



# UMass Extension

## Crops, Dairy, Livestock & Equine Newsletter

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Editor,

Masoud Hashemi

## 2018 Massachusetts Outstanding Dairy Farm



*Left to Right: Heather Bednarz, Will Rogers, Frank Chaffee, Wendy Rogers*

The Crops, Dairy, Livestock, and Equine team would like to congratulate **Roger's Farm**, located in Warren, MA, for receiving the 2018 Outstanding Dairy Farm Award.

*For more information about the Outstanding Dairy Farm Award, please see page 2.*

*Outstanding Dairy Farm Award, cont'd from page 1.*

*Want to nominate your dairy farm  
or a dairy farm you know?*

The following criteria must be met to qualify for the award:

- Farm must be operated by a full-time farmer
- Farm must have a quality dairy herd in relation to milk production, breeding, and animal health
- Farm must be run efficiently
- Farm must have a well established, balanced forage and feeding program
- Farm must operate in an economically sound way
- Farm must exhibit leadership and contribution to the immediate and extended community
- Farm must exhibit acts of environmental improvement through management or appearance

For more information, or to nominate a dairy farm for the award, contact:

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(413) 545-1843

***Self nomination is welcome.***

For a list of past winners and more information about the history of the award, please visit:

<https://ag.umass.edu/crops-dairy-livestock-equine/massachusetts-outstanding-dairy-farm-of-year/green-pastures-awards>

University of Massachusetts

Risk Management Education



**Pasture, Rangeland and Forage Insurance**

**Sales Closing Date: 11/15/2018**

A new crop insurance policy can provide livestock and hay producers with protection against drought. The [Pasture, Rangeland and Forage](#) is a single peril policy that is designed to provide protection based on rainfall near your farm in two month periods. The grower can insure up to 100% of his pasture and hay acres at a productivity factor from 60% to 150% of the county base value. This production will be distributed in 2 month intervals as determined by the grower. If precipitation falls below the selected trigger level in a 2-month period, your crop insurance company will issue an indemnity payment based on the % of production selected for that period. The grower **does not** have to keep records, report production, losses etc. The Rainfall Index uses NOAA data for a 17 X 17-mile grid that encompasses your farm. You can review the performance of this program at this website <http://maps.agforceusa.com/prf/ri/>

**Pasture, Rangeland & Forage performance**

**in 2016, 2017 & 2018**

Year	Policies Sold	Unites Insured	Acres Covered	Grower Premiums	Indemnities
2016	5	24	306	\$7,082	\$26,926
2017	14	48	1,458	\$30,666	\$39,694
2018	18	61	2,046	\$38,356	\$5,092

Crop insurance is sold and delivered through private crop insurance agents. A list of crop insurance agents is available at all USDA Service Centers or on the RMA website at:

<https://prodwebnlb.rma.usda.gov/apps/AgentLocator/#/>

UMass Extension works in partnership with the USDA Risk Management Agency (RMA) to educate Massachusetts producers about Federal Crop Insurance and Risk Management Programs.

For more information, please visit [www.rma.usda.gov](http://www.rma.usda.gov) or contact UMass Risk Management Specialists

Paul Russell at [pmrrussell@umext.umass.edu](mailto:pmrrussell@umext.umass.edu) or

Tom Smiarowski at [tsmiarowski@umext.umass.edu](mailto:tsmiarowski@umext.umass.edu)

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## Liming Pastures and Hay Fields to Improve Their Productivity and Quality

Masoud Hashemi (UMass), Richard Kersbergen (UMaine), Samantha Glaze-Corcoran (UMass)

Healthy and fertile soil is fundamental to the productivity and nutritional value of pastures and hay forage. Most plant nutrients are available to plants when the soil pH is in the range of 6 - 7. However, the soils in most regions of New England are naturally acidic and prone to low pH levels. Therefore, periodically liming the soil is necessary to bring the pH up to the optimum range (photo 1).

