NDSU Dept. of Cereal Science for grain quality analysis. These strips are also used for demonstration purposes during the annual summer field tours. Status: **Ongoing.**

Hard Red Winter Wheat Variety Trial. 23 cultivars.
This trial was composed of established and experimental varieties and was used to determine agronomic and quality parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation of elite experimental lines for release to the general public. This is a cooperative project with the NDSU Dept. Plant Science. 'Decade' was jointly released by MT and ND. Status: **Ongoing**.

Hard Red Winter Wheat Northern Regional Performance Nursery. 34 cultivars.
This trial was composed of experimental cultivars developed by plant breeders located throughout the great plain states and Canada. The information is used to assist plant breeders in determining cultivar adaptation and performance of agronomic traits (plant height, insect resistance, etc.) used in variety development. This is a cooperative project with the USDA - ARS at Lincoln, NE. Status: **Ongoing**.

BASF HRWW and HRSW Seed Treatment Trials. 14 treatments.
These trials were developed to evaluate crop tolerance and efficacy of fungal seed treatments being developed by BASF. The information will be used in the further development of fungal seed treatments. These trials was conducted for a fee and were a cooperative project with BASF. Status: **Completed**.

Winter Rye Variety Trial. 10 cultivars.
This trial was composed of established and experimental varieties and was used to determine agronomic and quality parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation of elite experimental lines for release to the general public. This is a cooperative project with the NDSU Carrington Research Extension Center. Status: **Ongoing**.

Hard Red Spring Wheat Variety Trial. 50 cultivars.
This trial was composed of established and experimental varieties and was used to determine agronomic and quality parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation of elite experimental lines for release to the general public. This is a cooperative project with the NDSU Dept. Plant Science and private seed companies. Status: **Ongoing**.

Hard Red Spring Wheat Uniform Regional Nursery. 37 cultivars.
This trial was composed of experimental cultivars developed by plant breeders located throughout the United States and Canada. The information is used to assist plant breeders in determining cultivar adaptation and performance of agronomic traits (plant height, insect resistance, etc.) used in variety development. This is a cooperative project with the USDA - ARS at St. Paul, MN. Status: **Discontinued**.

Western Hard Red Spring Wheat Elite Yield Trial. 76 cultivars.
This trial was composed of elite experimental cultivars developed by the HRS wheat plant breeder at NDSU. The information is used to assist in the development of spring wheat varieties for Western North Dakota. Status: **Ongoing**.

IMI Tolerant Hard Red Spring Wheat Elite Yield Trial. 40 cultivars.
This trial was composed of experimental cultivars that are being developed to tolerate imazamox (Beyond) herbicide. Cultivars are being developed by the HRS wheat plant breeder at NDSU. The information is used to assist in the development of IMI tolerant spring wheat varieties for North Dakota. Status: **Ongoing**.

IMI Tolerant Hard Red Spring Wheat Advanced Yield Trial. 10 cultivars.
This trial was composed of experimental cultivars that are in the final stages of development for tolerance to imazamox (Beyond) herbicide. Cultivars were developed by the HRS wheat plant breeder at NDSU and this test is a requirement for final approval and release to the public. The information is used by plant breeders to assist in the development of IMI tolerant spring wheat varieties for North Dakota. Status: **Ongoing**

Commercial White Spring Wheat Nursery. 22 cultivars.
This trial was composed of commercial and experimental cultivars developed by plant breeders located throughout the United States and Canada. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation of elite experimental lines for release to the general public. This is a cooperative project with the NDSU Williston Research Extension Center. Status: **Ongoing**.

HRSW Sawfly Breeder Nursery. 20 cultivars.
This trial was composed of commercial and experimental cultivars developed to resist sawfly infestations. Sawfly infestations have become a major problem in western North Dakota where no-till spring wheat is the predominant crop. The information is used to assist in the development of sawfly resistant varieties for western North Dakota. This is a cooperative project with the NDSU Dept. of Plant Sci. Status: **Ongoing.**

Optimizing the Identification and Development of High-yielding Spring Wheats with Resistance to Wheat Stem Sawfly. 19 cultivars at 3 locations.
This trial was composed of commercial and experimental cultivars developed to resist sawfly infestations. The objectives of the trial were to expand the knowledge base of sawfly, variety and environmental interactions relating to stem solidity, stem infestation and timing of infestations. The trials were seeded into a natural sawfly infested areas near Hettinger, Scranton and Regent. The information is used to assist in the development of integrated pest management strategies for western North Dakota. This is a cooperative project with the NDSU Dept. of Plant Sciences and the NDSU Dept. of Entomology and was funded by SBARE. Status: **Ongoing.**

Specialty Wheat Advanced Yield Nursery. 40 cultivars.
This trial was composed of experimental cultivars developed by the specialty wheat plant breeder at NDSU. The information is used to assist in the development of cultivars with specific characteristics such as unique starch or protein composition. Status: **Ongoing**.

Durum Variety Trial. 48 cultivars.
This trial was composed of established and experimental varieties and is used to determine agronomic and quality parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation of elite experimental lines for release to the general public. This is a cooperative project with the NDSU Dept. Plant Science. 'Tioga' was released. Status: **Ongoing**.

Barley Variety Trial. 24 cultivars.
This trial was composed of established and experimental varieties and was used to determine agronomic and quality parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation of elite experimental lines for release to the general public. Of these cultivars, 8 were two row types and the remaining were 6-row types. This is a cooperative project with the NDSU Dept. Plant Science. Status: **Ongoing**.

Western Regional Dryland Spring Barley Nursery. 31 cultivars.
This trial was composed of experimental cultivars developed by plant breeders located throughout the western United States and Canada. The information is used to assist plant breeders in determining cultivar adaptation and performance of agronomic traits (plant height, insect resistance, etc.) used in variety development. This is a cooperative project with the USDA - ARS at Aberdeen, ID. Status: **Ongoing**.

Oat Variety Trial. 34 cultivars.
This trial was composed of established and experimental varieties and was used to determine agronomic and quality parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation of elite experimental lines for release to the general public. This is a cooperative project with the NDSU Dept. Plant Science. 'Rockford' was released. Status: **Ongoing**.

Naked Oat Nursery. 36 cultivars.
This trial was composed of experimental cultivars that have been developed throughout the

United Stated and Canada and that produce a naked or hulless kernel. The information is used to assist the NDSU oat breeding program in the development of varieties adapted to North Dakota. This is a cooperative project with the NDSU Dept. Plant Science. Status: **Ongoing**.

Oat Kernel Quality Trial. 10 cultivars.
This trial was conducted to identify and better understand specific kernel quality characteristics of selected commercial and experimental cultivars. The information is used to assist the NDSU Dept. of Cereal Sciences in the identification and development of specific oat kernel quality characteristics. This is a cooperative project with the NDSU Dept. Plant Science. Status: **Ongoing**.

Spring Triticale Variety Trial. 6 varieties.
This trial was composed of established varieties and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation. This is a cooperative project with the NDSU North Central Research Extension Center. Status: **Ongoing**.

Spring Emmer Variety Trial. 10 cultivars.
This trial was composed of established and experimental cultivars and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation. This was a cooperative project with the NDSU Carrington Research Extension Center. Status: **Ongoing**.

Winter Spelt Variety Trial. 3 cultivars.
This trial was composed of established and experimental cultivars and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation. This was a cooperative project with the NDSU Carrington Research Extension Center. Status: **Ongoing**.

Winter Triticale Variety Trial. 3 cultivars.
This trial was composed of established and experimental cultivars and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation. This was a cooperative project with the NDSU Carrington Research Extension Center. Status: **Ongoing**.

Proso Millet Variety Trial, 3 varieties.
This trial was composed of established varieties and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety selection. The Hettinger Research Extension Center coordinates the statewide proso millet trials. Status: **Ongoing**.

Fall Seeded Broadleaf Crops Trial, 5 crops, 10 cultivars.
This trial was composed of established and experimental varieties of 5 different species (pennycress, winter camelina, spring camelina, winter canola and turnip) to determine adaptation as a potential fall seeded broadleaf crop. The information is used by scientists and plant breeders

to determine adaptation of various varieties and crops. The turnip and winter canola had very little winter survival. Status: **Ongoing**.

Spring Camelina Variety Trial, 6 cultivars.
This trial was composed of established varieties and was used to determine agronomic and quality parameters of individual varieties. Camelina is an industrial oil seed that currently has no established market in North Dakota but is being looked at as a possible bio-diesel crop. The information is used to determine adapted varieties and to assist in the development of this crop. This is a cooperative project with the NDSU Williston REC. Status: **Ongoing**.

Safflower Variety Trial, 12 cultivars.
This trial was composed of established and experimental varieties and was used to determine agronomic and quality parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation of elite experimental lines for release to the general public. This is a cooperative project with the NDSU Williston Research Extension Center. Status: **Ongoing**.

Dormant Seeded Safflower Trial, 4 cultivars seeded in the fall and spring.
This trial is designed to evaluate safflower that is seeded in the late fall prior to freeze up and comparing it with a typical spring seeding. This trial has been conducted for several years with promising results. Weed control strategies will need to be developed to correspond with this practice. The information is used by scientist to assist them in developing this cropping practice and to assess associated risks. This is an HREC lead project. Status: **Ongoing**.

Canola Varity Trial. 30 varieties.
This trial was composed of established and experimental varieties submitted by seed companies and tested for a fee. The information is used by growers to assist them with variety selection and by seed companies to assist them in determining adaptation. Status: **Ongoing**.

Canola Elite Yield Nursery. 50 cultivars.
This trial was composed of experimental cultivars being developed for adaptation to this growing region. The information is used by the NDSU canola breeder in the development of adapted varieties. The trial was not planted due to late seed submission. Two open pollinated lines were released (NDSU-662 and NDSU-626). Status: **Ongoing**.

Canola Seeding Date Trial. 5 seeding dates.
This trial was established to evaluate the effects of seeding dates on seed quality and yield with an emphasis on later seeding dates. Similar trials conducted in the past have established the need to plant this crop early for optimal yield, but the effects of later seeding dates is not entirely understood. The information is used by growers and by the insurance industry to assist them with understanding the potential risks of late seeding. The trial is being funded by SBARE and is being coordinated by the NDSU Dept. of Plant Sciences. Status: **Ongoing**.

Spring Canola Herbicide Systems and Hybrids Comparison Trial. 14 varieties.
This trial was composed elite varieties submitted by canola companies and tested for a fee. The information is used by growers to assist them with variety selection and by seed companies to assist them in determining adaptation. Status: **Ongoing**.

Juncea Variety Trial. 24 cultivars.
This trial was composed of established and experimental cultivars being developed by Viterra Inc. and was tested for a fee. This crop is being developed as an alternative to canola for areas that are more prone to heat and moisture stress. The information is used by plant breeders to assist them with variety development. This is a cooperative project with Viterra Inc. Status: **Ongoing**.

Mustard Variety Trial, 7 varieties.
This trial was composed of established varieties and is used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety selection. Four of the varieties were yellow types, one was an oriental type and two were brown types. This is a cooperative project with the NDSU Langdon Research Extension Center. Status: **Ongoing**.

Crambe Variety Trial, 3 cultivars.
This trial is composed of established varieties and was used to determine agronomic and quality parameters of individual varieties. The information is used by growers to assist them with variety selection. This is a cooperative project with the NDSU Williston Research Extension Center. Status: **Ongoing**.

Pennycress Evaluation.
This evaluation was composed of seed collected from locally growing field pennycress plants. Field pennycress is a winter annual (or spring annual) weed species in the mustard family which grows readily throughout ND. It has been reported to have a seed oil content of up to 40%. Status: **Ongoing**.

Buckwheat Variety Trial, 3 varieties.
This trial was composed of established varieties and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety. This is a cooperative project with the NDSU Langdon Research Extension Center. Status: **Ongoing**.

Field Pea Variety Trial. 19 cultivars.
This trial was composed of established and experimental varieties and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety selection and by seed companies to assist them in determining adaptation. Green and yellow types were represented in this trial. This was a cooperative project with the NDSU Carrington Research Extension Center. Status: **Ongoing**.

Dry Pea Flowering Date Adaptation Nursery. 12 cultivars.
This trial was composed of experimental cultivars being developed by the NDSU field pea breeder, Dr. Kevin McPhee. The information is used in cultivar development. This is a cooperative project with the NDSU Dept. of Plant Sciences. Status: **Ongoing**.

Western Regional Dry Pea Yield Nursery. 32 cultivars.
This trial was composed of experimental cultivars being developed by the USDA field pea breeding program at Pullman Washington. The information is used in cultivar development. This is a cooperative project with the USDA Pullman Station. Status: **Ongoing**.

Dry Pea Advanced Yield Nursery. 17 cultivars.
This trial was composed of experimental cultivars being developed by the NDSU field pea breeder, Dr. Kevin McPhee. The information is used in cultivar development. This is a cooperative project with the NDSU Dept. of Plant Sciences. Status: **Ongoing**.

Lentil Variety Trial. 10 varieties.
This trial was composed of established and experimental varieties and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders in determining cultivar adaptation and performance of agronomic traits (plant height, insect resistance, etc.) used in variety development. All market classes were represented in this trial. This is a cooperative project with the NDSU North Central Research Extension Center. Status: **Ongoing**.

ClearField Lentil Variety Trial. 10 varieties.
This trial was composed of established imazamox tolerant (ClearField) varieties and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety selection. This is a cooperative project with the NDSU North Central Research Extension Center. Status: **Ongoing**.

Western Regional Lentil Yield Nursery. 14 cultivars.
This trial was composed of experimental cultivars being developed by the USDA lentil breeding program at Pullman Washington. The information is used in cultivar development and is a cooperative project with the USDA Pullman Station. Status: **Ongoing**.

Chickpea Variety Trial. 8 varieties.
This trial was composed of established and experimental varieties and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by plant breeders to assist them with variety development and by growers to assist them with variety selection. Kaboli and Desi types were represented in this trial. This is a cooperative project with the NDSU Dept. of Plant Sciences. The trial was destroyed by ascochyta blight. Status: **Ongoing**.

Western Regional Chickpea Yield Nursery. 12 cultivars.
This trial was composed of experimental cultivars being developed by the USDA chickpea breeding program at Pullman Washington. The information is used in cultivar development and is a cooperative project with the USDA Pullman Station. The trial was destroyed by ascochyta blight. Status: **Ongoing**.

Soybean Variety Trial, 19 varieties.
This trial was composed of experimental, private and public varieties and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety selection and by seed companies to establish parameters of adaptation. Both conventional and Roundup Ready types were represented in this trial. This is a cooperative project with the NDSU Dept. Plant Science and private seed companies. Status: **Ongoing**.

Drought Tolerant Soybean Trial, 33 varieties.
This trial was composed of experimental cultivars that are being developed to tolerate droughty growing conditions. The information is used by plant breeders to assist them with variety development. This was a cooperative project and was funded by Pioneer HiBred. Status: **Completed.**

Dry Edible Bean Variety Trials, 29 varieties.
This trial was composed of established and experimental varieties and was used to determine agronomic and quality parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation of elite experimental lines for release to the general public. The trial included pinto, navy, great northern, small red, pink and black types. This is a cooperative project with the NDSU Dept. Plant Science. Status: **Ongoing**.

Hybrid Sunflower Trial, 45 oil type hybrids.
This trial was composed of established and experimental varieties submitted by seed companies and tested for a fee. The information is used by growers to assist them with variety selection and by seed companies to assist them in determining adaptation. Status: **Ongoing**.

Hybrid Corn Trial, 14 hybrids.
This trial is composed of established varieties submitted by seed companies and tested for a fee. The information is used by growers to assist them with variety selection and by seed companies to assist them in determining adaptation. The trial was destroyed by hail. Status: **Ongoing**.

Corn Breeder Nurseries, 312 plots.
These trials were established to determine agronomic and yield factors of corn varieties being developed by NDSU. The information will assist the NDSU plant breeder in the development of drought tolerance and early maturing cultivars. Status: **Ongoing**.

Hay Barley Trial, 6 varieties.
This trial was composed of commercial varieties that were developed specifically for the production of livestock feed. The information is used to assist plant breeders in determining cultivar adaptation and feed values used in variety development. Status: **Ongoing**

Off Station Variety Trials, Scranton, Regent, New Leipzig, Selfridge and Mandan.
Twelve hard red spring wheat varieties, six durum varieties, six barley varieties and six oat varieties were tested for yield, agronomic and quality factors at five southwestern North Dakota locations. Field pea and HRWW variety trials were also located at Mandan. The trials are used for demonstration purposes during the annual field tours and to enhance the data base on variety adaptation. The information is used by growers to assist them with variety selection. These trials are located in farmer fields and are cooperative projects with the NDSU and SDSU Extension Services, the ARS Northern Great Plains Research Lab, Ducks Unlimited and Pulse USA. Status: **Ongoing**.

