

Season Extension Strategies and Profitability in Dairy and Livestock Operations in New England

Progress report for LNE20-399

Project Type: Research and Education

Funds awarded in 2020: \$236,718.00

Projected End Date: 04/30/2023

Grant Recipients: University of Massachusetts Amherst; University of Maine; University of Vermont

Region: Northeast

State: Massachusetts

Project Leader:

[Masoud Hashemi](#)

University of Massachusetts Amherst

Project Information

Summary:

In a changing climate, northeast farmers are experiencing milder/wetter winters and hotter/drier summers, significantly impacting pasture productivity. Wet soils in spring may delay planting of long season annuals like corn while changes in summer conditions may intensify the summer slump of pastures. Grazing in New England is also limited in late fall. To avoid over-grazing, livestock producers heavily rely on labor-intensive and more expensive stored hay and/or purchased feed. These approaches can strain farm finances since livestock producers and dairy farmers operate on thin profit margins. Not surprisingly, we have found that producers throughout the region are highly interested in expanding the grazing season and other risk mitigating strategies.

This project will investigate several novel extended grazing systems to increase forage inventory, farm profits, and climate adaptability. These strategies will provide research and education to help livestock farmers confidently increase yield, produce high-quality forage, and replace stored feeds.

Our hypothesis is that the grazing season in New England can be extended/enhanced to increase forage inventory, reduced feed cost, and improved resilience to climate change conditions. This comprehensive project will build on our preliminary research to evaluate and assess practices that extend and enhance the grazing season and improve forage yield and quality. We will work to develop and fine-tune the following management practices:

- 1) Stockpiling: Investigating species composition and fertility management to provide high yielding/quality forage for late fall grazing.

- 2) No-till seedings into pastures: determine seeding rate, and nitrogen rates for

supplementing existing pastures with winter rye or triticale to improve yield and quality of grazing in late fall and following spring.

3) Cool-season annuals – determine best combinations of brassicas, grasses, and other forbs to extend grazing into the fall while minimizing the impact of secondary compounds on livestock health.

4) Warm-season annuals – identify best combinations that maximize yield and nutrient efficiency during the summer slump.

This project will implement a variety of educational methods to deliver comprehensive, practical information to Northeast dairy and livestock operators. We will conduct replicated experiments at university research stations in MA, VT, and ME and work with regional farmers to install on-farm demonstrations. The results will be shared at annual meetings and field days. New adopters will be able to ask questions to collaborating farmers and researchers in person and remotely. Field days will be held at university research farms to display and transfer research results to the agricultural community. On-farm trials will compliment research trials and will integrate any farmer-specific treatments that arise. Lastly, development of online educational articles and videos will assist with distribution to the broader agricultural community.

We will verify the performance target by surveying farmers about grazing practices at in-person meetings and over our list serves.

Performance Target:

Forty dairy and livestock producers in New England will implement a new practice or strategy to extend the grazing season, resulting in dry matter forage yield increases of one ton per acre and improvements in relative feed value (RFV) compared to stored dry hay on at least 2000 acres.

Introduction:

In 2020, we began research activities on Stockpile, Small Grains into Pasture, and Fall Brassica experiments. We also produced educational content to inform regional farmers about our research projects, innovative grazing methods, and the importance of extending the grazing season. Despite the coronavirus pandemic we were able to begin establishing relationships with collaborating farmers.

Research

Hypothesis:

Our hypothesis is that the grazing season in New England can be extended to increase forage inventory and reduce feed costs in changing climate conditions. This comprehensive project will evaluate and assess the following strategies of extending grazing season:

1) Stockpiling and its fertility management to improve forage yield and quality in late fall.

- 2) No-till winter rye planted into existing pasture for grazing in late fall and following spring.
- 3) Late fall grazing of brassicas and other cold-hardy forbs planted in late summer.
- 4) Growing warm-season grasses and forbs to compensate for reduced forage availability during summer slump.

Materials and methods:

This project will consist of four experiments focusing on crops, which can be grown during either the hot dry summer or cool fall and spring when traditional grazing systems are relatively unproductive. All proposed grazing strategies will be evaluated independently for management flexibility and per-acre income in order to allow farmers to choose the strategy or strategies that fit their farm. The effect of these strategies on general soil health and nutrient cycling will also be measured.