Liming influences the availability all nutrients in the soil, both macro and micro, and thus increases their uptake by forage plants. Research has shown that liming improves soil biological processes, such as in nitrogen cycling, which then increases nitrogen availability for plant uptake. Specifically of concern in forage crops, liming can increase phosphorus availability and reduce the uptake of toxic heavy metals. In addition, frequent lime applications to pastures and hayfields tends to improve forage yield and quality, which has important implications for livestock-based production systems (Photo 2). The health of livestock, including horses, largely depends on the nutritional value they receive from forage, which in turn depends on the nutrient availability in soils. When soil is deficient in a specific nutrient, the nutrient deficiency will be reflected in the animal's health. Liming also adds substantial quantities of both calcium and carbonate, which influence the biological availability and utilization of magnesium, potassium, and phosphorous in soils. Testing soil is the best way to determine the fertility status of pastures and hayfields.



**Photo 1: Hayfield with low pH. Notice the predominance of non-desirable grasses and weeds.**  
(Photo credit: Tim. Griffin, Tufts University)



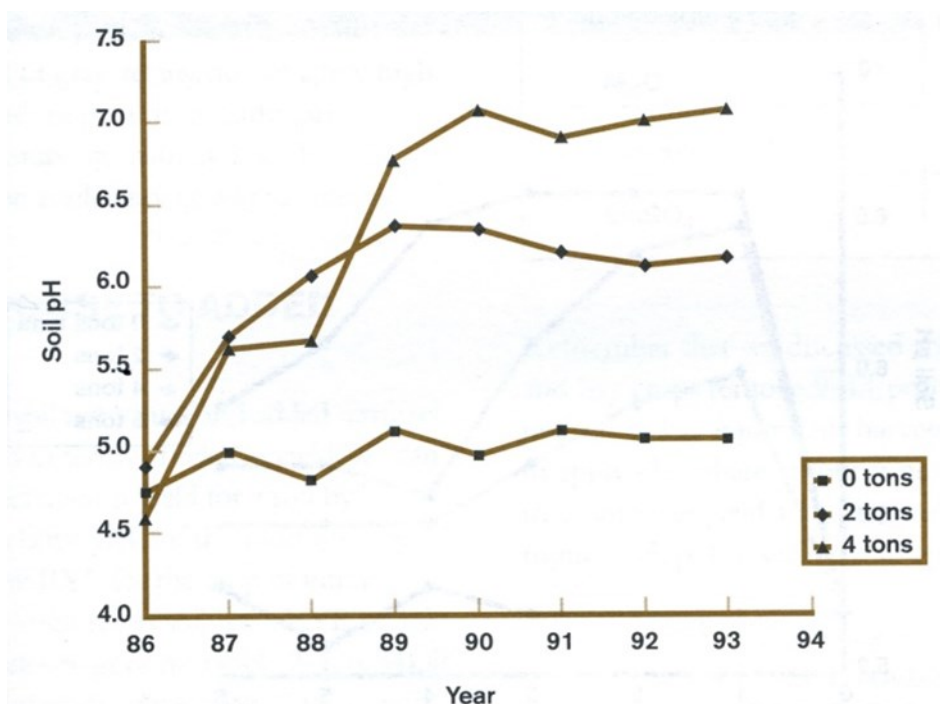
**Figure 3:** *When lime was surface-applied, the change in soil pH was relatively slow in the top 2 inches of the soil, but the change was relatively long lasting. Two tons of lime applied in 1986 to the 2- and 4-ton treatments. An additional 2 tons applied to the 4-ton treatment in 1988. From Forage Pro-*

**Time of lime application:** In general, lime can be applied at any time. However, lime moves down through the soil profile slowly, and it may take as long as a year before a response can be observed. Figure 3 shows how slowly surface applied lime to hayfields (where the soil cannot be disturbed) influences the soil pH.

Therefore, choosing to apply lime in the fall may provide enough time for lime materials to react with soil before the following spring crop growth. The effectiveness of lime will also depend on the type of soil to which it is applied. In lighter soils, such as sandy soils or soils low in organic matter, with cation exchange capacities (CEC, found on your soil report from a soil test lab) in the range of 9 to 12, lime materials act faster than in darker productive soils. It is wise to apply lime to pastures when rainfall is expected in the next 24-48 hours; this allows the lime materials to be washed off the leaves of the pasture plants so that it will not harm the grazing animals or affect palatability.