Other Agronomic Research

National Phenology Network, cloned Syringa chinensis lilac.
This study involves the observation and collection of biological information such as bud formation, flowering and leaf senescence based on a standard phenological clock (lilac). This is a cooperative project with the Dept. of Geography, Univ. of WI - Milwaukee. Status: **Ongoing.**

Foliar Disease Evaluations in Wheat, 50 HRSW, 23 HRWW and 48 durum varieties.
These evaluations were conducted to document varietal tolerance/sensitivity to foliar diseases. The information will assist growers in determining varietal susceptibility to several commonly occurring diseases. Status: **Ongoing**.

Joint Management of Wheat Stem Sawfly, Fusarium Crown Rot and Weeds: Assessing the Ecological Basis of a Total Systems Approach to Pest Management Strategies, 12 treatments.
This trial was conducted to document insect, plant disease and weed infestations under farming scenarios utilizing various seed varieties, herbicide treatments and seeding rates. The information will be used to gain a better understanding of the inter-relationships between various pests and farming practices. This trial is a cooperative project with Montana St. Univ. Status: **Completed.**

Cover Crops as a Source of Extra Grazing, 9 treatments.
This trial was conducted to document the potential practice of interseeding cover crops into spring seeded wheat as a source of post-harvest livestock feed. The utilization of "cover crops" is currently being promoted by several organizations as a method of enhancing species diversity which ultimately enhances the productivity of the land. These claims have little scientific backing and provide almost no direction on how those claims were achieved. The information will assist scientists in the understanding of the role cover crops may play in our environment and crop/livestock systems. This trial is a cooperative USDA – Five States Ruminant Consortium project under the direction of Dr. Greg Lardy. Status: **Completed.**

Application Timing of Valor SX Herbicide in HRWW, 8 treatments.
This trial was conducted to document the efficacy and crop safety of Valor SX Herbicide applied at various timings to HRWW. The information will be used by the manufacturer to establish guidelines for herbicide use. This trial was funded by Valent. Status: **Completed.**

Effect of Planting Depth on Winter Wheat Tolerance toValor SX Herbicide Applied in No-till Wheat Stubble, 12 treatments.
This trial was conducted to document the efficacy and crop safety of Valor SX Herbicide applied to HRWW that was planted at various seeding depths in soil with an abundance of standing stubble. The information will be used by the manufacturer to establish guidelines for herbicide use. This trial was funded by Valent. Status: **Completed.**

Effect of Planting Depth on Winter Wheat Tolerance toValor SX Herbicide Applied to Bare Soil, 12 treatments.
This trial was conducted to document the efficacy and crop safety of Valor SX Herbicide applied

to HRWW that was planted at various seeding depths in soil that had little stubble cover. The information will be used by the manufacturer to establish guidelines for herbicide use. This trial was funded by Valent. Status: **Completed.**

Evaluation of PrePare Herbicide in HRWW, 8 treatments.
This trial was conducted to document the efficacy and crop safety of PrePare Herbicide in HRWW. The information will be used by the manufacturer to establish guidelines for herbicide use. This trial was funded by Arysta. Status: **Completed.**

Evaluation of BAS-94461 Herbicide in HRWW, 7 treatments.
This trial was conducted to document the efficacy and crop safety of a new herbicide being developed by BASF for use in HRWW. The information will be used by the manufacturer to establish crop tolerance and guidelines for herbicide use. This trial was funded by BASF. Status: **Completed.**

Evaluation of Rimfire Max Herbicide in HRWW, 9 treatments.
This trial was conducted to document the efficacy and crop safety of Rimfire Max Herbicide in HRWW. The information will be used by the manufacturer to establish crop tolerance and guidelines for herbicide use. This trial was funded by Bayer. Status: **Completed.**

Evaluation of Orion and Pulsar Herbicide Tank Mixtures in HRSW, 11 treatments.
This trial was conducted to document the efficacy and crop safety of tank mixtures of Orion and Pulsar Herbicides in HRSW. The information will be used by the manufacturer to establish crop tolerance and guidelines for herbicide use. This trial was funded by Syngenta. Status: **Completed.**

Broadleaf Weed Control in Wheat, 13 treatments.
This trial was conducted to determine the effectiveness of various herbicides and herbicide combinations at controlling various broadleaf weeds in wheat. There are many different broadleaf weed herbicides on the market and many different herbicide combinations being used by producers. The trial looked at various herbicides and herbicide combinations for injury to the crop and for herbicide effectiveness at controlling weeds. The information will be used by producers for herbicide tank mix selection and by manufacturers for tank mix and application guidelines. This trial is a cooperative project with the NDSU Dept. of Plant Sciences. Status: **Ongoing**.

Grassy Weed Control in Wheat, 13 treatments.
This trial was conducted to determine the effectiveness of various herbicides and herbicide combinations at controlling various grassy weeds in wheat. There are many different grassy weed herbicides on the market and many different herbicide combinations being used by producers. The trial looked at various herbicides and herbicide combinations for injury to the crop and for herbicide effectiveness at controlling weeds. The information will be used by producers for herbicide tank mix selection and by manufacturers for tank mix and application guidelines. This trial is a cooperative project with NDSU Dept. of Plant Sciences. Status: **Ongoing**.

Evaluation of Broadleaf Weed Control in HRSW, 12 treatments.
This trial was conducted to document the efficacy and crop safety of an experimental broadleaf herbicide being developed for the small grain market. The information will be used by the manufacturer to establish crop tolerance and guidelines for herbicide use. This trial was funded by Valent. Status: **Completed.**

Evaluation of Grassy Weed Control in HRSW, 14 treatments.
This trial was conducted to document the efficacy and crop safety of an experimental herbicide being developed for grassy weed control in the small grain market. The information will be used by the manufacturer to establish crop tolerance and guidelines for herbicide use. This trial was funded by Valent. Status: **Completed.**

Evaluation of Application Timing of BAS 810H in HRSW, 7 treatments.
This trial was conducted to document the efficacy and crop safety of an experimental broadleaf herbicide being developed for the small grain market. The information will be used by the manufacturer to establish crop tolerance and guidelines for herbicide use. This trial was funded by BASF. Status: **Completed.**

Evaluation of Rimfire Max Herbicide for Grassy Weed Control in HRSW, 6 treatments.
This trial was conducted to document the efficacy and crop safety of Rimfire Max Herbicide applied with various combinations of adjuvants and other broadleaf weed herbicides for the control of both broadleaf and grassy weeds in spring wheat. The information will be used by the manufacturer to establish guidelines for herbicide compatibility and use. This trial was funded by Bayer CropScience. Status: **Completed.**

Evaluation of Rate and Application Timing of Assure II Herbicide on Tough Grassy Weeds in Field Pea, 11 treatments.
This trial was conducted to document the efficacy and crop safety of various rate and timing combinations of Assure II Herbicide for the control of tough grassy weeds (wild oat, Persian darnel, Japanese brome and downy brome) in field pea. The information will be used by farmers and by the manufacturer to establish guidelines for herbicide use. This trial was funded by Dupont. Status: **Completed.**

Broadleaf Weed Control Herbicide Comparisons in HRSW, 2 trials with 5 treatments.
These trials were conducted to document the weed control differences between various broadleaf herbicides. The information will be used by the manufacturer to establish market position and guidelines for herbicide use. This trial was funded by Bayer. Status: **Completed.**

Evaluation of Rimfire Max for Carryover into Sensitive Crops, 7 treatments.
This trial was conducted to document the potential response of carryover Rimfire Max Herbicide to sensitive crops. The information will be used by the manufacturer to establish crop tolerance and guidelines for herbicide use. This trial was funded by Bayer. Status: **Ongoing.**

Relationship of Soil Temperature to Lentil Seedling Emergence in Soils Treated with Spartan Herbicide, 9 treatments.
This trial was conducted to document crop responses to Spartan Herbicide that was applied to

soils at various temperatures. Spartan is not labeled for use in lentil because of potential crop injury but crop response is not completely understood. The information will be used to better understand circumstances for potential herbicide use. This trial was funded by the Northern Pulse Growers Association. Status: **Completed.**

NDAWN and NOAA Weather Monitoring.
The Hettinger REC agronomy dept. is responsible for daily collection and transmission of weather data to the National Oceanic and Atmospheric Administration and for the maintenance of the North Dakota Ag. Weather Network weather station. Status: **Ongoing.**

Evaluation of Perennial Herbaceous Biomass Crops (Switchgrass).
This trial was established to document the appropriate grass species, harvest methods, production practices and economics in the production of perennial biomass stands. The trial was reseeded this year after very poor stand establishment in past years caused by drought. The information will assist in the feasibility of biomass production for conversion to bio-energy. This trial is being coordinated by the NDSU Central Grasslands REC, Streeter and is being funded by the ND Natural Resources Trust. Status: **Ongoing.**

NDSU Extension Service Live Lamb Carcass Contest Report

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Using ultrasound measurements for live carcass evaluation can be used as an effective tool for selection of carcass merit improvement. It has been used very little on sheep; however, the technology has been available to North Dakota youth participating in the sheep project.

Introduction

The use of ultrasound has been around for research purposes but not used as often in performance measurements for live evaluation until the last decade. In sheep it is used even less, but offers the same amount of accuracy as other species. Combining carcass traits with economic traits of importance such as growth, maternal traits, pedigree, and reproduction can make flock selection decisions for genetic improvement easier. The points evaluated for decision making purposes are ribeye area (REA), fat thickness (FT), and body wall thickness (BWT). These carcass traits are highly heritable and can be useful in determining extremes.

REA is measured in square inches between the 12-13th rib. It is positively correlated with carcass cutability, giving a good indicator of total muscling. REA reflects the differences in the proportion of muscle-to-bone within the carcass, and usually measures between 1.5 - 4.0 square inches. Fat thickness or backfat, is measured over the center of the ribeye at the 12 - 13th rib. The fat usually ranges from 0.1 - 0.5 inches. Fat thickness is the most important measurement that helps determine carcass cutability. As fat thickness increases, the percent BCTRC will decrease. Body wall thickness is a measurement across the lean, bone, and fat of the loser rib. This area can accumulate excess fat and thus, serves as an indicator of lean meat yield. BWT usually ranges from 0.5 - 1.2 inches.

Procedures

In the youth lamb project, the market lamb portion is one that allows smaller youth to get involved at a young age because the size of the animal may fit the size of the child, however that doesn't limit the knowledge of the participants. This project was started to allow youth that do not traditionally get to evaluate their carcasses a live glimpse at them. This can also help them to make their own decisions regarding technology such as ultrasound. This report marks the 2nd year of an ongoing project known as the North Dakota Live Lamb Carcass Contest. In the sheep project for 4-H, FFA, or Junior sheep members, youth can enter their live market sheep for ultrasound measurements, weight measurements, and then combine that for an index of percent boneless closely trimmed retail cuts (%BCTRC=49.936-(0.0848 X HCW)-(4.376 X FT)-(3.530

X BW)+(2.456 X REA). This contest was offered at the North Dakota State Fair and was open to youth members. Weights and ultrasound measurements were taken from 109 lambs entered our database.

Results and Discussion

After the calculations for %BCTRC were determined the top 20 in the contest received awards from the North Dakota Lamb and Wool Producers Association. The top lamb %BCTRC was 50.63, had a 4.87 in. REA, and 0.5 in. FT. The range for all of the competitors was 2.13 - 5.40, BWT ranged from 0.47 - 1.77, FT ranged from 0.2 - 1.40, and the %BCTRC ranged from 43.84 - 50.63. Many of the ranges were larger than the previous year. This may be due to weather factors over this strange weather pattern year. There was a growing interest as well in the project. Many of the youth remembered this from last year and compared their previous results, but also analyzed all of the carcass factors.

Implications

With this ongoing project, we will be able to evaluate the progress of the youth market lamb project and how selection can affect carcass traits.

Interaction of corn processing and distillers dried grains with solubles on health and performance of steers[1]

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INTRODUCTION

One challenge with using ethanol co-products is the potential for sulfur induced polioencephalomalacia (**PEM**) in ruminants (Gould, 1998). Research has demonstrated that lambs fed diets containing 60% DDGS did not develop PEM (Neville et al., 2010) and performed similar to those fed lesser concentrations of DDGS (Schauer et al., 2008). Schauer et al. (2008) and Neville et al. (2010) provide evidence that use of DDGS can be increased in lamb finishing rations. Differences in lamb and beef cattle responses to high S diets require additional research. Average utilization of DDGS in the beef feedlot industry is 16.5% (Vasconcelos and Galyean, 2007); this is lower than the 20-30% inclusion suggested to optimize ADG and G:F (Klopfenstein et al., 2008). The reason for the low DDGS inclusion rate in beef feedlot diets could be economic or more likely a result of negative connotations with feeding co-products (i.e. sulfur content). Feeding 60% DDGS results in exceeding the maximum tolerable level of dietary S (0.3%; NRC, 2005).

Neville et al. (2010) demonstrated that lambs can be fed a greater S concentration than recommended by NRC (2005). Our hypothesis was that feeding combinations of DDGS and either DRC or HMC with dietary S content exceeding 0.3% S will not result in incidence of PEM. We further hypothesized that feeding high-moisture corn (**HMC**) in combination with DDGS will increase ruminal hydrogen sulfide (H_2S) gas concentrations over those found when feeding DDGS with dry-rolled corn (**DRC**). Admittedly animal performance may suffer due to decreased palatability and intake as the concentration of DDGS increases. However, the economic benefit from decreased feed costs may warrant such feeding practices. The objective of this study was to evaluate the influence of feeding increasing concentrations of DDGS and corn processing method (high-moisture vs. dry-rolled corn) on animal performance, incidence of PEM, and concentration of ruminal (H_2S) in feedlot steers.

MATERIALS AND METHODS

All animal care and handling procedures were approved by the North Dakota State University Animal Care and Use Committee prior to the initiation of the research. Seventy-two mixed breed steer calves (750 ± 27 lb) were utilized in a completely random design with a 3x2 factorial arrangement of treatments to evaluate the outlined objective. Animals were assigned to

[1] Partial support for the research and Dried Distillers Grains Plus Solubles was provided by Dakota Gold Research Association, Sioux Falls, SD. Additionally, partial support for this research was provided by the North Dakota State Board of Agricultural Research and Education Research Fund – Animal Agriculture and Hay Committee.

treatment at the time of arrival. Main effects included concentration of DDGS (20, 40, or 60% DM basis) and corn processing method [high-moisture (**HMC**) vs. dry-rolled corn (**DRC**)] resulting in treatments of: 1) 20% DDGS with DRC, 2) 40% DDGS with DRC, 3) 60% DDGS with DRC, 4) 20% DDGS with HMC, 5) 40% DDGS with HMC, and 6) 60% DDGS with HMC. Treatment diets were formulated to meet or exceed dietary nutrient requirements for steers weighing 715 lb and gaining 3.2 lb daily (NRC, 2000; Table 1). The dietary treatments were formulated to have minimum Ca to P ratio of 1:1. Diets were formulated to provide 150 mg/hd/d thiamin based on an estimated DMI of 22 lb; actual thiamin provided was 135.5 mg/hd/d. Prior to initiation of this study steers were vaccinated for clostridial and respiratory, and dewormed. Steers were trained to use the Calan Broadbent Feeding System (American Calan, Northwood, NH) prior to adaptation to finishing diets. During this training phase steers were fed a diet consisting of 50% corn silage, 25% alfalfa hay, 25% dry-rolled corn (DM basis). Steers were maintained on this diet until d 0 at which time adaptation to final finishing diets began. Neither the receiving diet nor the training diet contained DDGS.

Ruminal H_2S gas concentrations were measured via rumen puncture during the adaptation to the finishing diets and throughout the finishing phase. Collection of rumen gasses occurred 5 h after feed was offered. Hydrogen sulfide measurements were collected on d 0, 7, 14, 21, 28, 35, 49, 63, and 91; final finishing diets were provided on d 28. On d 0, steers began the dietary adaptation period which increased the concentrate portion of the diet to 85% over 28 d (Table 2). Adaptation diets increased the amount of concentrate (corn and DDGS) while reducing the amount of corn silage and alfalfa hay. Steers were then given a single 10 ml injection of penicillin to prevent infection after conclusion of gas sampling procedure.

Two day BW were collected at arrival (d -28), beginning of dietary adaptation (d 0), beginning of the finishing phase (d 28), and the conclusion of the study. Intermediate weights were collected every 28 d as single day weights to monitor animal performance (data not presented). Steers received a single implant containing 80 mg trenbolone acetate and 16 mg estradiol (Revalor-IS, Intervet Inc., Millsboro, DE) on d 28. Feed offered was recorded daily with feed refusals collected, weighed, and sampled weekly. Weekly feed samples were collected to determine dietary DM and nutrient composition. Average daily gain and G:F were calculated based on these data. Carcass characteristics were collected by trained personnel 24 h after slaughter. Liver scores were recorded with evaluation based on procedures outlined by Brink et al. (1990).

RESULTS

The day × corn processing × DDGS concentration interaction for hydrogen sulfide gas concentrations was not significant ($P = 0.91$). Ruminal H_2S concentration was affected by increasing DDGS concentration in the diet ($P < 0.001$) and day ($P < 0.001$), but not by corn processing method ($P = 0.94$). No differences in H_2S concentration among treatments were observed on d 0, 7, 14, or 21 ($P \geq 0.14$; Figure 1). On d 28, steers fed 60% DDGS had greater ($P \leq 0.006$) H_2S concentrations than those fed either 20 or 40% DDGS. Hydrogen sulfide concentration increased ($P < 0.001$) from d 28 to d 91 for steers fed 60% DDGS. Steers fed 60% DDGS had the greatest concentrations of H_2S on d 91 ($P \leq 0.01$). Hydrogen sulfide

concentrations were either static ($P = 0.68$) or tended to decrease ($P = 0.08$) for steers fed 20 or 40% DDGS, respectively, from d 49 to d 91.