Current Preliminary Research

In response to interest from regional livestock producers two preliminary research on stockpile and brassicas species were conducted in 2018 and repeated in 2019 in MA. Several studies on forage brassicas and summer forage annuals from 2017-2019 also have been conducted in VT. In MA stockpile trial, tall fescue and orchardgrass plots were mixed with no legume, alfalfa, and red clover. In second year (2019), some grass-only plots were fertilized with urea in either early or late August. Biomass production will be determined in late fall/early winter 2019 to observe changes in treatment performance during pasture establishment and in preparation for future season stockpile analysis in terms of forage quality and yield.

In MA, a wide spectrum of fall brassicas and other forbs were planted in Mid-September 2019 to test for initial suitability as fall grazing forages. This preliminary trial is mainly focused on assessing weed suppression, recommended seeding rates, growth habit, cold tolerance, and yield. This initial experiment will allow us to fine-tune the species and variety selection for trials in the fall of 2020 and 2021.

2020 overview: The COVID-19 pandemic caused many delays in our research plan. Research activities in all three states (MA, ME, VT) were significantly disrupted by research station closures and social distancing. The summer annual experiment was delayed until 2021 at all locations and the small grains into pastures experiment was postponed in Maine and Vermont.

Despite logistical complexities, much of our research was completed as planned. Stockpile experiment pastures were established in Vermont and Massachusetts, small grains were planted into pastures in Massachusetts, and the fall brassica experiment was planted in Vermont and Massachusetts. Unfortunately, dry weather in Massachusetts hampered brassica emergence and the Massachusetts location harvest was not used in 2020. The brassica experiment in Vermont was harvested as planned.

Experimental Concepts and Design

1) Established pastures comprised of tall fescue and orchardgrass as monocrops and mixed, will be evaluated for yield and quality. To improve the quality of stockpile grasses and possibly reduce nitrogen application, we will integrate red clover and alfalfa along with no supplemental nitrogen, or application of nitrogen in either early August or late August. No nitrogen plots will be used as control. We will simulate grazing by harvesting forages in late October. Forage yield and quality indices will be measured. The plots will be arranged in a randomized complete block design (RCBD) with 13 treatments and four replications. Plots will be 10' x 25'. (MA, VT)

Stockpile Experiment 2020

Pasture plots as described above were planted in Massachusetts and Vermont.

In Vermont, on 29-Apr plots were planted with perennial forage species mixtures in a complete randomized block design with five replicates. Plots were 5' x 20' and consisted of tall fescue and orchardgrass planted alone and mixed with alfalfa and red clover. During the growing season, the plots were mowed to control weeds and support establishment of the desired species, however, no data were collected during this establishment phase. In the fall of 2021, additional N fertility treatments will be imposed on the plots. Data including yield and quality will be collected in 2021. The varieties used were KF Enhancer II alfalfa, Kora fescue, Juliet red clover, and Echelon orchardgrass.

Vermont Stockpiling Experiment Seeding Vermont Stockpiling randomization

In Massachusetts, on 10/29/20 plots were planted with perennial forage species mixtures in a complete randomized block design with four replicates. Plots were 6' x 25' and consisted of tall fescue and orchardgrass planted alone and mixed with alfalfa and red clover. Data collection will begin in 2021. Planting was done with a Brillion cone seeder. Layout and seeding rates are attached. The varieties used were Foregrazer alfalfa, Barolex fescue, Marathon red clover, and Echelon orchardgrass.

MA 2020 stockpile seeding rates and layout

2) Winter rye will be no-till drilled into established pastures in August. The winter rye will be harvested in late October and early spring and evaluated for yield and quality. Management treatments will include seeding date, fertility management, and harvest date. The experiment will be set up as a RCBD with four replications of 20 treatments. Plots will be 6' x 15'. Annual winter rye will be planted at four times (no rye (control), Early August, Late August, and Early September) at the rate of 120 lbs/ac, combined with three nitrogen fertilizer rates (0, 50, and 100 lbs N/acre). Each plot will be split into two harvesting times, one in late October/early November and the other in spring (April). In ME and VT, collaborating farmers will establish at least one to two treatments of their choice and they will evaluate production. In MA and VT, small plot trials with all treatments will be established at research farms. (MA, ME, VT)

Small grains into pastures 2020

In Massachusetts, on 9/25/20 plots were planted with 50/50 mix of Aroostook rye and Fridge triticale at 0, 60, 120 pounds per acre into established pastures. On 9/27, half of the plots received 40 pounds per acre nitrogen in the form of bloodmeal while the others received no nitrogen. 6' x 25' plots were arranged in a randomized complete block design with four replications. Planting was done with a Great Plains no-till seeder. Harvest for yield and forage quality will be collected in the spring of

2021. *Layout is attached.*

[small grains into pasture 2020 layout](#)

This experiment was postponed until 2021 in Maine and Vermont due to coronavirus logistical difficulties and dry weather.

