North Central Region SARE

2007 Farmer/Rancher Grant Application

Project Title: Inter-seeding Legumes into Established Cool Season Pastures

One or Two Sentence Description of Project:

Eight carefully selected legumes will be inter-seeded into two paddocks of an established Smooth bromegrass pasture using a no-till drill. Legume establishment will be measured with a frequency frame sampled three times during the establishment year.

Project Leader: Calvin K. Adams

Address: 283 360th Road
Beloit, Kansas
67420

Phone: (785) 792 6338

Fax: N/A

E-Mail: calsue@twinvalley.net

Is the applicant a Farmer/Rancher? Yes___X____ No_____

Grant Funds Requested: $2758.50_____

Is this an Individual____X___ or Group_____ Project?

Have you previously received a SARE Farmer/Rancher Grant? Yes___ No__X__

If yes, was the project successfully completed? Yes_____ No___X____

If project was not completed, explain why not. N/A

1) Describe the problem your project will address, and provide a detailed description of the innovative plan you are proposing to test possible solutions to the problem.

The problem is multi-dimentional; (1) We are in the process of trying to enter the grass finished segment of our industry. Adding legumes to our cool season pastures could substantially improve the quantity and quality of forage produced, as well as help fill the July-Aug "hole" in cool season production. . (2) Commercial fertilizer costs are soaring and their use can potentially produce ground and surface water quality problems. 3) Adding legumes can potentially reduce the amount of commercial fertilizer needed to maintain Smooth bromegrass forage production. (4) Adding legumes will extend the summer grazing season by increasing the quantity and quality of forage produced, improve animal weight gain and profitability potential, and reduce methane production (a contributing greenhouse gas). 5) Nitrogen availability is important to water efficiency of cool season grass pastures (annual precipitation is 24 inches, so water use and efficiency are critical factors for cool season, introduced pasture species).

This trial will be seeded into two paddocks of a 12 paddock rotationally grazed, Smooth bromegrass system. The two paddocks to be inter-seeded have two distinct soils, one is an upland soil with a moderate 5-7 % slope, and the other is a lowland soil with minimal 1-3% slope. Each is representative of similar fields and landscape positions in North Central Kansas. Each paddock is approximately 440' by 660'. Each of 8 legumes (grazing tolerant alfalfa, yellow flowered alfalfa, yellow sweetclover, birdsfoot trefoil, white clover, Korean lespedeza, cicer milkvetch, and hairy vetch) will be seeded in alternating strips with a total of 4 replications across both paddocks with a 10' wide no-till drill with 7.5 inch spacing between rows. An unseeded 10' strip will also be included in each replication of legume strips as a control. The paddocks will be fertilized according to soil tests, except a control strip at least 30' across each paddock running perpendicular to the direction of seeding will remain unfertilized to allow a test of legume establishment of fertilized vs. unfertilized stands. In subsequent years, this will also allow for an estimated measurement of the production provided by the nitrogen from legumes that establish by measuring the difference in grass production in this unfertilized area within each legume strip and within the unseeded strip.

Establishment will be measured within a square frequency frame divided into 100 subframes each 4" by 4" in size. The number of 4" by 4" subframes with a desired legume rooted within it will be counted for each frame. A total of 4 frequency frames will be counted in each legume strip and in the unseeded control strip in the fertilized, unfertilized, upland, and lowland portions of the paddocks. With 4 replications, a total of 16 frames will be counted in each treatment combination. Since the drill used will have 7.5" row spacings, 5 rows of legume will be included in each frequency frame, and will result in over 240' of legume row to be characterized for each combination. A conservative estimate of legumes/sq ft can be calculated since only presence or absence of a legume is recorded within a subframe, when actually many more legume seedlings within a subframe could be present. Sampling will occur 3 times during the establishment year. After seeding around the first of March, frequency sampling will occur 6-8 weeks after seeding, 14-16 weeks after seeding, and again 30-32 weeks after seeding near the time of the first autumn frost. Establishment Criteria: Four plants per square foot will be considered an excellent stand, but 2 or more plants will be considered positively.