Results for steer performance are reported in Table 3. There were no corn processing and DDGS concentration interactions ($P \geq 0.12$). Furthermore, there was no effect of corn processing ($P \geq 0.14$). Therefore the effects will be discussed as either linear or quadratic responses to increasing DDGS concentration. There were no differences in initial BW ($P \geq 0.82$) due to DDGS inclusion with steers averaging 340 ± 12 kg. Performance data was partitioned into adaptation (d 0 - 28) and finishing (d 29 - end). During the adaptation phase there were no differences in ADG, DMI, or G:F for DDGS concentration ($P \geq 0.35$). During the finishing phase ADG and DMI decreased quadratically ($P \leq 0.02$) while G:F decreased linearly ($P = 0.01$) with increasing concentration of DDGS in the diet. As a result of decreased ADG, final BW decreased linearly ($P = 0.002$) with increasing DDGS inclusion.

Similar to steer performance, corn processing and DDGS concentration interactions were not affected ($P \geq 0.12$) and corn processing had no affect ($P \geq 0.35$) on carcass characteristics of steers. Carcass composition reflected the decrease in final BW with a linear decrease in HCW ($P = 0.006$) as well as a linear decrease in fat depth ($P = 0.005$) with increasing concentration of DDGS in the diet. As a result of decreased backfat thickness, yield grade decreased linearly ($P = 0.01$) with increasing DDGS inclusion. Marbling score was unaffected by corn processing ($P = 0.46$) and DDGS concentration ($P = 0.82$) with an average marbling score of 477 ± 33.6 (Small^0 = 400). Further, KPH, ribeye area, and quality grade were unaffected by corn processing ($P \geq 0.35$) and DDGS concentration ($P \geq 0.18$). Liver abscess evaluation resulted in all scores of 0 (no abscesses).

DISCUSSION

Previous research (Leibovich et al., 2009) has reported that corn processing did not affect in vitro H_2S production. The present study demonstrates that corn processing does not affect in vivo H_2S concentrations. Unlike previous reports (Gould et al., 1997) the present study indicates that H_2S concentrations do not decrease immediately after adaptation to high concentrate rations. One possible explanation for this is differences in acute versus chronic exposure to sulfur. Further, the results from the present study indicate that rumen microorganisms may not adapt in a way that decreases the concentration of H_2S in the rumen gasses. Other work (Niles et al., 2002; Neville et al., 2010) feeding various concentrations of DDGS agree with the present study in that increasing DDGS concentration in the diet results in increased H_2S concentration in the rumen gas cap.

Corrigan et al. (2009) reported that corn processing resulted in changes in DMI, however these changes were not observed in the present study. Similar to Corrigan et al. (2009) the present study demonstrated a quadratic decrease in DMI with increasing inclusion of DDGS. It is unknown if the decreases in intake and performance in the present study are a function of decreased gut motility or sub-clinical PEM. Interestingly, Loneragan et al. (2001) concluded that while H_2S levels may not be great enough to cause toxicity they be great enough to decrease animal growth. The results of the present study appear to support this conclusion as steer

performance was impacted when greater concentrations of DDGS were fed resulting in greater H_2S concentrations. The decrease in HCW, backfat thickness, as well as yield grade for the steers fed 60% DDGS are understandable given the decreased performance of those animals.

During the course of this study there were no confirmed cases of PEM even though dietary S concentrations ranged from 0.6 to 0.9% S, which exceeds the recommended maximum tolerable level (0.3% S; NRC, 2005). These results stand in stark contrast to the recommendations of NRC (2005) and previous research (Loza et al., 2010). In the present study, one steer from the HMC with 60% DDGS treatment did exhibit signs of sulfur toxicity (blind staggers, lack of appetite, and lethargy: McDowell, 2000). This steer responded to treatment with thiamin injections (1 g/d thiamin hydrochloride) and recovered completely within 3 d; histological analysis was not conducted thus a diagnosis of PEM cannot be confirmed. Although only one case of PEM was suspected, sub-clinical cases of PEM could be one explanation for the decreased animal performance of those steers fed 60% DDGS. The lack of confirmed clinical PEM incidence points to a need to clearly distinguish between the maximum tolerable level and toxicity within the scientific literature.

CONCLUSIONS

The present study along with Neville et al. (2010) and Schauer et al. (2008) have consistently demonstrated that S from DDGS can be fed in excess of maximum tolerable level in both lambs and steers fed high concentrate diets. It is possible the maximum tolerable level of sulfur (NRC, 2005) needs to be reevaluated. In addition, from a practical application standpoint, factors which may alter fermentation such as grain source, digestibility, and rate of adaptation must be considered as variables influencing sulfur toxicity in the ruminant animal should be considered when formulating high concentrate rations which included dried distillers grains plus solubles.

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Table 1. Ingredient and nutritional composition of final finishing diets fed to steers

	Dry-Rolled Corn			High-moisture Corn		
Item	20% DDGS	40% DDGS	60% DDGS	20% DDGS	40% DDGS	60% DDGS
Ingredient, %						
Alfalfa Hay	5.0	5.0	5.0	5.0	5.0	5.0
Corn Silage	10.0	10.0	10.0	10.0	10.0	10.0
Corn[1]	58.2	38.2	18.2	58.2	38.2	18.2
DDGS[2]	20.0	40.0	60.0	20.0	40.0	60.0
CSB[3]	5.0	5.0	5.0	5.0	5.0	5.0
Supplement[4]	1.8	1.8	1.8	1.8	1.8	1.8
Nutrient composition, % (analyzed)						
CP	15.9	20.8	22.6	16.1	19.6	23.0
NDF	25.5	30.1	31.7	24.6	27.6	30.9
ADF	7.7	8.8	8.6	7.8	8.5	8.5
Ca	1.1	0.9	0.7	0.9	0.9	0.7
P	0.6	0.7	0.9	0.5	0.7	0.8
S	0.6	0.7	0.9	0.6	0.7	0.9
Cu	0.003	0.003	0.002	0.003	0.003	0.003
Zn	0.01	0.1	0.1	0.1	0.1	0.1

[1] Corn fed either as dry-rolled corn or high-moisture corn.
[2] DDGS = distillers dried grains plus solubles.
[3] CSB = concentrated separator byproduct.
[4] Supplement contained (%, total ration, DM basis): limestone 1.7%; vitamin A, D, and E premix 0.02% [Trouw Nutrition, Highland, IL (1,500,000 IU vitamin A, 500,000 IU vitamin D, and 500 IU vitamin E)]; Rumensin 0.02% (176 g/kg Monensin, Elanco Animal Health, Indianapolis, IN); Trace mineral premix 0.05% [Hubbard Feeds Inc., Mankato, MN (3.95% Ca, 2.56% Cu, 16.0% Zn, 4.0% Mn, 1,050 mg/kg I, and 250 mg/kg Co)]; 0.002% thiamin (analyzed concentration 13.55 mg/kg dietary DM).

Table 2. Final finishing ration and adaptation diets (%, DM basis) fed to steers

	Stage of Adaptation				
Diet	Step 1	Step 2	Step 3	Step 4	Step 5
Day	0	7	14	21	28
20% DDGS					
Alfalfa Hay	20.0	16.3	12.5	8.8	5.0
Corn Silage	40.0	32.5	25.0	17.5	10.0
DDGS[1]	--	5.0	10.0	15.0	20.0
Corn[2]	33.2	39.4	45.7	51.9	58.2
CSB[3]	5.0	5.0	5.0	5.0	5.0
Supplement[4]	1.8	1.8	1.8	1.8	1.8
40% DDGS					
Alfalfa Hay	20.0	16.3	12.5	8.8	5.0
Corn Silage	40.0	32.5	25.0	17.5	10.0
DDGS[1]	--	10.0	20.0	30.0	40.0
Corn[2]	33.2	34.4	35.7	36.9	38.2
CSB[3]	5.0	5.0	5.0	5.0	5.0
Supplement[4]	1.8	1.8	1.8	1.8	1.8
60% 0DDGS					
Alfalfa Hay	20.0	16.3	12.5	8.8	5.0
Corn Silage	40.0	32.5	25.0	17.5	10.0
DDGS[1]	--	15.0	30.0	45.0	60.0
Corn[2]	33.2	29.4	25.7	21.9	18.2
CSB[3]	5.0	5.0	5.0	5.0	5.0
Supplement[4]	1.8	1.8	1.8	1.8	1.8

[1] DDGS = distillers dried grains plus solubles.
[2] Corn fed either as dry-rolled corn or high-moisture corn.
[3] CSB = concentrated separator byproduct.
[4] Supplement contained (%, total ration DM basis): limestone 1.7%; vitamin A, D, and E premix 0.02% [Trouw Nutrition, Highland, IL (1,500,000 IU vitamin A, 500,000 IU vitamin D, and 500 IU vitamin E)]; Rumensin 0.02% (176 g/kg Monensin, Elanco Animal Health, Indianapolis, IN); Trace mineral premix 0.05% [Hubbard Feeds Inc., Mankato, MN (3.95% Ca, 2.56% Cu, 16.0% Zn, 4.0% Mn, 1,050 mg/kg I, and 250 mg/kg Co)]; 0.002% thiamin (analyzed concentration 13.55 mg/kg dietary DM).

Table 3. Influence of corn processing and concentration of distillers dried grains plus solubles (DDGS) on animal performance of steers

	Dry-Rolled Corn			High-moisture Corn				*P*-value [1,2]			
Item	20% DDGS	40% DDGS	60% DDGS	20% DDGS	40% DDGS	60% DDGS	SEM[3]	Corn	DDGS	L	Q
Initial BW, lb	761	750	761	750	752	750	28.6	0.76	0.97	0.96	0.82
Final BW, lb	1372	1336	1289	1358	1396	1233	31.1	0.52	0.004	0.002	0.16
Adaptation[4]											
ADG, lb	4.0	4.0	3.8	3.8	4.0	4.0	0.22	0.87	0.64	0.91	0.35
DMI, lb	24.5	26.0	25.6	25.1	25.4	25.6	0.84	0.97	0.41	0.29	0.42
G:F	0.16	0.16	0.15	0.14	0.16	0.16	0.01	0.70	0.77	0.74	0.51
Finishing[5]											
ADG, lb	4.4	4.2	3.1	4.4	4.0	2.6	0.22	0.14	<0.001	<0.001	0.02
DMI, lb	24.3	23.2	18.7	23.8	22.5	17.2	0.88	0.23	<0.001	<0.001	0.01
G:F	0.18	0.18	0.17	0.18	0.17	0.15	0.01	0.35	0.03	0.01	0.36

[1] *P*-values for effect of corn processing, concentration of DDGS, and linear or quadratic effect of DDGS.
[2] DDGS x corn processing interaction ($P \geq 0.17$); thus main effects of corn processing and DDGS inclusion are presented.
[3] n = 11, 12, 10, 12, 11, and 12, respectively.
[4] Adaptation measured from day 0 through day 28.
[5] Finishing measured from day 29 through slaughter.

Table 4. Influence of corn processing and concentration of distillers dried grains plus solubles (DDGS) on carcass quality of steers

	Dry-Rolled Corn			High-moisture Corn				*P*-value[1,2]			
Item	20% DDGS	40% DDGS	60% DDGS	20% DDGS	40% DDGS	60% DDGS	SEM[3]	Corn	DDGS	L	Q
HCW, lb	847.4	826.4	804.6	835.7	845.8	768.4	20.5	0.56	0.01	0.006	0.18
Fat depth, in	0.4	0.5	0.4	0.5	0.4	0.4	0.05	0.78	0.01	0.005	0.29
KPH, %	1.9	2.0	2.0	1.8	2.0	1.7	0.14	0.35	0.18	0.99	0.07
Ribeye area, in^2	13.2	12.8	13.1	13.0	14.0	12.9	0.38	0.40	0.56	0.86	0.29
Marbling score[4]	466	488	505	478	489	436	33.6	0.46	0.82	0.95	0.53
Quality Grade[5]	10.1	9.9	10.7	10.3	10.5	10.1	0.45	0.87	0.87	0.61	0.89
Yield Grade	3.0	3.0	2.6	3.0	2.8	2.4	0.19	0.45	0.03	0.01	0.48

[1] *P*-values for effect of corn processing, concentration of DDGS, and linear or quadratic effect of DDGS.
[2] DDGS x corn processing interaction ($P \geq 0.12$); thus main effects of corn processing and DDGS inclusion are presented.
[3] n = 11, 12, 10, 12, 11, and 12, respectively.
[4] Marbling score based on 400 = $Small^0$.
[5] Quality Grade based on Low Choice (Ch^-) = 10, High Prime (Pr^+) = 15.

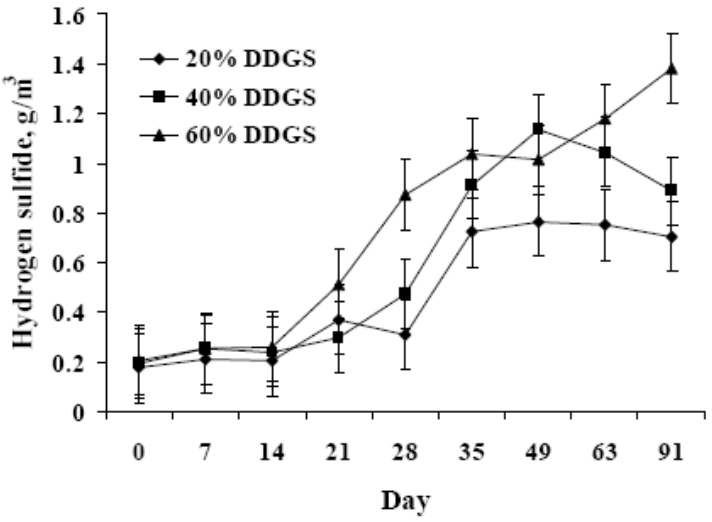

Figure 1. Change in hydrogen sulfide concentration (g/m^3) caused by increasing dietary DDGS (DDGS) concentration in steers over adaptation from a medium-concentrate to high-concentrate finishing ration. Treatments were based concentrations of DDGS (20, 40, and 60% DM basis) as well as corn processing (high-moisture vs. dry-rolled corn). *P*-values: corn processing ($P = 0.94$), DDGS ($P < 0.001$), and corn processing by DDGS ($P = 0.36$). Concentrations of hydrogen sulfide gas measured via rumenocentesis on hydrogen sulfide detector tubes (Gastec©, Kanawaga, Japan).

Targeting the North Dakota Natural Beef Market: Impacts on Early Calf Growth and Performance*

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Introduction

Because of shrinking profit margins, beef producers are looking for opportunities to increase profits from their calf crops. One possible method of increasing calf profits is to produce calves "naturally", a niche market that targets beef producers who have raised their cattle without any antibiotics, implants, and ionophores during their life cycles. Anecdotal reports of large premiums have been reported for calves marketed as natural in the market place. Little research has directly assessed the production costs and best management practices involved in natural beef production beginning with the receiving and backgrounding phases of feedlot finishing. Most research has evaluated natural feeding practices during the final finishing phase only for both calf feds and yearling cattle. Furthermore, cattle producers considering entering this niche market have questions regarding the methods and economics of producing calves by a natural production system. This study will investigate the impacts of natural production in the receiving and backgrounding phases of calf growth.

Materials and Methods

The NDSU Institute for Animal Care and Use Committee approved all protocols. The experiment was conducted at the NDSU Hettinger Research Extension Center's feedlot in Hettinger, ND, and the NDSU Carrington Research Extension Center's feedlot in Carrington, ND. Seventy-six Angus-cross steer calves (average birth date = Mar. 28 ± 20 days) were purchased from a local sale barn ($108/cwt) on October 16, 2008 (Stockmen's Livestock Exchange, Dickinson, ND) and transported by commercial trucker to the Hettinger feedlot. Calves originated from a single ranch in Medora, ND (Little Missouri Cattle LLC) that confirmed cattle were raised under natural production practices through producer documentation. Calves were age and source verified through the CalfAID™ USDA Process Verified Program (Dickinson, ND). After arrival, calves were acclimated to the SW Feeders feedlot for a period of seven days. Calves were fed a natural diet (totally mixed ration; Step 1; Table 1) from day -7 through -1 of the adaptation period.

Two-day unshrunk weights were recorded on the calves prior to morning feeding on day -1 and 0 (October 23 and 24, 2008). Seventy-two calves were selected for study use, stratified by body weight, allotted randomly to one of 12 pens (six steers/pen; six pens/treatment) and pens were assigned randomly to one of two treatments: 1) natural diets and production management (NAT) and 2) conventional diets and management (CONV). At time of weighing, calves were dewormed and vaccinated for respiratory, clostridial, *Hemophilus somnus*, and Mannheimia diseases. During processing, four calves (three NAT and one CONV) did not have radio-frequency identification tags (RFID) and had to be retagged with a new RFID tag (cost =

$2.75/tag). Notification of retagging and the new RFID numbers were reported to the CalfAID™ program for the calves' production records.