3) Fall brassicas and other cool-season forbs such as chard, forage beets will be planted as monoculture and mixed with grasses in August for late fall harvest. They will be evaluated for yield and quality. Particular attention will be paid to glucosinolate content in brassica forages and their usefulness in lactating animals as well as management concerns such as weed growth and frost tolerance. The plots will be arranged as a randomized complete block design with four replications. Plots are 4' x 10' and forage species will be planted on late August. Brassicas and the mixed forage will be harvested and evaluated for their yield, quality and glucosinolate assessment in late October or early November, depending on weather conditions (MA, VT).

Fall Brassicas 2020

In Vermont, on 20-Aug plots were planted with six forage brassica varieties planted alone and in combination with an oat/pea mixture at three additional rates. Plots were harvested on 15-Oct with a Carter plot forage harvester equipped with scales. Yields were recorded and an approximate 1 lb. subsample collected and dried for dry matter content determination. The dried samples will be ground to 1mm particle size and analyzed for forage quality using NIR procedures at the UVM Cereal Grain Testing Laboratory (Burlington, Vermont). In addition, root and shoot biomass from three plants in each of the six brassica-only treatment plots in three of the replicates were collected, dried, and sent to UMass for nutrient and glucosinolate content analyses. This experiment will be repeated at this location in 2021. The varieties used were Everleaf oats, 4010 peas, and Appin, Barkant, Barsica, T-Raptor, Pacific Gold, and Ground Hog brassicas. Layout is attached.

[Vermont 2020 SARE Cool Season Annuals Map](#)

In Massachusetts, fall brassica experiment was planted on 8/21/20 but brassica emergence was so poor that the experiment was not harvested. This was likely due to very dry weather. The experiment will be redone in 2021. Layout and seeding rates are attached.

[MA Brassica Layout 2020](#)

4) Mixed summer annuals, including grasses, legumes, and forbs will be grown to compensate the summer slump. The forage crops will be grown as mixes of differing levels of diversity from monocrop to many species mixtures. Forage composition will be tracked at first and second harvest to assess the rate of growth and species' response to grazing and other management practices. Harvested forage will be evaluated for yield and quality. The experiment will be laid out as RCBD with plots 4' x 20' (MA, VT, ME).

Summer Annuals 2020

This experiment was postponed in all locations until 2021 due to research station closures from COVID-19 pandemic.

Forage Analysis

Harvested forage in all four experiments will be evaluated for NDF (Neutral Detergent Fiber), ADF (Acid Detergent Fiber), crude protein, mineral nutrients, energy content, and RFV (Relative Feed Value) at PI lab in MA and/or an independent laboratory. High-pressure liquid chromatography (HPLC) will be used to measure glucosinolates in brassica forages.

Forage Analysis 2020

Lab work has not been completed on any samples.

Participation Summary

Education

Educational approach:

In person field days and meeting were not possible in 2020 due to COVID-19. Instead over 2020, a series of 6 monthly [webinars](#) was produced by all three states to educate regional farmers about a variety of techniques for extending the grazing season. This series covered all of our research topics as well as several other grazing extension strategies. The webinars were delivered live and are now hosted on YouTube as well as university websites. 315 people attended the webinars live and 250 views on YouTube. Vermont held a virtual field day on 7-Aug in which research results and information related to perennial and annual forage production were shared with 40 attendees. A [presentation of research results](#) was recorded and posted to YouTube. Since the live event the recording has been accessed 75 times. Additionally, Massachusetts communicated with our 1,070 [Crop Dairy Livestock and Equine newsletter](#) subscribers about grazing extension and the research project.

Milestones

Milestone #1

What beneficiaries do and learn:

320 livestock producers across six New England states learn about grazing extension strategies at spring meetings and receive a survey to determine current practices and constraints.

Proposed number of farmer beneficiaries who will participate:

320

Actual number of farmer beneficiaries who participated:

565

Proposed Completion Date:

May 31, 2020

Status:

Completed

Date Completed:
September 18, 2020

Accomplishments:

Spring field days were not possible due to the COVID-19 pandemic and instead the three participating states jointly produced a series of six, monthly [webinars](#) on extending the grazing season. These webinars were viewed by 565 people in 2020 and continue to be available online. The survey that we had planned to distribute at spring meetings in 2020 was delayed and will be distributed in the spring of 2021 either at spring meetings, if these are possible or through our state email lists.