2) Describe how you will add to or build on previous work done on this problem.

Research from Missouri and South Eastern Kansas have shown that adding legume forages to cool season pastures is a highly desirable practice. However there is little information available on the subject for ranchers in North Central Kansas. Climatic conditions vary significantly with Beloit averaging 27 inches of precipitation per year compared to an average of 40-42 inches in SE KS or Central MO where most of the research has been conducted.

We have been quite successful in establishing and maintaining very productive bromegrass pastures, but have not had much success in establishing legumes into them. The lack of success may be attributed to broadcast seeding, drought conditions, species selection, or pasture management during establishment. This project offers a direct comparison of 8 of the most adapted legume species directly drilled into an established cool season pasture to optimize the chance of finding the legume best suited to establish in these climatic and management conditions.

As fertilizer input costs continue to rise sharply profit margins continue to shrink. Adding legumes to maintain forage production and increase late season pasture quality and animal performance may lead to improved profitability by reducing commercial fertilizer costs. A reduction in commercial fertilizer use will also reduce the risk of ground and surface water contamination

Our selection of legumes was based on a careful review of available research literature such as Kansas Rural Center publication 'Cover Crops and Legumes' as well as University of Nebraska 'Interseeding legumes into brome increases cattle's weight gains'and Kansas State University Extension experience. If successful this endeavor could result in significant forage quality enhancement and improved economic returns for our cool season pastures.

3) How will you share information from your project with other farmers/ranchers? Be innovative in your outreach. (Each project must include outreach – the more the better.)

1. Local grazers group – provide tour to area producers of our management intensive grazing system and how the addition of legumes can improve on our current system as well as their current practices.
2. Kansas Grazers Assn.- provide a tour with an expanded clientele base to include the entire state. This research project can be an example of how legumes establish in grass in this region compared to success of legume establishment for other producers in entirely different regions of Kansas.
3. News release/newsletter article – write an article about the SARE Farmer Rancher Program and project results, especially relating them to current recommended practices of establishing legumes into grass in North Central Kansas.
4. Journal article - the trial protocols are developed in a manner that will allow the experiment to be publishable in a professional, refereed manuscript available on the internet to provide accessibility to producers and professionals alike. A second year of production and data collection will be required for the manuscript to come to fruition. The current plan is to continue the data collection for two years and try to secure additional funding for the second year.

4) SARE defines sustainable agriculture as good for the environment, profitable, and good for your family and community. How will you evaluate the environmental, economic, and social impacts of your project and how will those impacts contribute to the growth of sustainable agriculture?

What impacts this project might have will, first of all, depend on the careful analysis of our data. Which legumes establish. Does soil type effect specific legume species establishment and production? How difficult are legumes to establish into existing stands of Smooth bromegrass pasture? What is the cost of legume establishment?

Economic impacts: As a grass farmer who chooses to harvest his product by the bite (I'm a custom grazer), I have very few governmental supports. As input costs continue to sky rocket I must do what ever I can to make ends meet. If this project supports one or more legumes that I could utilize, it would have a significant positive impact on my economics. I am sure the same would be true for my neighbors and colleagues in the region. We will track forage production, animal performance and per acre profitability of this project and compare those numbers to the 7 year farm average.

Environmental impacts Reduced commercial fertilizer application rates reduce the potential risk for ground and surface water contamination. Legumes increase forage quality and maintain animal gain and performance later into the growing season. Legumes remove nitrogen from the atmosphere. Cool season grasses are more water efficient and maintain production longer into the summer or during a drought with some available nitrogen present.

Reducing and or eliminating the need for commercial fertilizer could be significant but nitrogen availability from the legumes may take 2-3 years post establishment. If the legume stand can be established and sustained, the legumes would reduce the need and cost of commercial fertilizer. The cost of forage production between the legumes versus commercially fertilized pasture will be evaluated at a cost per pound of forage produced.