Calves receiving the "natural" treatments did not receive any animal byproducts derived from mammalian, avian and/or aquatic sources, growth-promoting implants and ionophores (USDA, AMS, 2009). For the first 21 days of the study, calves were fed a 49:51 forage:concentrate step-up ration containing 14.8 percent crude protein and 0.52 megacalories/pound of net energy for gain (Step1 NAT and CONV diets; dry matter basis; Table 1). The NAT rations contained cracked corn, ground mixed hay, oat silage, dried distillers grains with solubles (donated by POET Nutrition Inc, Sioux Falls, SD), a growing supplement that contained no medications, an active (live) yeast concentrate (ProTernative™, donated by Ivy Natural Solutions, Overland Park, KS), limestone, deccox crumbles and sodium bicarbonate. The CONV rations were composed of similar ingredients, with the exception of no active (live) yeast concentrate and the growing supplement contained 350 milligrams/pound Rumensin® (Elanco Animal Health, Indianapolis, IN) and melengesterol acetate (MGA; Pfizer Animal Health, New York, NY) at 0.5 milligrams/pound.

On November 13, 2008, calves were revaccinated for respiratory, clostridial, *Hemophilus somnus*, and Mannheimia diseases and CONV calves implanted with a Ralgro implant (36 mg zeranol; Schering-Plough Animal Health Corp., Kenilworth, NJ). From day 21 to the end of backgrounding, calves were fed a 49:51 forage:concentrate growing diet (13 percent crude protein; 0.56 megacalories/pound of net energy for gain NAT and CONV final diets; dry matter basis; Table 1). All diets fed were formulated for 2.20 pounds of daily gain. Calf diets were fed once daily (9 a.m.) and slick bunk management was used to determine individual pen daily feed allotments. Calves had free access to water in ice-free automatic fence line water fountains.

Calves were checked daily and data recorded for bloat scores (as described by Paisley and Horn, 1998) and respiratory illness. Calf weights were measured on day 0, 1, 21, 22, 48, 83 and 84. Initial and final weights were determined by averaging two consecutive weigh days (unshrunk weights), while interim body weights were measured as unshrunk weights recorded prior to feeding. Diet samples were collected (day 2, 7, 15, 43, 49, 62, 74 and 82), composited by treatment and analyzed by a commercial laboratory (Midwest Laboratories, Omaha, Neb.) for nutritional components.

At the conclusion of the 85-day growing period at Hettinger, calves were shipped to the NDSU Carrington Research Extension Center for finishing on January 21, 2009. A report on the impacts of natural production during the finishing period and carcass traits for these calves is described in the following companion paper (**Anderson et. al, 2009**- Vern please let me know what the title and who the authors are on this). Calf growth and performance from this study was analyzed as a completely randomized design with the pen serving as the experimental unit. Treatment means were separated by least square means following a protected F-test ($P < 0.05$).

Results and Discussion

The medicated (CONV) diets used in this study were fed to another group of growing calves (as described by Thompson et al., 2009). This group had problems with rumen bloat and the

decision to add sodium bicarbonate to the calf diets was made to help promote saliva production by increased cud chewing in the calves. Regardless of treatment (NAT or CONV), none of the calves involved in this trial had any cases of rumen bloat. Additionally, deccox (decoquinate) crumbles were included in both treatments to prevent coccidiosis. North Dakota Natural Beef LLC (Fargo, ND) was consulted prior to feeding the coccidiostat to ascertain if the product's use was permitted under their natural program specifications.

During the adaptation period, one calf was treated once for respiratory illness, resulting in the calf's automatic assignment to the to the CONV treatment. One other CONV calf was treated for respiratory illness in the first two weeks of the study. Interestingly, no NAT calves were treated for respiratory illnesses. Veterinary medical costs were similar across treatments during the study and averaged $7.32/hd ($P = 0.42$; Table 2).

The effect of management strategies on calf backgrounding performance are presented in Table 2. Calves averaged 209 days of age at weaning ($P = 0.40$). Natural calves weighed 549 pounds, while the CONV calves averaged 544 pounds at the study start ($P = 0.31$). Conventional calves were significantly heavier and had greater daily gains (ADG) compared to NAT calves at the end of the growing period (787 pounds and 2.85 pounds vs. 765 pounds and 2.54 pounds for CONV and NAT calves, respectively; $P \leq 0.03$).

Feed intakes (DMI) were 6.8 percent higher for NAT calves (21.9 pounds) as compared to CONV calves (20.4 pounds; $P = 0.02$). These observed DMI differ from those reported by Sawyer et al. (2003) in their study comparing natural versus conventional finishing programs. Feed intakes by CONV calves may have been influenced by the Rumensin levels fed (325 mg monensin) during the 85-day growing period. Conventionally managed calves had $0.17 lower feed costs/pound of body weight gained and 0.02 greater feed efficiency (gain:feed) as compared to NAT calves ($P \leq 0.001$). Similar gain:feed results were reported by Wileman et al. (2009) in their analysis of modern technologies used in beef production.

Interestingly, NAT ration costs (as fed basis) were greater than $10/ton as compared to the CONV calves ($119.40/ton vs. $108.86/ton for NAT and CONV, respectively; $P < 0.001$). Ration costs were determined by dividing total feed costs incurred by the total pounds fed out for the 85-day period. These ration costs may have been affected by the higher intakes observed in this study for the NAT calves.

Implications

In the present study, calves that were managed as "natural", with no growth-promoting implants, ionophores, or antibiotics, gained less weight during backgrounding as compared to their contemporaries that were managed conventionally (implanted with a growth-promoting implant, fed an ionophore, and treated with antibiotics during period of morbidity). Conventional calves weighed more, had lower feed costs and greater feed efficiencies than natural calves after the 85-day background period. Continued evaluation of breakeven costs and pen closeouts for naturally raised verses conventionally raised calves is necessary, especially in times of high feed costs.

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Acknowledgements

The authors would like to thank Ivy Natural Solutions, Overland Park, KS, for their donations of the ProTernative™ Stress Formula and Continuous Fed yeast products and POET Nutrition, Inc., Sioux Falls, SD, for their donation of the dried distillers' grains with solubles used in this study. The authors would also like to thank Joe and Sandi Frenzel, David Pearson, Don Stecher, Donald Drolc, Dale Burr, Time Schroeder and Tyler Ingebretson for their assistance in conducting this trial.

*Partial support for this research was provided by the U. S. Department of Agriculture-Agricultural Research Service Northern Great Plains Research Laboratory, Mandan, ND. Specific Cooperative Agreement No. 58-5445-7-315. *Disclaimer: Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U. S. Department of Agriculture.*

Table 1. Dietary ingredient and nutrient concentration of calf growing diets

	Diets			
	Natural		Conventional	
Item	Step 1	Final	Step 1	Final
Ingredient, % DM basis				
Cracked corn	32	32	31.8	31.7
Deccox crumbles	1.5	1.5	1.5	1.5
Dried distillers grains w/solubles	12.4	12.4	12.6	12.6
Growing supplement[a,b]	3.9	4.2	3.9	4.2
Limestone	0.5	0.5	0.5	0.5
Mixed hay[c]	39.8	39.5	39.8	39.6
Oat silage	9.1	9.1	9.1	9.1
ProTernative™ yeast[d,e]	0.3	0.3	-	-
Sodium bicarbonate	0.5	0.5	0.6	0.6
Nutrient Concentration[f]				
DM, %	77.4	75.8	77.1	74.9
CP, % DM basis	14.8	13.0	14.8	13.0
NE_g, Mcal/lb.	0.53	0.56	0.52	0.56
Ca: P	1.56	2.1	2.0	2.1

[a]Natural calf growing supplement contained min 7.2% CP, 3.375% Ca, 0.27% P, 1.0% K, no animal byproducts, and
no medications (as fed).
[b]Conventional calf growing supplement contained min 7.2% CP, 3.375% Ca, 0.27% P, 1.0% K, no animal
byproducts, 350 mg/lb Rumensin® and MGA (melengesterol acetate) at 0.5 mg (as fed).
[c]Mixed hay composed of equal parts of ground barley and alfalfa-grass hays.
[d]ProTernative™ Stress Formula yeast product used in the Step 1 diet (21 days).
[e]ProTernative™ Continuous Fed yeast product used in the final diet (64 days).
[f]Analytical results for growing diets are from composited samples.

Table 2. Effect of management strategies on calf backgrounding performance

Item	Treatments		SEM[c]	*P* -value[d]
	NAT[a]	CONV[b]		
No. head	36	36	-	-
Age at weaning, days	207	211	3.23	0.40
Initial weight, lb.	549	544	3.3	0.31
Final weight, lb.	765[f]	787[g]	6.3	0.03
DMI, lb./d	21.9[g]	20.4[f]	0.37	0.02
Weight gain, lb.	216[f]	242[g]	6.8	0.02
ADG, lb./d	2.54[f]	2.85[g]	0.08	0.02
Gain:feed	0.12[f]	0.14[g]	0.003	0.001
Feed cost, $/lb. of body weight gain[e]	0.68[g]	0.51[f]	0.017	< 0.001
Veterinary medicine costs, $/hd	7.01	7.63	0.74	0.42

[a]NAT: Naturally produced calves.
[b]CONV: Conventionally produced calves.
[c]Standard error of mean; n = 6 observations per treatment.
[d]*P* -value for F-test of treatment.
[e]Cracked corn = $0.09/lb; deccox crumbles = $0.36/lb; natural growing supplement = $0.16/lb; medicated growing
supplement = $0.23/lb; limestone = $0.11/lb; ground mixed hay = $0.05/lb; oat silage = $0.01/lb; salt block =;
$0.10/lb; sodium bicarbonate = $0.28/lb.
[f, g]Means with different subscripts differ ($P < 0.05$).

Growth performance and carcass characteristics of conventionally raised lambs implanted with zeranol versus naturally raised lambs[1]

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[1]Partial support for this research was provided by the USDA-ARS Northern Great Plains Research Laboratory, Mandan, ND Specific Cooperative Agreement No. 58-5445-7-315. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture. The authors would like to thank David Pearson, Donald Drolc, and Donald Stecher for assistance in conducting this trial.

The objective of this research was to elucidate the advantages of conventional lamb feeding systems in comparison to lambs raised in accordance with naturally raised guidelines. Voluntary standards released by the Agriculture Marketing Service provide feedlot operations with procedures to produce naturally raised lamb in agreement with consumer perceptions of the product. If lambs can be raised within these guidelines as cost effectively as lambs raised in a best management practice operation and sold at a premium, it could provide lamb feedlot operations with an alternative to conventional programs while increasing profitability.

Summary

The objective of this research was to compare the growth performance and carcass characteristics between naturally raised and conventionally raised lambs. Two hundred eighty eight crossbred lambs (75 lbs.) were finished in twelve feedlot pens according to treatment over a 112 day trial. Treatments were Naturally Raised (**NR**) or Conventional (**C**). Naturally Raised lambs were fed a basal diet (80% corn, 20% concentrate) with decoquinate added for coccidiosis control, and could not be treated with antibiotics. Conventional lambs were fed a similar 80:20 basal ration, but with decoquinate, chlortetracycline and lasalocid added. Conventional lambs were also implanted with 36 mg zeranol (Ralgro®, Schering-Plough) on day 28, and could be treated with antibiotics as necessary. After 112 days, lambs were harvested and carcass data was collected. Conventional lambs had increased average daily gain ($P = 0.06$). Naturally Raised lambs had increased rib eye area ($P = 0.03$), decreased body wall thickness ($P = 0.05$), and increased boneless, closely trimmed retail cuts ($P = 0.05$). Conventional lambs also had increased percentage of lambs with rectal or vaginal prolapses ($P = 0.001$) and increased percent mortality ($P = 0.01$). Conventional lambs trended to be heavier at the final weight ($P = 0.07$) and have increased dry matter intake ($P = 0.09$). There were no differences in yield grade ($P = 0.25$), feed efficiency ($P = 0.47$), or quality grade ($P = 0.85$). While C lambs gained more, the viability of the zeranol is put into question by the high incidence of prolapse and mortality. Future research should evaluate graded levels of zeranol implants to discern if the incidence of prolapse and mortality can be decreased.

Introduction

The USDA Agriculture Marketing Service released voluntary standards for the production of naturally raised livestock in January of 2009. *The United States Standards for Livestock and*

Meat Marketing Claims, Naturally Raised Claim for Livestock and the Meat and Meat Products Derived From Such Livestock provided guidelines for what should be marketed as naturally raised livestock. The core of the report stated that naturally raised livestock should be raised "…without growth promotants and antibiotics and that have never been fed mammalian or avian by-products…" Niche marketing (including naturally raised or organic) has steadily grown in popularity over the last decade. Farmers and ranchers could take advantage of this growing market if the requirements were better understood, and the economic benefits were clearly demonstrated.

Naturally raised lambs must be able to compete with conventional lambs that can be both supplemented with lasalocid or chlortetracycline at levels to improve growth efficiency and be implanted with zeranol. Zeranol has been shown to increase average daily gain (**ADG**) and feed efficiency in lambs (Hustfedler et al., 1996; Nold et al., 1992; Salisbury et al., 2007). Chlortetracycline (**CTC**), an antibiotic often used as a broad-spectrum antibiotic in livestock operations, has been shown to improve ADG, feed efficiency, and survival rate (Johnson et al., 1956; Bridges et al., 1953; Kunkel et al., 1956). Lasalocid, a polyether ionophore, has also been shown to increase ADG and feed efficiency and decrease incidence of coccidia in steers (Anderson et al, 1988; Bartley et al., 1979; Berger et al., 1981) and increase ADG and improve feed efficiency in lambs (Funk et al., 1986). Naturally raised lambs must perform at the same level as conventional lambs or producers must receive a premium in order to justify naturally raised lamb production.

Procedures

Two hundred eighty eight spring born crossbred lambs (wethers and ewes) were stratified by weight and assigned randomly within stratification to one of two treatments (Naturally Raised or Conventional) in a completely randomized design to evaluate lamb growth performance and carcass characteristics under naturally raised and conventional management practices. At the start of the trial, lambs were moved to 12 feedlot pens (n = 6). Each pen represented one experimental unit and contained 24 lambs. Treatments were randomly assigned to pens. Treatments consisted of Naturally Raised and Conventional. Naturally raised (**NR**) lambs were fed the basal feedlot ration, and supplemented with decoquinate (Deccox®). Naturally raised lambs could not receive any other antibiotics. If treatment with antibiotics was necessary, an ear notch was administered to the treated lamb and it was removed from the data set. Conventional (**C**) lambs were raised using best management practices, including supplementation with decoquinate (Deccox®), lasalocid (Bovatec®), CTC, and implanted with zeranol (Ralgro®). Thirty six mg zeranol were administered via subcutaneous implant in the ear on d 28. The feedlot ration for treatment C consisted of 78.7% corn, 19.7% market lamb pellet, 1.2% Deccox®, and 0.4% CTC on a dry matter basis. The C market lamb pellet contained lasalocid and 38% crude protein. The feedlot ration for treatment NR was 80% corn and 20% market lamb pellet, which contained decoquinate and 38% crude protein. Lambs were fed ad-libitum via bulk feeders and had access to fresh water. Refusals were collected every 28 days.

Experimental Periods and Sampling Procedures. The experiment began May 15, with lambs weighed two consecutive days to determine starting body weight. Lambs were weighed once every 28 days after initial weights, with two consecutive weights taken at the end of the trial. Lambs were then shipped for harvest and carcass data collection at Iowa Lamb Corporation in Hawarden, IA. Feed samples (approximately 0.44 lb) were collected approximately once every 28 d, dried at 55°C for 48 h, ground through a Wiley mill (1-mm screen), and composited for analysis of ADF and NDF, N, and OM.

Statistical Analysis. Lamb performance data was analyzed as a completely randomized design using the MIXED procedure of SAS with replication serving as experimental unit. The contrast statements included the linear effects of management practices. Response variables included: 1) lamb growth performance; 2) carcass data; 3) incidence of rectal and vaginal prolapse; and 4) mortality.

Results and Discussion

Conventional management practices showed advantages and disadvantages in comparison to naturally raised management. Conventional lambs had increased ADG ($P = 0.06$) and subsequently increased gain ($P = 0.06$) over the 112 d trial, illustrating the growth effects of CTC, lasalocid, and zeranol displayed in previous research. The increase in gain, which averaged approximately five pounds across treatments, makes conventional management an economically viable option when compared to naturally raised lambs. The implants costs roughly one dollar per head, and the five pounds gained (assuming market price of one dollar per pound) covered the cost of implants as well as provided a four dollar increase in profit compared to naturally raised lambs (not including labor). Extrapolated to a 2000 head feedlot, conventional practices with zeranol could result in an $8,000 per year increase return. While C lambs had a trend of increased DMI ($P = 0.09$) the overall economic effects were minimal. Conventional lambs also showed a trend of increased ADG and gain during early treatment periods. The difference between treatments may have been larger had the lambs been slaughtered earlier. Lambs were slaughtered at an average weight of 159 lbs, and differences between treatments may have diminished as gain decreased in the larger C lambs late in the trial.