Milestone #2

What beneficiaries do and learn:

250 farmers return the survey; 200 farmers provide contact information for further involvement in the project. 6 farmers, two in each state, plant at least one on-farm demonstration in collaboration with the project team.

Proposed number of farmer beneficiaries who will participate:
250

Proposed Completion Date:
August 31, 2020

Status:
In Progress

Accomplishments:

Our planned survey was delayed for a year due to the COVID-19 pandemic.

Milestone #3

What beneficiaries do and learn:

180 farmers attend at least one field day that explains the project performance target, the known benefits of extended grazing, ongoing research in strategies for extending grazing into the summer slump, and on-farm trials.

Proposed number of farmer beneficiaries who will participate:
180

Actual number of farmer beneficiaries who participated:
115

Proposed Completion Date:
November 30, 2020

Status:
In Progress

Accomplishments:

Our planned field days in 2020 were cancelled due to the pandemic. Vermont held a [virtual field day](#) on August seventh which included information about this research and has been viewed 115 times. Other field days were rescheduled for 2021 to coincide with the delayed research activities. If in-person field days are not possible in 2021, these will also be virtual field days.

Milestone #4

What beneficiaries do and learn:

200 farmers attend a spring workshop or field day in each of three states and learn about post-frost and early spring grazing extension, species selection, forage quality, and management timing. Preliminary results from research trials will be delivered to farmers and collaborators.

Proposed number of farmer beneficiaries who will participate:

300

Proposed Completion Date:

October 31, 2021

Status:

In Progress

Milestone #5

What beneficiaries do and learn:

6 farmers, two in each state, plant at least one on-farm demonstration in collaboration with project team.

Proposed number of farmer beneficiaries who will participate:

6

Proposed Completion Date:

September 1, 2021

Status:

In Progress

Milestone #6

What beneficiaries do and learn:

50 farmers consult about grazing extension including information on species selection, fertility management, management schedule, and type of livestock with project team by phone and email.

Proposed number of farmer beneficiaries who will participate:

50

Proposed Completion Date:

March 31, 2023

Status:

In Progress

Milestone #7

What beneficiaries do and learn:

Extension articles and videos will be produced and distributed online and at the field days and training workshops.

Proposed number of farmer beneficiaries who will participate:

900

Actual number of farmer beneficiaries who participated:

1750

Proposed Completion Date:

March 31, 2023

Status:

In Progress

Accomplishments:

An [extension article](#) on extended grazing was produced for the UMass Crop Dairy Livestock and Equine program discussing grazing extension strategies and their purpose in the Northeast. Our [webinar series](#) and UVM's [virtual field day](#) videos are available online on university websites and YouTube.

Milestone #8

What beneficiaries do and learn:

40 farmers will document acres used for grazing season extension, forage yield, and stocking rate by completing and submitting verification information to project staff.

Proposed number of farmer beneficiaries who will participate:

40

Proposed Completion Date:

March 31, 2023

Status:

In Progress

Milestone #9

What beneficiaries do and learn:

2500 livestock producers in six states of New England and upstate New York learn about grazing extension strategies through direct mailings.

Proposed number of farmer beneficiaries who will participate:

2500

Actual number of farmer beneficiaries who participated:

1070

Proposed Completion Date:

April 30, 2023

Status:

In Progress

Accomplishments:

The [extension article](#) for UMass CDLE extension was mailed to 1070 subscribers.

Performance Target Outcomes

TARGET #1

Target: number of farmers:

40

Target: change/adoption:

Forty dairy and livestock operations in New England will implement one or more proposed strategies to extending grazing season on at least 2000 acres. This will increase and diversify forage inventory during summer slump, late fall/early winter, and early spring on their farms.

Target: amount of production affected:

2000 acres.

Target: quantified benefit(s):

These strategies will allow farmers to grow an additional \$500,000 of forages annually (2,000 acres x \$250/acre) while enhancing environmental sustainability and resiliency. Assessed through survey.

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 or SARE.



Sustainable Agriculture
Research & Education [US Department of Agriculture](#)



This site is maintained by SARE Outreach for the SARE program and is based upon work supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award No. 2019-38640-29881. SARE Outreach operates under cooperative agreements with the University of Maryland to develop and disseminate information about sustainable agriculture. [USDA is an equal opportunity provider and employer.](#)

© 2022 Sustainable Agriculture Research & Education