Social and local impacts: The social impact would be huge. If successful, it would add an affordable tool that farmers and ranchers could utilize to keep their operation profitable and thus sustainable. The use of legumes in other parts of the country show positive benefits compared to commercial fertilizer. This project could, if successful, contribute to the growth of sustainable agriculture. Any information on the establishment and maintenance of legumes into cool season perennial pastures is very limited for North Central Kansas making this effort very important. To evaluate the impact to local farming operations, the number of producers who request additional information from me directly, the NRCS and K-State Research and Extension will be tracked.

5) Describe your farm or ranch operation if you are submitting an individual proposal.

My wife Sue and I operate a 400 acre grass farm in SE Mitchell County, Kansas (North Central KS). It is about ½ native rangeland and ½ cool season grass. We utilize management intensive grazing on all of our grass. We have custom-grazed sale barn stockers for some tine now, taking one group from green up in spring to mid-July, and a second group from mid Sept. to Dec. each year. This project is just one of the things we are adding in our effort to enter the grass finished segment of our industry I learned the basics of grazing management at the basic and advanced Management Intensive Grazing school taught by Jim Gerrish at the Missouri Forage Systems Research Center. I have attended various local workshops and schools since then including those conducted by the Kansas Society of Range Management and the Kansas Graziers

Association. Cost-share funds for water and fencing systems have been received through the NRCS, Environmental Quality Incentives Program, the Kansas Rural Center Clean Water Farm Program, and the Mitchell County Conservation District State Conservation Commission Program. I now have seven years of annual forage production, species composition transect, and range and pasture trend and health evaluation data from our grass pastures. These data provide the basis for many of our management decisions. I actively network with fellow grazers as a co-founder of our local grazers group and am on the board of directors of the Kansas Grazers Assn.

I also have an off-farm job. I work two days a week at the Kansas Neurological Institute in Topeka as a PhD Neuro-scientist. Previously I served 6 years at the Army Research Lab at Ft. Knox Kentucky where I helped develop the first safety standards for Ruby Laser use and worked on early development of the night vision devices the military now uses so extensively. I next spent 10 years at the University of Florida, where I led a group of behavioral scientists and materials engineers in the development of the first and only scientifically based methodology for training women to do breast self-examination. This methodology is now patented through out the free world. I then returned to my home of origin for health reasons.

6) List the names, addresses, and phone numbers of any cooperators. Include how they will participate or what they will contribute.

1. Dwayne Rice
   Rangeland Management Specialist
   Natural Resources Conservation Service
   112 East Court, P.O. Box 156,
   Lincoln, Kansas, 67455-0156
   785-524-4482

Helped with project design and layout. Will assist with planting, data collection, stand evaluation and information dissemination and out reach activities.

2. Keith Harmony
   Kansas State University
   Ag research Center – Hays
   1232 240th Ave
   Hays, Kansas 67601
   785 625 3425 ext 221

Helped develop sampling protocol, will assist in data collection and will provide statistical data analysis. Will assist in all out reach activities.

Ξ _____

Signature of Applicant (**must** be a Farmer/Rancher)

FNC07-660, Inter-seeding Legumes into Established Cool-Season Pastures

This project received very positive comments from reviewers. The problem and solution were clearly stated so even someone unfamiliar with the issues could understand the value of the project. Similar research has been done in other areas of the state and another state and the grant author made sure to point out why the research being done in this project was different (climate is very different than in previous studies). It was clear that the grant author had done careful research before writing the grant proposal and knew about previous work done with legumes. He thought through how he would carry out the project, then clearly explained the process he intended to use step by step.

The outreach plan was well thought out and very specific and included different audiences and two ways to reach them: tours and articles. The groups the grant author hopes to reach were listed so reviewers could tell they were good choices for outreach.

The plan for evaluating impacts was excellent and included questions the grant author hopes to answer, discussion of specific impacts the project may have on the grantee's farm as well as on other farms in the area. Impacts that can be measured will be and the grantee explained how those impacts will be measured. The budget provided specifics about project expenses (such as the varieties of plants used and the pounds of each seed needed). Outreach costs were included in the budget which helps show the grant author is serious about outreach. The only weakness was that some reviewers felt the grant author may have under budgeted for project expenses but they appreciated his economy.