Most carcass characteristics were similar between treatments ($P \geq 0.25$), with the exceptions of rib eye area (**REA**), body wall thickness (**BWT**), and boneless, closely-trimmed retail cuts (**BCTRC**). Naturally Raised lambs had larger REA when compared to C lambs ($P = 0.03$). However, the numeric difference between treatment averages was less than one tenth of an inch (2.66 vs. 2.57 in^2). Naturally raised lambs also had a thicker body wall ($P = 0.05$) and greater BCTRC ($P = 0.05$). This could suggest C lambs had decreased carcass performance, but the authors feel this was influenced by the extended trial length. However, the major cause for concern in the trial was the high incidence of rectal and vaginal prolapses and mortality in the C treatment. The twelve prolapses in the C treatment were significantly more than the NR treatment, which resulted in no prolapses ($P = 0.001$). Of the twelve lambs prolapsed, some had to be treated repeatedly, and eventually four died ($P = 0.01$). The advantages of the increased gain are most likely negated by the cost of treating prolapsed lambs and mortality as a result of complications from prolapses. Zeranol has often been cited as an instigator in increased

prolapses anecdotally, and a trend of increased prolapses was observed in a trial by Salisbury et al (2007).

Implications

Decreased growth performance in naturally raised lamb demands premiums be offered to lamb producers in order for natural lamb production to be an economically viable practice, despite the possibility of improved carcass characteristics. While increased prices are afforded producers who sell products in niche markets such as farmers markets or directly to restaurants, large-scale feedlot operations using naturally raised management techniques require a premium for naturally raised lamb to offset the potential loss in growth performance compared to conventionally raised lambs. Alternatively, the increased performance in conventionally raised lambs, which may be attributed to zeranol implants, offers economic opportunities if a level of zeranol dosage can be found to improve growth without increasing incidences of prolapse. Future research will focus on determining if decreased levels of zeranol will produce increased gain without increased prolapses and decreased carcass quality.

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Table 1. Ingredient and nutritional composition of diets fed to feedlot lambs

	Diets[1]	
Item	C	NR
Ingredient	DM basis	
Whole Corn, %	78.68	80
C Market Lamb Pellet[2], %	19.77	0
NR Market Lamb Pellet[3], %	0	20
Deccox, %	1.18	0
Chlortetracycline,%	0.37	0
Nutrient composition		
CP, %	17.59	17.64
TDN, %	85.99	86.62
Ca, %	1.00	1.02
P, %	0.33	0.33

[1] Treatments abbreviations C (conventional), NR (naturally raised).
[2] Conventional Market Lamb Pellet contained: 136 g/ton lasalocid, 38% CP, 3.75-4.75% Ca, 0.6% P, 3.0-4.0% salt, 1.2ppm Se, 24,000 IU/lb Vitamin A, 2,400 IU/lb Vitamin D, and 70 IU/lb Vitamin E.
[3] Naturally raised Market Lamb Pellet contained: 65mg/lb (0.01432%) decoquinate, 38% CP, 3.75-4.75% Ca, 0.6% P, 3.0-4.0% salt, 1.2ppm Se, 24,000 IU/lb Vitamin A, 2,400 IU/lb Vitamin D, and 70 IU/lb Vitamin E.

Table 2. Comparison of Conventional and Naturally Raised feeding practices on feedlot lamb performance and carcass characteristics

	Treatment[1]			
Item	C	NR	SEM[2]	*P*-value[3]
Initial Wt, lbs	75	75	0.28	0.96
Final Wt, lbs	162	157	1.57	0.07
ADG, lbs/d	0.77	0.73	0.01	0.06
Intake, lbs DM/hd/d	3.60	3.47	0.05	0.09
G:F, lbs gain: lbs DMI	0.21	0.21	0.003	0.47
Gain, lbs	87	82	1.48	0.06
HCW, lbs	81.5	80.4	0.8	0.35
Leg Score[4]	11.5	11.5	0.07	0.95
Conformation score	11.5	11.6	0.06	0.5
Fat Depth, in[5]	0.33	0.31	0.01	0.25
Body Wall Thick, in	1.11	1.06	0.01	0.05
Ribeye Area, in^2	2.57	2.66	0.02	0.03
Flank Streaking[6]	351.03	356.89	5.85	0.5
Quality Grade	11.4	11.4	0.06	0.85
Yield Grade[7]	3.72	3.55	0.1	0.25
%BCTRC[8]	43.57	43.92	0.11	0.05
Lean, lbs	35.4	35.2	0.28	0.69
Dress, %	49.26	49.26	0.15	0.99
Prolapse, %	0.083	0	0.01	0.001
Mortality, %	0.028	0	0.006	0.01

[1]Treatments abbreviations C (conventional) NR (naturally raised)
[2]Standard Error of Mean; n = 6.
[3]*P*-value for F-tests of mean
[4]Leg score, conformation score, and quality grade: 1 = cull to 15 = high prime.
[5]Adjusted fat depth and yield grades.
[6]Flank streaking: 100-199 = practically devoid; 200-299 = traces; 300-399 = slight; 400-499 = small; 500-599 = modest.
[7]Yield Grade = 0.4 + (10 x adjusted fat depth).
[8]% Boneless closely trimmed retail cuts (49.936 – (0.0848 x Hot Carcass Weight, in.) - (4.376 x Fat Depth, in.) – (3.53 x BW, in.) + (2.456 x Ribeye Area, in^2)).

Wildlife and Range Department
Hettinger Research Extension Center

Benjamin Geaumont

2010 Field Research Projects

Research Efforts

1. **Evaluation of the environmental consequences of agricultural production on post-contract Conservation Reserve Grasslands (CRP).**

The primary study objectives include: 1) compare nest density and success of ring-necked pheasant nesting by treatment including season long grazing, hay land, no-till corn, no-till barley, and idle; 2) compare nest density and success of duck species nesting by treatment; 3) determine nesting habitat use by pheasant and waterfowl within the various treatments focusing on vegetation density (VOR); and 4) determine which explanatory variables at a micro-habitat level influence pheasant nesting success. Data collection is ongoing.

2. **Survival, home range, and habitat use by ring-necked pheasant chicks in southwest North Dakota.**

The primary objectives include: 1) determine those abiotic and biotic variables that influence chick survival on post-CRP grasslands; 2) determine habitat characteristics selected for by brooding hens; and 3) determine home range of pheasant broods and quantify movement patterns throughout the first 30 days of brood rearing. Data recorded during this trial will provide landowners and managers with knowledge regarding habitats which best maximize pheasant chick survival while maintaining agricultural outputs. Data collection is ongoing.

3. **Sharp-tailed grouse survival, home range, and habitat use on the Grand River National Grasslands in northwest South Dakota.**

The primary study objectives include: 1) evaluate sharp-tailed grouse nest site selection based on habitat and describe vegetation composition and visual obstruction readings (VOR); 2) compare the use of semi-variance statistics to the commonly used co-efficient of variation to determine patch selection by sharp-tailed grouse; 3) provide an example of how semi-variance statistical techniques can be used by wildlife scientists to evaluate habitat selection and patch size determination; 4) estimate nest survival rates of sharp-tailed grouse on the GRNG in northwest South Dakota; 5) evaluate the effects of abiotic and biotic factors on nest survival rates; and 6) estimate survival of male and female grouse during the nesting season.

4. **Evaluate winter survival, home range, and habitat use by ring-necked pheasant on a post-Conservation Reserve Program landscape in southwest North Dakota (NEW).**

Project objectives include; 1) determine preferred pheasant winter cover habitat in southwestern North Dakota; 2) identify average distance traveled between natal sites and wintering grounds; 3) develop management recommendations to increase pheasant abundance on privately owned lands; 4) identify habitat use, survival, and dispersion differences between male and female pheasants in southwestern North Dakota; 5) compare nest-searching techniques to determine most efficient research technique; 6) identify proportion of ring-necked pheasants that show annual breeding site fidelity.

5. **Evaluation of annual forages associated with cover crops as forage for sheep, benefits to soil health, and as wildlife cover and food (NEW spring 2010).**

Project objectives include: 1) investigate ewe performance on annual forages associated with cover crops; 2) evaluate the economic feasibility of using stock piled annual forages for fall grazing of ewes; and 3) monitor wildlife use of annual forages planted for fall grazing

Agreements

1. **Bowman-Slope Soil Conservation District, NDSU Bowman Extension Service, and Hettinger Research Extension Center**

The Bowman-Slope Conservation District began a multi-year cover crop demonstration project this spring throughout both Bowman and Slope Counties. As many as 30 producers are partaking in this ongoing project. We at the Hettinger Research Extension Center have agreed to help evaluate the effectiveness of cover crops sowed as part of this project. We will help collect and analyze soils and vegetation data.

2. **Hettinger Research Extension Center, US Forest Service, and Rocky Mountain Elk Foundation**

We began a collaborate effort with the United States Forest Service and Rocky Mountain Elk Foundation concerning restoration efforts at the Elkhorn Ranch. Cover crops were established on historic crop lands to reduce weeds and to improve soil. Future work will focus on the restoration of crop land as well as the development of research plots with the goal of providing a better understanding of prairie restoration in the badlands region. The Elkhorn ranch has a high biological value as well as a great history.

Impacts of integrated pest management of Leafy Spurge (Euphorbia esula) following a 10-year sheep grazing study: A progress report

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The objective of the current study is to determine the most effective combination of grazing and herbicide treatments in combination of bio-control with insects for control of leafy spurge. This report highlights initial findings for an on-going study.

Introduction

Leafy spurge (*Euphorbia esula*) was first reported in North America in 1827 (Kaufman and Kaufman, 2007). Native to central and eastern Europe, leafy spurge was inadvertently introduced in cultivated crop seeds and as an ornamental in the United States. Worldwide introduction has brought leafy spurge to every continent except Australia (Lajeunesse et al., 1997). Leafy spurge is found in 35 states of the U.S. and throughout Canada, thriving in uncultivated areas (Kaufman and Kaufman, 2007). Within the North Great Plains (NGP) region, Liestritz et al. (2004) estimated the direct economic loss from leafy spurge at $37 million with secondary impacts of $83 million.

Biology and Ecology. Leafy spurge is a perennial forb, reaching a height of up to three feet and existing in a variety of habitats (Lajeunesse et al., 1997; Kaufman and Kaufman, 2007). Small, yellow-green flowers develop on like colored bracts (Lajeunesse et al., 1997). Growth begins in early spring with the first period of flower development occurring in late May and June. Additional periods of flowering can occur throughout the growing season.

Root structure plays a key role in successful colonization (Lajeunesse et al., 1997; Kaufman and Kaufman, 2007). Fibrous roots develop thick mats in the upper layer of soil, while taproots descend to 26 feet or more. Specialized root buds can produce a new plant if the top shoot is removed (Dersheid et al., 1985). Lym and Messersmith (1993) found leafy spurge root systems are most cold tolerant in the upper six inches of soil. Cultivation causes root fragmentation that increase root density in the subsequent year. However, but by the third year of cultivation leafy spurge density decreased to 0-30%. Laboratory experiments found leafy spurge root segments of one centimeter could regenerate six percent of the time (Lym and Messersmith, 1987). The diverse and massive root system aids leafy spurge in storing carbohydrates essential for surviving stressful environmental conditions (Lajeunesse et al., 1997) and early season growth (Dersheid et al., 1985).

Each flowering stem develops pod-like structures filled with seeds (Lajeunesse et al., 1997; Kaufman and Kaufman, 2007), potentially producing up to 140 seeds per stem. Once the pod has dried, it bursts open dispensing seeds up to 15 feet from the parent plant. Seeds can remain

viable in the upper layers of the soil for eight years, while deeply buried seeds a longer potential life span. Selleck et al. (1962) found seeds remained viable for up to 13 years. Long distance dispersal relies on transfer of seeds embedded in fur, mud or feces (Lajeunesse et al. 1997).

Herbicide Control. Herbicides provide leafy spurge control at varying levels. Lym and Messersmith (1990) found picloram applied at a rate of two pounds/acre, applied twice, provided 90% control of leafy spurge, while dicamba applied at eight pounds/acre, applied twice, provided 70% control. For long-term control, an annual treatment using picloram and 2,4-D at a rate of 0.25 plus 1 pound/acre reduced leafy spurge density 85-93% after five years (Lym and Messersmith, 1987). Recent studies using picloram found fall was the preferred time of application (Lym and Messersmith, 2006). Annual applications are recommended until 90% control is reached.

Lym and Messersmith (2006) found 2,4-D reduced leafy spurge top growth during the season applied. Lym (2000) found 2,4-D did not translocate to leafy spurge roots, thus considered less effective in controlling or killing root growth. Application of 2,4-D is common in areas around water when picloram use is prohibited or when grazing animals may be sensitive to herbicides (Lym and Messersmith (2006).

The use of imazapic, methylated seed oil, and 28% nitrogen at a rate of two ounces plus two pints plus two pints/acre produced 98%, 78%, 94%, and 71% leafy spurge control for nine, 12, 21, and 24 months; respectively, after one treatment (Markle and Lym, 2001). Nitrogen aided in the absorption of imazapic with foliar applications. Markle and Lym (2001) found imazapic alone at a rate of two ounces/acre reduced leafy spurge by 75%, 33%, 74%, and 43% respectively for nine, 12, 21, and 24 months following the one treatment. Treatments were applied for two consecutive years.

Livestock grazing. Grazing with sheep and goats has proven to be successful in controlling leafy spurge. Cattle have an aversion to toxins contained in leafy spurge and can develop scours if enough spurge is consumed (Heemstra et al., 1999). Sheep and goats, however, readily forage on leafy spurge (Walker et al., 1994). Differences in internal organs allow each species to consume different types of forage than cattle (Frost and Launchbaugh, 2003). Sheep are able to consume more forbs due to a large rumen, while a large liver allows goats to more efficiently process toxic compounds.

A reduction in sheep grazing occurs when pastures reach a high-density of leafy spurge. Walker et al. (1994) showed sheep consumed only 51% of the available leafy spurge in a pasture per season. Dahl et al. (2003) found sheep remove only leave and flowering portions of the plant. Grazing by sheep over a four-year period can reduce leafy spurge stem density by 99% (Schauer et al., 2006). Cattle and sheep combined require 5 years of grazing to achieve the same level of control with sheep only when sheep consumed 100% of the carrying capacity. Dahl et al. (2000) found six years of grazing by cattle and sheep is required to reach a 98% level of control. The use of sheep with cattle did not decrease cattle or sheep performance, or change grass and grass-like species production.

In contrast, goats readily graze leafy spurge consuming up to 66% in a single pasture per season (Walker et al., 1994). Goats tend to defoliate leafy spurge rather than consume just flower and leaf parts. Angora goats used at Camp Grafton, ND reduced leafy spurge stem densities by 84.2% and shrubs 91.6% in a four-year period (Sedivec et al., 1995). Sedivec and Maine (1993) found a 57.2% increase in grass and a 44.1% decrease in leafy spurge after two years of grazing with angora goats. Sedivec et al. (1995) found that grass species production increased significantly after three years of grazing.

Biological Controls. Four genera of biological control agents were released in the United States to combat leafy spurge (Hansen et al., 1997). Root boring moths (*Chamaesphecia hungarica*) lay eggs on leafy spurge stems with larvae move downward, burrowing into the roots and killing the plant (Gassman and Tosevski, 1994). Female root-boring beetles (*Oberea erythrocephala*) girdle leafy spurge stems and lay eggs in a cavity. The larvae tunnel downward through the stem to the root area (Schroeder, 1980). Gall midge (*Spurgia esulae*) laid eggs near buds and once the eggs hatch the instars feed on the buds (Pecora et al., 1991). Flea beetle (*Apthona* spp.) adults consume foliage and flowers. The female lay eggs at the base of the stem and once hatched, feed on the shallow, fine roots of leafy spurge (Gassman et al., 1996). Of the four agents released, the flea beetle has had the greatest success with established populations in 18 states (Hansen et al., 1997).

Flea beetles slowly decrease leafy spurge density (Lym and Nelson, 2000). Several subspecies of the leafy spurge flea beetle (*Apthona* spp.) were released in the NGP region. *Apthona nigriscutis* decreased leafy spurge densities by 65% within 53 feet of its release. The reduction in leafy spurge took three to five years. *A. czwalinae* and *A. lacertosa* took four years to reduce leafy spurge densities by 95%. *A. nigriscutis* required a beetle density of 4-8 beetles/yd^2 and *A. czwalinae* and *A. lacertosa* a beetle density of 22.5 beetles/yd^2. *A. czwalinae* was more prolific and dispersed faster from the release site. Hansen et al. (1997) found flea beetles are not suited for release in high-density leafy spurge areas. Lym and Olson (1999) found densities of 60-90 stems/yd^2 were the limit for flea beetle introduction. Soil type also influences flea beetle establishment. Sandy soils reduced flea beetle establishment (Larson et al., 2008), while silt loam, silty clay loam, clay loam, and clay soils with 6-9.5% organic matter had the highest establishment rates (Lym and Olson, 1999). South facing slopes had the highest establishment success.

Combining different control methods can be an effective management tool (Lym, 2005). Integrated pest management systems use site assessment to select the most appropriate control methods based on landowner's budget and site conditions. Multiple control methods can target different parts of the leafy spurge plant and life stages, thus providing better overall control of leafy spurge (Lajeunesse et al., 1997).

Procedures

Study Sites. This study was developed to test different management practices on leafy spurge re-establishment following a long-term sheep grazing study near Mandan, North Dakota at two locations. The first location is owned by the North Dakota State Correctional Center (NDSCC) two miles southwest of Mandan in Morton County on Section 32, T139N, R81W. The second

location is operated by the USDA-ARS Northern Great Plains Research Laboratory and three miles south of Mandan in Morton County on the north half of Section 9, T138N, R81W. The NDSCC location contains two replicate blocks and the USDA-ARS one replicate block. Each replicate consists of a 20-acre block subdivided into four 5-acre plots. The treatments were incorporated using a randomized complete block design in each 5-acre plot. Each of the four 5-acre plots represented one of four treatments from a previous study (see Previous Study section for description). Barker and Whitman (1989) classified the vegetation as northern mixed grass prairie comprised of wheatgrass-grama-needlegrass (*Elymus, Bouteloua, Heterostipa*; Shiftlet, 1994).

Previous Study. The current study was designed to study leafy spurge stem density change following different sheep and cattle grazing treatments using a maintenance type program. The study locations were part of a long-term research project studying three different grazing treatments on leafy spurge control, plant community impacts, and livestock performance. The grazing treatments included cattle only (**CO**), sheep only (**SO**) and cattle and sheep (**CS**); with a non-use treatment as the control (**Ctrl**; Schauer et al., 2006). Grazing occurred from approximately June 1 through October 1 each year or until 50 to 60% disappearance. Leafy spurge stem densities in the **SO** and **CS** grazing treatments were reduced by 99% from the beginning of the trial (1996) to the end (2006) compared to the **Ctrl**. The **SO** treatment required four years and **CS** five years to achieve 99% reduction in leafy spurge. As a note, flea beetles (*Apthona* species) infested all three replicates in 2001, resulting in leafy spurge stem density reduction on the **CO** and **Ctrl** that had not occurred in the first five years, with leafy spurge stem densities reduced by 91% and 89% on the **CO** and **Ctrl**; respectively.

Current Study. The current maintenance study focuses on integrated pest management using grazing, herbicides, and leafy spurge flea beetles. Based on the results from the previous trial, sheep were selected as the control, since they had effectively decreased leafy spurge in a short period and maintained control throughout the duration of the trial. The cattle only treatment was the least effective method of control in the previous trial. Therefore, additional research using a combination of treatments is necessary to determine potential methods of controlling leafy spurge in conjunction with cattle only grazing.

In May 2006, Admire Pro, an insecticide, was applied at 8 ounces/acre to remove spurge beetles from each of the sites. Core samples were taken in July 2006 to confirm the insecticide treatment was successful. All three replicate sites used in the current trial contained two grazing treatments in the four 5-acre pastures and included one sheep only (**SO**) pasture (considered the control and was previously the **SO** pasture) and three cattle only (**CO**) pastures. The three **CO** pastures comprised the previous study's **CO**, **CS**, and **Ctrl** pastures and labeled as such.

Stocking rates were 1.6 AUM/acre for cattle on the **CO**, **CS**, and **Ctrl** treatments, and 1.4 AUM/acre for **SO**. Although stocking rates were design to be the same between treatments, animal equivalent conversions created slightly different rates. Ten ewes were placed on the **SO** treatment on 20 May and removed by 9 October. Two steers were placed on the cattle only **CO,**

CS, and **Ctrl** treatments 1 June and removed by 1 October. The target grazing disappearance rate is 50 to 60% of grass and grass-like species. Grazing occurred at all sites in 2007, 2008, and 2009. Sheep depredation by coyotes occurred at the second NDSCC site in June 2009. Sheep were not replaced at that site due to losses.

Each of the **CO**, **CS**, and **CTRL** 5-acre pastures was further divided into 32 - 12 ft by 50 ft sections (192 ft by 100 ft area). The **SO** contained a total eight 12 ft by 50 ft sections. Eight treatments were studied and included a non-use control (**NU)**; insect only **(I)**; 2.4-D only **(2,4D)**; Plateau only **(P)**; 2,4-D and Tordon **(2,4DT)**; 2,4-D and insect **(2,4DI)**; 2,4-D, Tordon, and insect **(2,4DTI)**; and Plateau and insect **(PI)**. The **CO, CS,** and **Ctrl** pastures contained four replicates the eight treatments, while the **SO** one replicate.

Leafy spurge stem density was determined for each treatment prior to livestock grazing each season. Stem counts were obtained by averaging five 2.7 ft^2 quadrats from each treatment replicate.

Tordon (picloram), Plateau (impazapic), and 2,4-D were applied to the treatment plots in 2008. The 2,4-D treatment was applied at 2 quarts/acre in mid-July and the 2,4-D and Tordon treatment applied at rates of 1 quart and 1 pint/acre; respectively, in mid-July. Plateau was applied at the rate of 7 ounces/acre in late September. Herbicide was applied by a hand sprayer. Flea beetles reinvaded all three sites by 2007 and not manually applied with the combination treatments in 2008.

Treatment effect for leafy spurge stem density between treatments was analyzed using SAS (SAS Inst. Inc., Cary, NY) GLM statistical model to compare between treatments and across years. A SAS analysis using a split plot design was used to compare year, block, and grazing treatment affects. When significant differences occurred ($P \leq 0.05$), Tukey's Honesty Significant Difference was performed to separate differences.

Results

Insects were removed as a treatment from the study due to reinfestation of flea beetles at all three sites. The study was modified to four treatments (three herbicides and one control) with a eight replication pasture in **CO, CS**, and **Ctrl** and two replicated within the **SO** pasture.

Significant changes ($P \leq 0.05$) in leafy spurge stems density occurred between treatments in each of the three cattle grazing treatments (**CO, CS,** and **Ctrl**) in 2009 (Figure 1). The **P** treatment was more effective when compared to the **NU** and **2,4DT** treatments in the **CO** pasture. The **P** treatment reduced ($P \leq 0.05$) leafy spurge density 56.6% and 38.7% greater than the **NU** and **2,4DT**; respectively. Within the **CS** treatments, **P** reduced ($P \leq 0.05$) leafy spurge density by 56.5% and 60.7% compared to the **NU** and **2,4D**; respectively. Leafy spurge density was also best controlled by **P** in the **Ctrl** pasture. The **P** treatment reduced ($P < 0.05$) leafy spurge by 51.5% and 37.2% compared to **2,4D** and **NU**; respectively.

The only other herbicide to show difference in leafy spurge density changes was **2,4D** in the **CO** pasture. Leafy spurge was reduced by 46.2% by **2,4D** compared to the **NU** (Figure 1). Leafy

spurge stem density was at 99% control in the **SO** pasture, similar to pre-levels found in the previous study.

Levels of leafy spurge varied between the grazing treatments pastures. Pre-treatment levels of spurge in 2007 were 29.4 times greater in the **Ctrl**, 5.2 times greater in the **CS**, and 29.4 times greater in the **CO** compared to the **SO**. Leafy spurge presence in **SO** was maintained at levels below 1.3%. Comparisons of grazing treatments within 2008 showed **CO** had a higher level ($P = 0.01$) of leafy spurge compared to the **SO** treatments (Figure 1). A difference in leafy spurge stem density levels was found between **Ctrl** and **SO** ($P = 0.007$), **CO** and **CS** ($P = 0.037$), and **CO** and **SO** ($P = 0.047$) in 2009.

Discussion

Plateau at a rate of 7 oz/acre applied in late summer consistently reduced leafy spurge in all three of cattle grazing pastures. Plateau targets the root system and is drawn down into the plant's roots when fall applied (Markle and Lym, 2001). At this time of the growing season in North Dakota, plants draw down available nutrients to aid in over wintering. Markle and Lym (2001) found Imazapic (Plateau) alone reduced leafy spurge by 75% nine months after the first application (mid September), with a decrease in effectiveness to 33% twelve months after the first treatment. The results of this study showed an overall effectiveness rate nine months after the first application of 50.1% compared to **NU** (Figure 2). The level of control was not as high in our study, which may be attributed to the higher number of replications. The Markle and Lym study had four field replicates for each of their herbicide treatments. This study used three blocks with 24 replications contained in each of the blocks among the **CO, CS,** and **Ctrl** pastures, totaling 72 replications for each of the herbicide treatments. The higher number of replications may show a truer level of herbicide effectiveness in field settings.

The 2,4-D treatment applied at 2 qt/ac during the flower growth stage reduced leafy spurge only in the **CO** grazing treatment (Figure 2). Leafy spurge levels increased in the nine months following the first treatment in the **Ctrl** and **CS** treatments. Averaged across all three grazing treatments, a 2.4% decrease in leafy spurge stem density occurred. Lym and Messersmith (2006) found a 20% reduction in leafy spurge using 2,4-D applied at a rate of 1 qt/ac and a reapplication of 1pt/acre twelve months following the initial application. Their timing for herbicide application was June when flowering of leafy spurge was at maximum. Our application timing was in mid-July during a later period of flowering. The lower control levels of 2,4-D compared to Plateau may reflect a lower 2,4-D control due to application time (Lym, 2000).

The 2,4-D plus Tordon treatment reduced leafy spurge from 8.2% to 29.2% with an average reduction between all grazing treatments 17.9% (Figure 2). Lym and Messersmith (2006) found leafy spurge reduction rates of 50% 12 months following the first application. Their application rate was also 1 qt/ac plus 1 pt/acre of 2,4-D and Tordon; respectively. Their application of the 2,4-D plus Tordon mix occurred in June, which they determined was the optimal treatment timing for this herbicide combination. Our application of the 2,4-D plus Tordon was mid-July. Earlier spraying of herbicides such as 2,4-D and Tordon appear to weaken leafy spurge at a time when a large portion of its nutrients and energy are used for seed production and plant growth (Lym and Messersmith, 1985). Later in the season, when leafy spurge has attained maturity, it is less vulnerable to these herbicide applications.

Flea beetles may have aided in controlling leafy spurge to a certain extent. Flea beetle presence was noted in 2007, 2008, and 2009; however, counts were not collected to determine beetle density. As noted by Lym and Nelson (2000) effective flea beetle densities range from 4-22.5 beetles/yd^2, and once introduced, individuals may take 3-5 years to control leafy spurge. Once established, the combination of flea beetles and herbicides may compliment each by weakening both the reproductive cycle and root systems of leafy spurge.

The previous study's grazing treatments appear to have an ongoing impact on leafy spurge levels. The 2007 levels of leafy spurge were lower in the **CS** grazing treatment compared to the **CO** and **Ctrl.** Stem count comparisons in 2008 showed a continued trend with higher levels of leafy spurge in **CO** treatments compared to **SO**. Leafy spurge counts in 2009 (Figure 1) continue the trend of higher levels of spurge in the **CO** treatments compared to the **SO** and lower levels of leafy spurge within the **CS** pastures compared to the **CO** and **Ctrl** treatments. In the previous study the **CO** treatment was least responsive to leafy spurge control by grazing (Schauer et al. 2006), while the **CS** treatment was second in effectively controlling leafy spurge. The **SO** pastures have consistently shown very low spurge numbers in both studies, confirming sheep are an effective method to control leafy spurge and maintain infestations.

Additional research is required to determine if herbicides will control leafy spurge within the cattle grazing treatments at levels comparable to sheep grazing.

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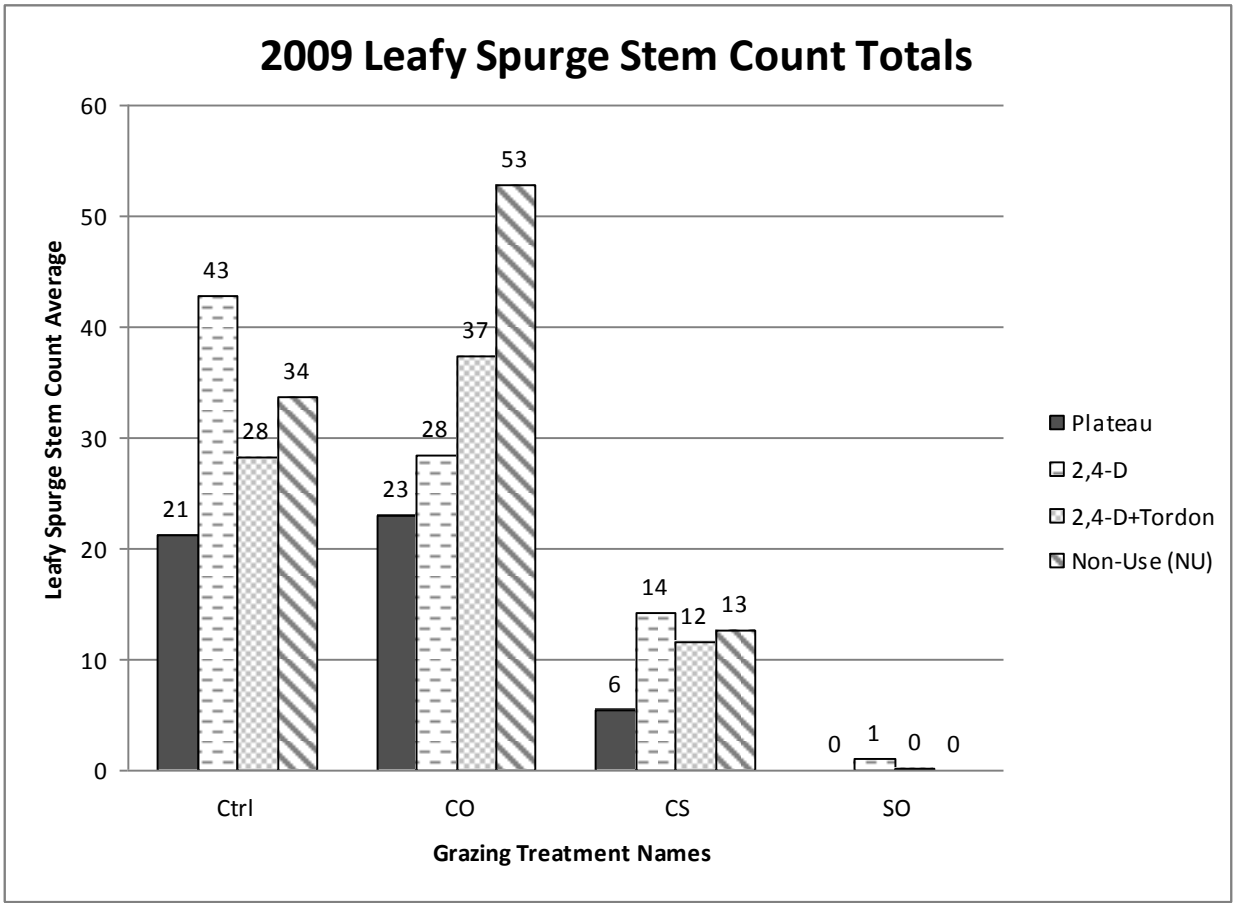

Figure 1. Average leafy spurge stem count within the treatments for 2009. Averages based on the total of five 2.7 ft^2 quadrats per herbicide treatment. **CO**, **CS**, and **Ctrl** are the three cattle only treatments for the current study with two steers per 5 acre pasture. The **SO** treatment has ten ewes per pasture and is the control for the study. **SO** (sheep only) shows the best overall control of leafy spurge.

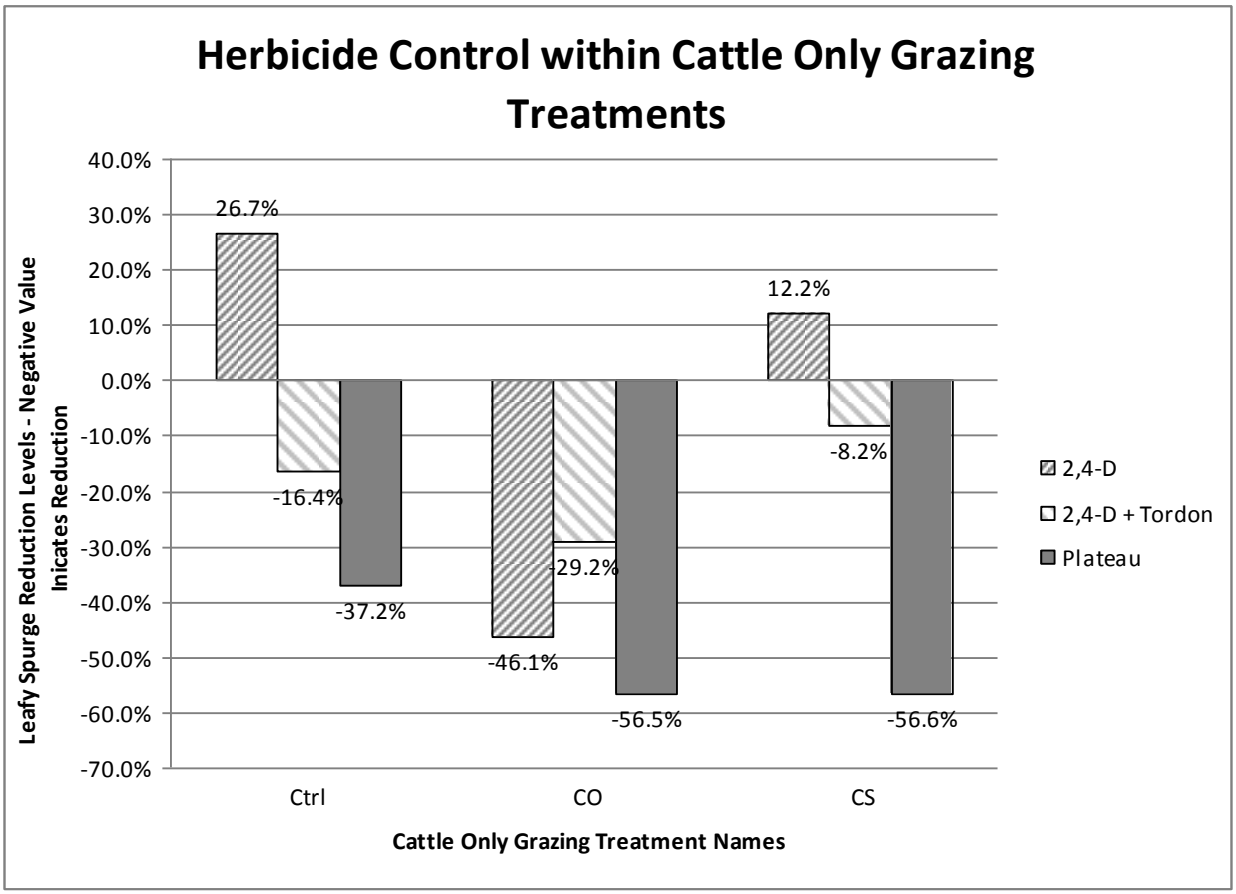

Figure 2. Effectiveness of herbicides nine months follwing the first application. Negative values indicate a reduction in leafy spurge. The three cattle only treatments are shown above as **Ctnl**, **CO**, and **CS**. Overall herbicide control was most effective within the **CO** treatments.

Outreach, Presentations and Publications

Christopher Schauer, Hettinger REC Director and Animal Scientist

Presentations and Outreach

Rambouillet Ram Test Results.
Ram Test Field Day, Hettinger, ND
March 13, 2010

Growth performance and carcass characteristics of conve3ntionally raised lambs implanted with zeranol versus naturally raised lambs.
Western Extension, Research, and Academic Coordinating Committee, Dubois, ID
June 8, 2010

Sheep Management
ND Youth Sheep School, Hettinger, ND
October 2, 2010

ND Shearing School
Hettinger, ND
November 13 – 15, 2010

Publications

Schauer, C.S., M.L. VanEmon, M.M. Thompson, D.W. Bohnert, J.S. Caton, and K.K. Sedivec. 2010. Protein supplementation of low-quality forage: Influence of frequency of supplementation on ruminant performance and nutrient utilization. Sheep & Goat Res. J. 25:66-73.

Scholljegerdes, E.J., W. J. Hill, H. T. Purvis, L. A. Voigt, and C. S. Schauer. 2010. Effects of supplemental organic cobalt on nutrient digestion and nitrogen balance in lambs fed forage-based diets. Sheep & Goat Res. J. 25:74-77.

Geaumont, B.A., K.K. Sedivec, C.S. Schauer. 2010. Ring-necked Pheasant Nest Parasitism of Sharp-tailed Grouse Nests in Southwest North Dakota. The Prairie Naturalist. 42(1/2):73-75.

Neville, B.W., C.S. Schauer, K. Karges, M.L. Gibson, M.M. Thompson, L.A. Kirschten, N.W. Dyer, P.T. Berg, and G.P. Lardy. 2010. Effect of thiamine concentration on animal health, feedlot performance, carcass characteristics, and ruminal hydrogen sulfide concentrations in lambs fed diets based on 60% distillers dried grains plus solubles. J. Anim. Sci. 88:2444-2455.

Neville, B.W., C.S. Schauer, K. Karges, N. Dyer, and G.P. Lardy. 2010. Considerations for increased DDGS use in finishing lambs. Proceedings of U.S. Sheep Research Programs. p. 29-30.

M.M. Thompson, C.S. Schauer, V.L. Anderson, B.R. Ilse, R.J. Maddock, and K.K. Karges. 2010. Natural and conventional diet and management effects on steer feedlot performance, carcass trait and economics. J. Anim. Sci. Proc. 61:232-235.

Saevre, C.B., J.S. Caton, J.S. Luther, A.M. Meyer, J.D. Kirsch, M. Kapphahn, D.A. Redmer, and C.S. Schauer. 2010. Effects of rumen protected arginine supplementation on ewe serum amino acid concentration, circulating progesterone, and ovarian blood flow. J. Anim. Sci. Proc. 61:7-10.

Eckerman, S.R., G.P. Lardy, M.M. Thompson, B.W. Neville, M.L. Van Emon, P.T. Berg, and C.S. Schauer. 2010. Feedlot performance and carcass quality of conventionally raised lambs implanted with zeranol versus naturally raised lambs. J. Anim. Sci. Proc. 61:3-6.

Swanson, T.J., L.A. Lekatz, T.L. Neville, M.L. Van Enom, C.S. Schauer, K.R. Maddock Carlin, C.J. Hammer, and K.A. Vonnahme. 2010. Effects of late gestation metabolizable protein (MP) supplementation on ewe organ and blood parameters. J. Anim. Sci. 88(Suppl. 2):W142.

Magolski, J.D., W.L. Keller, T.M. Jeske, C.A. Schwartz, L.A. Lekatz, J.D. Kirsch, C.S. Schauer, K.A. Vonnahme, and K.R. Maddock-Carlin. 2010. Effects of maternal metabolizable protein supplementation during late gestation on ovine fetal muscle calpain and calpastatin activities. J. Anim. Sci. 88(Suppl. 2):T176.

Camacho, L.E., L.A. Lekatz, M.L Van Emon, C.S. Schauer, K.R. Maddock Carlin, and K.A. Vonnahme. 2010. Effects of maternal MP supplementation in late gestation on uterine and umbilical blood flows in sheep. J. Anim. Sci. 88(Suppl. 2):M278.

Neville, T.L., L.A. Lekatz, T.J. Swanson, M.L. Van Emon, C.S. Schauer, K.R. Maddock Carlin, C.M. Hammer, and K.A. Vonnahme. 2010. Effects of maternal metabolizable protein supply on fetal organ weights. J. Anim. Sci. 88(Suppl. 2):W149.

Lekatz, L.A., M.L. Van Emon, P.K. Shukla, S.T. O'Rourke, C.S. Schauer, K.M. Carlin, K.A. Vonnahme. 2010. Influence of metabolizable protein supplementation during late gestation on vasoreactivity of maternal and fetal placental arteries in sheep. J. Anim. Science. J. Anim. Sci. 88(Suppl. 2):1130.

Sebesta, E., B. Geaumont, M. Meehan, C. Schauer, and K. Sedivec. 2010. The evaluation of soil carbon levels on post-contract Conservation Reserve Program lands. Soc. Range Manage. 71:O-10.

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Woehl, D. K. Sedivec, C. Schauer, and A. Gearhart. 2010. Relationship between visual

obstruction and herbage production by ecological sites in a semi-arid climate of the Northern Plains. Soc. Range Manage. 71:P C-23.

Thompson, M.M., C.S. Schauer, V.L. Anderson, B.R. Ilse, S. Arndorfer, M.L. Gibson, K.K. Karges, and R.J. Maddock. 2010. Targeting the North Dakota Natural beef market: Impacts on early calf growth and performance. 2010 NDSU Beef Feedlot Research Report. 33:22-27.

Neville, B.W, G.P. Lardy, K.K. Karges, S.R. Eckerman, P.T. Berg, and C.S. Schauer. 2010. Interaction of corn processing and distillers dried grains with solubles on health and performance of steers. 2010 NDSU Beef Feedlot Research Report. 33:32-39.

Eckerman, S.E., G.P. Lardy, M.M. Thompson, B. Neville, M. VanEmon, P.B. Berg, and C.S. Schauer. 2010. Growth performance and carcass characteristics of conventionally raised lambs implanted with zeranol versus naturally raised lambs. 2010 NDSU Sheep Research Report. 51:3-7.

Neville, B.W., C.S. Schauer, and G.P. Lardy. 2010. Influence of thiamin supplementation on hydrogen sulfide gas concentrations in ruminants fed high sulfur diets. 2010 NDSU Sheep Research Report. 51:8–11.

Sebesta, E.L., K.K. Sedivec, B. Geaumont, S. Kronberg, K. Larson, D. Houchen, and C.S. Schauer. 2010. Impacts of integrated pest management on Leafy Spurge (Euphorbia esula) following a 10-year sheep grazing study: A progress report. 2010 NDSU Sheep Research Report. 51:12-19.

Becker, W., C. Schauer, and R. Schmidt. 2010. NDSU Extension Service live lamb carcass contest report. 2010 NDSU Sheep Research Report. 51:29-30.

Eric Eriksmoen, Research Agronomist

Presentations

Small Grain Varieties & Sawfly Strategies - Hettinger Co. Crop Improvement Assn. – Regent
Small Grain Varieties & Sawfly Strategies – Taylor Institute – Taylor
Small Grain Varieties & Sawfly Strategies - Slope Co. Crop Improvement Assn. – Amidon
Small Grain Variety Update - West River Breeders – Reeder
Planned Research - HREC Advisory Board
Skip-Row Corn – Perkins Co. Extension meeting - Bison
HREC Employee Safety Training - Hettinger
Research at the HREC (Poster) - Mandan ARS Annual Convention – Mandan
Small Grain and Pulse Crops – Mandan
Weed Control Update – SW ND Extension Agents meeting
Crops Day and Field Tour Summaries – KNDC radio
Crop Growing Conditions in SW ND – KFGO radio
Dormant Seeded Safflower – KMOT TV – Hettinger

Drought Tolerant Soybeans – KMOT TV - Hettinger
HREC Small Grain Variety Trial Field Tour - Hettinger
Small Grain Variety Trial Field Tour - Scranton
Small Grain Variety Trial Field Tour - Regent
Small Grain Variety Trial Field Tour - Mandan
Small Grain Variety Trial Field Tour - New Leipzig
Small Grain Variety Trial Field Tour - Selfridge
27th Annual Western Dakota Crops Day Show - Hettinger

Publications

USDA-ARS. Annual Report. W. Regional Dryland Spring Barley Nursery 2009. National Small Grains Germplasm Research Facility, Aberdeen, ID. Jan. 2010.

USDA-ARS. Annual Report. Report on Wheat Varieties Grown in Cooperative Plot and Nursery Experiments in Spring Wheat Region in 2008. USDA-ARS Midwest Area. St. Paul, MN. Jan. 2009.

NDSU Ext. Bul. A-652 rev. ND and SD Hybrid Sunflower Performance Testing 2009. Jan. 2010.

NDSU Ext. Bul. A-1469. ND Dry Pea Performance Testing 2009. Jan. 2010.

NDSU Dept. Report. 2009 ND Weed Control Research. Feb. 2010.

NDSU Ext. Bul. A-1105 rev. 2009 ND Alternative Crop Variety Performance. Feb. 2010.

Eric Eriksmoen. HRSW, HRWW, Durum and Oat Variety Trial Results from Mandan. In Proc. 2010 Research Results and Technology Conference. Feb. 23, 2010. Mandan, ND.

NDSU Dept. Report. Quality Evaluation Program. HRSW Field Plot Variety Trials - 2009 Crop. May 2010.

NDSU Ext. Bul A-1196 rev. ND Hard Winter Wheat Variety Trial Results for 2010 and Selection Guide. Oct. 2010.

NDSU Ext. Bul A-1067 rev. ND Durum Wheat Variety Trial Results for 2010 and Selection Guide. Nov. 2010.

NDSU Ext. Bul. A-1049 rev. ND Barley, Oat and Rye Variety Trial Results for 2010 and Selection Guide. Nov. 2010.

NDSU Ext. Bul. A-574 rev. ND Hard Red Spring Wheat Variety Trial Results for 2010 and Selection Guide. Nov. 2010.

NDSU Ext. Bul. A-1124. 2010 Canola Variety Trials. Nov. 2010.

NDSU Ext. Bul. A-1469. ND Dry Pea Performance Testing 2010. Dec. 2010.

NDSU HREC Ag. Report 27. 27th Annual Western Dakota Crops Day Research Report. Dec. 2010.

Professional and Community Activities

ND Crop Variety Selection committee member
Western Weed Science Association member
Paramedic with West River Ambulance
Hettinger Chamber of Commerce member
Hettinger Ag. Marketing Club
Treasurer for the West River Breeders Association
Coordinator - ND Uniform Proso Millet Trials
Hettinger REC Safety Officer

Crops judge - Adams, Slope & Hettinger Co. Fairs
Certified >First Detector= with the National Plant Diagnostic Network

Meetings and Training Attended

Dollars, Diversity and Direction meeting – Dickinson
Sawfly Research Forum – Dickinson
ManDak Zero Till Conference – Minot
SBARE meeting – Fargo
ND Pulse Growers Assn. Annual Convention - Minot
ND REC Agronomists meeting - Carrington
ND Variety Release meeting - Fargo
Adams Co. Crop Improvement meeting – Reeder
Hettinger Co. Crop Improvement Assn. meeting – Regent
Slope Co. Crop Improvement Assn. meeting – Amidon
HREC 5year Strategic Planning meeting - Hettinger
Best of the Best Wheat Research & Marketing Forum – Dickinson
ND Crop and Seed Assn. Annual Convention - Minot
Skip Row Corn Meeting with Perkins Co. Ext. – Bison, SD
Western Weed Science Society Annual Conference - Hawaii
NDSU Branch Station Conferences – Fargo
Defensive Drivers Course – Hettinger
Ducks Unlimited / Bayer Field Tour – Berthold
Hettinger REC Advisory Board meetings – Hettinger
Dow Chemical Field Tour - Dickinson
SW Crop Improvement and Seed Assn. Meeting - Bismarck
Mandan ARS Board of Directors Meeting - Mandan
Mandan ARS Annual Growers Workshop – Mandan
Hettinger Ag. Marketing Club - Hettinger
Hettinger Chamber of Commerce Ag. Committee meetings – Hettinger
Plot Tours - Hettinger, Scranton, Regent, New Leipzig, Mandan, Ralph and Selfridge
Mandan USDA-ARS Grower Appreciation Tour – Mandan
27th Annual Western Dakota Crops Day show - Hettinger

Benjamin Geaumont, Wildlife Post-Doctorate Research Fellow

Presentations

Geaumont, B.A., C.S. Schauer, and K.K. Sedivec. 2010. Observations of Ring-necked Pheasant Egg Dumping: Its Occurrence and Influence on Sharp-tailed Grouse Production in Southwest North Dakota. 2010 Annual Society of Range Management Conference, Denver, CO.

Sebesta, E., **B. Geaumont**, M. Meehan, C. Schauer, and K. Sedivec. 2010. The Evaluation of Soil Carbon Levels on Post-Contract Conservation Reserve Program Lands. 2010 Annual Society of Range Management Conference, Denver, CO.

Geaumont, B.A., D. Nudell, and C.S. Schauer. 2010. Cover Crops and Wildlife. 2010 Annual Crops Day Tour. Hettinger Research Extension Center, Hettinger, ND.

Geaumont, B.A., K.K. Sedivec, K. Larson, J. Stackhouse, and C.S. Schauer. 2010. Ring-necked Pheasant Ecology: Five Years of Observations. Natural Resource Conservation Service, Hettinger County, Mott, ND.

Geaumont, B.A., C.S. Schauer, and K.K. Sedivec. 2010. Evaluation of Ring-necked Pheasant Production on Post-Conservation Reserve Program Grasslands in Southwest North Dakota. 2010 Pheasants Forever North Dakota State Convention. Bismarck, ND.

Geaumont, B.A., C.S. Schauer, and K.K. Sedivec. 2010. Evaluation of Ring-necked Pheasant Production on Post-Conservation Reserve Program Grasslands in Southwest North Dakota. 2010 Society of Range Management North Dakota Chapter's State Meeting. Bismarck, ND.

Geaumont, B.A., K.K. Sedivec, C.S. Schauer, and Dean Houchen. 2010. Sharp-tailed Grouse Production on the Grand River National Grasslands. 2010 Beef Days. Hettinger Research Extension Center. Hettinger, ND.

Publications

Geaumont, B.A., K.K. Sedivec, and C.S. Schauer. 2010. Ring-necked Pheasant Nest Parasitism of Sharp-tailed Grouse Nests in Southwest North Dakota. The Prairie Naturalist 42(1/2): 73-75.

Students and Student Employees

Three Graduate Students

- Dean Houchen – MS Student
- Kristine Larson – MS Student
- Jeff Stackhouse – MS Student

Two student technicians

- Amanda Lipinski
- Samantha Sayler

Michele Thompson, Southwest Feeders Coordinator

Presentations and Outreach

HREC Beef Research Review: Management Alternative to Improve Your Bottom Line (Dec. 7, 2010)

Forty cattle producers, land managers, and wildlife specialists attended the day's events; program had more first time attendees at this event than last two programs. Topics presented included: ethanol co-products, artificial insemination, sharp tailed grouse production on Grand River National Grasslands, and keynote speakers were members of the ND Grazing Lands Coalition:

Gabe Brown, Ken Miller and Lance Gartner, who spoke on ways they have improved soil health on their individual ranches.

NDSU Extension Service Beef College at Bismarck, ND on February 11, 2010. Topic covered "Economics of feeding strategy on market cow performance, carcass quality and economics". Approximately 100 people attended the meeting.

Dickinson State University on February 18, 2010. Spoke to the Junior Seminar and Livestock Production classes. Topic covered "Southwest Feeders research programs-past and present". Presentations were given to Dr. Chip Poland's Junior Seminar class (20 students) and Livestock Production class (5 students).

2010 ADSA-PSA-AMPA-CSAS-WSASAS-ASAS Joint Annual Meeting in Denver, CO on July 14, 2010. Topic covered "Natural and conventional diet and management effects on steer feedlot performance, carcass traits, and economics".

Hettinger REC Beef Research Review on December 7, 2010. Topic covered "Ethanol co-products from dry milling in beef cattle diets".

Producer Outreach:

Anthony Larson, Dr. Carl Dahlen, Joe and Sandi Frenzel, J & M Farms, David Howe, Gary Stier, Mario Ndonji, Jerry Effertz, Carter Archibald, Donald Melling, Garland Hochhalter, Herman Schumacher, Jason Leiseth, Paige Burian, Jim Lowman, Jack Reich, Vern Wold, Casey Maher, Fast Angus, Steve Brooks, Gail McGee, Andrea Bowman, Dennis Markegard, Lance Gartner, Gabe Brown, Ken Miller, Vivian Hernandez, and Tim Anderson (beef): nutrient and dry matter intake requirements for late gestation cows; pictures and information on SW Feeders bunk spacing arrangement; individual carcass data, feeding summary and WSASAS paper on natural and conventional cattle production; removed old weigh files off Gallagher scale head and downloaded old files; auction market sales reports for feeder calves and replacement heifers; cold advisory for newborn livestock (CANL) for calves; HREC Beef Research Review handouts; causes of rectal prolapses in fattening cattle; sulfur level in DDGS diets and sulfate levels in livestock drinking water sources; finishing cattle rations, cull cow diets; thiamin impacts on behavior; cull cow feeding information; nutritional analyses of natural beef; remote sensing technology to monitor sick cattle remotely; cattle gestation chart; feeder calf rations and breakevens; requested comments on SW Feeders CRIS project and potential research projects for beef cattle; bred heifer growing rations and breakevens; information on naturally raised and grass fed beef; fat cattle pricing information; Cattle Fax feeder pricing for leased cattle; growing cattle rations to achieve $1/day maximum feeding costs; calf growing rations with DDGS, information on water sulfate testing and levels of DDGS in cattle rations; thank you notes for speaking and booth at NDSU HREC Beef Research Review, and mineral premix evaluation for calf growing rations containing DDGS.

Wyman Scheetz, Misty Steeke, Curt Stanely, Matt Benz, Dean Swenson, Burton Pfliger, Burdell Johnson, Brent Stroh, Lyle Wagner, Judy Pond, Dale, Richard-Walco (sheep): cold advisory for newborn livestock (CANL) for lambs; requested comments on SW Feeders CRIS

project and potential research projects for sheep; copper levels in mineral blocks for sheep; treatment for coccidiosis in sheep; and information on meat goats (Boer goats)

Dr. Oelke-UNM Economist: Information on Adams county land rents, grazing stocking rates and livestock carrying capacity

Vern Stark, Eric Eriksmoen, and Dr. Don Obert (agronomy): information on hairy vetch and Willow Creek winter wheat; sent barley and triticale samples for analytical nutrient content; forwarded Eric's forage barley results for Tetonia and Lenatah barleys

NDSU IACUC Committee: protocol reviewer (1)

Francie Berg: historical livestock stocking rate in eastern MT and contact information for Ft. Keogh, Miles City, MT

Publications

Neville, B. W., C. S. Schauer, K. Karges, M. L. Gibson, M. M. Thompson, L. A. Kuschten, N. W. Dyer, P. T. Berg and G. P. Lardy. 2010. Effect of thiamine concentration on animal health, feedlot performance, carcass characteristics, and ruminal hydrogen sulfide concentrations in lambs fed diets based on 60% distillers dried grains plus solubles. J. Anim. Sci. 88: 244-2455.

Schauer, C. S., M. L. Van Emon, M. M. Thompson, D. W. Bohnert, J. S. Caton, and K. K. Sedivec. 2010. Protein supplementation of low-quality forage: Influence of frequency of supplementation on ewe performance and lamb nutrient utilization. Sheep & Goat Res. Jour. 25: 66-73.

Thompson, M. M., C. S. Schauer, V. L. Anderson, B. R. Ilse, R. J. Maddock, K. K. Karges, and M. L. Gibson. 2010. Natural and conventional diet and management effects on steer feedlot performance, carcass traits and economics. Proc. West. Sect. Am. Soc. Anim. Sci. 61: 232-235.

Eckerman, S. E., C. S. Schauer, M. M. Thompson, B. W. Neville, M. L. Van Emon, P. T. Berg and G. P. Lardy. 2010. Growth performance and carcass characteristics of conventionally raised lambs implanted with zeranol versus naturally raised lambs. Proc. West. Sect. Am. Soc. Anim. Sci. 61:3-6.

Eckerman, S. E., G. P. Lardy, M. M. Thompson, B. Neville, M. Van Emon, P. B. Berg, and C. S. Schauer. 2010. Growth performance and carcass characteristics of conventionally raised lambs implanted with zeranol versus naturally raised lambs. NDSU Sheep Report. 51:3-7.

Thompson, M. M., C. S. Schauer, V. L. Anderson, B. R. Ilse, S. Arndorfer, M. L. Gibson, K. K. Karges, and R. J. Maddock. 2010. Targeting the ND natural beef market: Impacts on early calf growth and performance. NDSU Beef Feedlot Research Report. 33:22-27.

Popular press articles from SW Feeders work and interviews

Thompson, M. "Third Annual Beef Research Review a Success". Adams County Record. Volume 105, Issue 52, pp. 1 and 3.

Roesler, S. "As corn, soybean prices rise, distillers becomes more high value". Farm & Ranch Guide, December 12, 2010 issue.

Laudert, S. "Natural premiums studied". Beef Magazine, November 10, 2010 issue, p. 16.

Dan Nudell, Agriculture Economist

Presentations

Critical Controls Points for Profitable Sheep Production, Guelph, Ontario
OSMA survey results, Toronto, Ontario
NRCS cover crop demonstration project

Publications

NDSU Ag Econ Report, Potential Economic Effects of Post-CRP Land Management in Southwest North Dakota, AE2011

Professional and Community Activities

Hettinger Housing Authority, Chairman
SW Rural Economic Area Partnership, Chairman
REAP Investment Board member

Meetings and Training attended

Hettinger Research Beef Day
Outlook for Ag Producers
Estate planning workshop
ARCGIS training at SD School Mines
HREC 5year Strategic Planning meeting - Hettinger
Defensive Drivers Course – Hettinger
Hettinger REC Advisory Board meetings – Hettinger
Hettinger Farm and Home Show
Hettinger Tree Workshop
Agriculture Economics graduate seminars

Advisory Board Meeting Minutes

Advisory Board Meeting
Hettinger Research Extension Center
February 25, 2010

After a noon lunch the meeting was called to order by Chairman Shawn Arndorfer, Hettinger Research Extension Center, 1:00 PM.

Board members present: Joe Rohr, Steve Pfeifer, Rodney Howe, Denise Andress, Chuck Christman, Matthew Benz, Julie Kramlich, Larry Leistritz, Cole Ehlers, Dennis Sabin, Dean Wehri and Shawn Arndorfer. Staff present: Chris Schauer, Dan Nudell, Michele Thompson, Ben Geaumont, Megan Van Emon and Terri Lindquist. Administration and guests: Tim Faller, Roger Ashley and Duane Barondeau.

Shawn Arndorfer called for a motion to approve the minutes from the previous meeting. Larry Leistritz motioned to approve minutes and Dean Wehri seconded, motion passed.

Shawn Arndorfer called for a motion to approve the agenda. Julie Kramlich motioned to approve the agenda and Larry Leistritz seconded, motion passed.

Director's Report – Chris Schauer – Handout

1. SBARE- Rodney Howe:
    a. NDSU is currently conducting the President search
    b. Extension Agents – many are retiring, and we need training for new agents
2. HREC requests – need support at the legislature
    a. Multiple Land Use Specialist
    b. Soil Health
    c. Plant Protection

Animal Science Report

1. Southwest Feeders – Michele Thompson (handout)
    a. Beef Research Review canceled due to power outage
2. Animal Science – Chris Schauer (handout)
    a. Matt Benz – there has been a lot of interest in DDGS work in lambs
    b. Megan VanEmon updated on the Metabolizable Protein project

Range Report

1. Amanda Gearhart (handout on Forest Service work)
2. Wildlife and Livestock Interactions – Ben Geaumont (handout)
    a. Stockmen's Assoc. and NDLWPA have passed resolutions in favor of this position
    b. SBARE has ranked this as the #1 initiative
    c. Tour on July 13 from 3:00 – 5:00

Agronomy Report

1. Eric Ericksmoen (handout)
2. Crops Day is July 13 from 5:00 – 7:00

Economics Report

1. Dan Nudell (handout)
    a. Outlook for Ag Producers (3/1/2010)
    b. Farm Transition workshop
    c. Collaboration with Dr. Harlan Hughes on Long Term Lease
        i. Looking for case studies and participants

2005-2010 Strategic Plan

1. Evaluated past Strategic Plan

2010-2014 Strategic Plan

1. Presented plan (attached as separate document)
2. Motion to Table until next business meeting – Larry Leistritz, Dennis Sabin 2nd
    a. Passed

New Business

1. Matt Benz – motioned for the NDSU HREC Advisory Board to submit a letter to the NDSU President Search Committee to recommend that the new NDSU President have a strong agriculture presence with 1 of his/her degrees in agriculture. 2nd by Steve Pfeifer
    a. Passed
2. Elections: Shawn Arndorfer called for nominations. (Steve Lynch was brought up as a future candidate – Steve Pfeifer)
    a. Larry Leistritz motioned to elect Jeremy Fordahl, Justin Freitag and a soil conservation representative to the HREC advisory board. Matt Benz seconded the motion. Motion passed.
3. Larry Leistritz motioned to elect Dean Wehri as vice chairman. Cole Ehlers seconded the motion. Motion passed.
4. Larry motioned to close nominations. Cole Ehlers seconded the motion. Motion passed.

The next HREC advisory board meeting is scheduled for July 7, 2010 from 12:00 – 3:00 at the HREC.

Dean Wehri moved to adjourn the meeting, Shawn seconded. Meeting adjourned at 2:55 PM.

Advisory Board Meeting
Hettinger Research Extension Center
July 7, 2010

After a noon lunch the meeting was called to order by Chairman Ted Sailer at 1:00 pm.

Board members present included Gloria Payne, Denise Andress, Julie Kramlich, Larry Leistritz, David Merwin, Cole Ehlers, Dennis Sabin, Dean Wehri, Nathan Swindler, Joe Rohr, Justin Freitag, Terry West and Ted Sailer. Staff present included Christopher Schauer, Ben Geaumont, Michele Thompson, Eric Eriksmoen and Cassie Dick. Guest Gerald Sturnn was present.

Chairman Ted Sailer called for a motion to approve the minutes from the previous meeting. Gloria Payne motioned to approve the minutes and Larry Leistritz seconded, motion passed to approve the minutes from the previous meeting.

Chairman Ted Sailer called for a motion to approve the agenda for the meeting. Julie Kramlich motioned to approve the agenda and Dennis Sabin seconded, motion passed to approve the agenda.

Director Christopher Schauer welcomed the new board members and invited them to give input throughout the meeting.

Gerald Sturnn thanked the board members for participating in the advisory board, explaining their participation is important for NDSU research and extension work.

Director's Report- Christopher Schauer (Handout provided)

1. New website up and running http://www.ag.ndsu.edu/HettingerREC/
2. SBARE
    a. Short explanation of what and how SBARE works with the Hettinger REC and legislature
    b. Requests to the legislature from SBARE
3. CASE IH rental agreements
4. Graduate Students update
5. Legislative session
    a. Next session January 2011
    b. Requests
    c. Seeking input and representation

Animal Science Report- Christopher Schauer (Handout provided)

1. 2005-2010 Internal Goals
2. Progress towards goals
3. Publications

Range Report- Ben Geaumont (Handout provided)

1. Six research trials underway and two cooperator agreements
2. Funding Obtained

3. Extension work
4. Plan for 2010
5. Publications

Southwest Feeders Report- Michele Thompson (Handout provided)

1. Beef programming
2. Research activities
3. 2010 Summer Project
4. CANL: A new tool to assist livestock producers during the 2010 calving and laming season
    a. Available on line www.weather.gov/bis

Agronomy Report- Eric Eriksmoen

1. Crop tours coming up on July 13, 2010
2. About 100 agronomy trials this summer
    a. Sawfly projects
    b. Variety development
    c. Weed control development- new variety's need to have weed control available
    d. Drought tolerant varieties- corn and soybeans
    e. Cover crop work
    f. Fan weed being grown this year as a possible oil seed
3. Hettinger REC does not work with organic varieties- however, the Dickinson REC does
4. Discussion on wheat steak mosaic- usually management problem, best to till it under

Economics Report- given by Christopher Schauer in place of Dan Nudell

1. Working on possible cover crop development with Ben Geaumont
2. Land ownership transfer research

Open Discussion

1. Offer services to bee/honey producers- colony collapse disorder
2. If you hear about things to do with the station and are curious, please call to ask. We will keep you informed and please help us keep informed.
3. Animal Health & Welfare
    a. NDSU is trying to address animal health and welfare by hiring staff and working with non-producer groups
    b. Low-stress handling
    c. Education to non-producers
4. Areas of beef/sheep production that need to be addressed
    a. Swath grass grazing
    b. Continued work with distillers grain
    c. Residual feed intake

5. Vineyard/fruit production- no one at NDSU to represent this area
6. Crested and smooth brome grass taking over grazing areas

2010-2014 Strategic Plan- board had a chance to read the strategic plan and discuss

Chairman Ted Sailer called for a motion to accept the 2010-2014 strategic plan. Larry Leistritz moved to accept the strategic plan. Dean Wehri seconded, motion passed to accept the 2010-2014 strategic plan.

The next meeting will be held _____

The meeting was adjourned at 2:35 PM.

Personnel

Hettinger Research Extension Center

Christopher Schauer	Director/ Animal and Range Science
Dan Nudell	Assistant R/E Center Specialist/ Ag Economics
Eric Eriksmoen	Associate R/E Center Specialist/ Agronomy
Michele Thompson	Assistant R/E Center Specialist/ Livestock
Ben Geaumont	Post-Doctorate Research Fellow/ Wildlife
Amanda Gearhart	Research Specialist/ Range
Terri Lindquist	Finance Paraprofessional
Cassie Dick	Administrative Secretary
Don Stecher	Manager of Ag Operations
Nels Olson	Research Technician/ Agronomy
David Pearson	Research Technician/ Shepherd
Donald Drolc	Research Technician/Livestock

Range and Wildlife Graduate Students

Dean Houchen
Kristine Larson
Eva Sebesta
Jeff Stackhouse
Derek Would

Animal Science Graduate Students

Megan VanEmon
Steve Eckerman
Bryan Neville
Chelsey Savre

The Hettinger Research Extension Center hires individuals on a part-time basis to help in the research effort. Many of these are students as well as local residence. We would like to acknowledge the following people who helped at some time during the past year: John White, Caitlin Pearson, Matt Korang, Cole Turner, Alix Pearson, Samantha Sayler, Derrick Stecher, Teresa Huck, Amanda Lipinski, Tess Kilwein, Shawna Monson, Devin Gaugler and Melisa Eriksmoen.

Advisory Board Members

Gloria Payne	Elgin, ND	Dean Wehri, Vice-chair	Mott, ND
Denise Andress	Hettinger, ND	Nathan Swindler	Mott, ND
Chuck Christman	Lemmon, SD	Joe Rohr	Elgin, ND
Matthew Benz	Beulah, ND	Justin Freitag	Scranton, ND
Julie Kramlich	Hettinger, ND	Terry West	Hettinger, ND
Larry Leistritz	Fargo, ND	Jeremy Fordahl	Hettinger, ND
David Merwin	Hettinger, ND	Ted Sailer, Chair	Hettinger, ND
Cole Ehlers	Hettinger, ND	Rodney Howe	Hettinger, ND
Dennis Sabin	Morristown, SD		

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