**Types of lime:** There are two major types of lime, known as calcitic lime and dolomitic lime. Calcitic lime is calcium based, whereas dolomitic lime is magnesium based but also contains calcium. When soil test results indicate that there is not enough magnesium in the soil, applying dolomitic lime is recommended. This is specifically important in fields with a history of grass tetany, which is caused by magnesium deficiency in forage. Dolomitic lime is recommended in pastures that have a history of grass tetany to raise forage magnesium levels.

Lime materials are available as coarse textured, fine textured, or pelletized. In general, the finer the texture the lime material is, the faster it will react with the soil particles. Pelletized lime is a more convenient form of lime that can be spread more accurately and evenly using conventional fertilizer-spreading equipment.



**Figure 3:** When lime was surface-applied, the change in soil pH was relatively slow in the top 2 inches of the soil, but the change was relatively long lasting. Two tons of lime applied in 1986 to the 2- and 4-ton treatments. An additional 2 tons applied to the 4-ton treatment in 1988. From *Forage Production for Pasture-Based Livestock Production, NRAES-172*, edited by Edward B. Rayburn, and published by NRAES (2006).

**Amount of application:** Like other fertilizers, the amount of lime required to adjust soil pH will be determined based on the soil test result. The lower the soil pH, the more lime you will need to apply to bring the pH into the optimum range. Soil texture and the organic matter content of the soils will also influence the amount of lime required. With the same pH, sandy soils require less lime than clay soils. Likewise, soils high in organic matter require more lime to adjust the acidity than soils low in organic matter. Remember that pH values and application rates are not linear. In other words, a pH of 5.0 is 10 times more acidic than a pH of 6.0, and a pH of 5.0 is 100 times more acidic than a neutral pH of 7.0.

It is not unusual that soil testing labs recommend an application of 7-8 thousand pounds of lime per acre. These recommendations can call for even more lime when pastures and hayfields have never been limed thus the soil acidity is in the 5.0-5.5 range. Applying more than 4,000 pounds (two tons) per acre in a single application, however, is not recommended. This is because the soil can only react to a certain amount of lime material at one time. When recommendations call for large amounts of lime, it is also recommended that the required amount of lime be split in 2-3 applications with a 3-4 month gap between the applications.

Other liming materials are available to help raise soil pH. One of the more heavily used materials is wood ash from biomass boilers. Wood ash contains potassium carbonate, and can be 50-60% equivalent to the liming potential of calcium carbonate. However, be aware that some of the available wood ash materials may or may not be approved for use on organic farms. You should always check with your certifier before using any of these products on your fields.

## More Bang for Your Buck: Cover Crops can be Forage, Too

Sam Corcoran and Masoud Hashemi

*Overwintering cover crops peak through the snow in March.*



By this time of year, the fall fields are all but tucked in. Hopefully, they were sent to bed with a nice cover crop blanket. Planting cover crops on time in the fall protects the soil and captures the nutrients from fall applied manure as well as lingering nutrients in residual fertilizer. Fall nutrient capture is particularly critical for nitrogen and phosphorous, two environmentally-important nutrients. Improving fall nutrient capture in turn improves the on farm nutrient balance and reduces environmental risks. Beyond the environmental benefits, cover crops can offer an economic advantage, too. While it is getting too late for grazing fall cover crops, the overwintering rye, wheat, or triticale cover crops can be your first harvest of the spring.

Cover crops are traditionally planted for their ecosystem services: erosion prevention, weed suppression, nutrient capture, carbon sequestration, etc. By contrast, dual-purpose cover crops are planted with the intention of harvesting them or allowing them to be grazed by animals, rather than being incorporated back into the soil.

There are three primary advantages to this strategy:

- 1) Extra feed:** Dual-purpose cover crops can extend the grazing season in the fall or jump start the spring season. For example, fall oats and forage radish make an excellent grazing crop in the fall with no spring cleanup. Overwintering small winter grains can be ensiled or harvested for baling in the spring; alternatively, they also make for great spring grazing and animals can be used to aid in crop termination.
- 2) Nutrient remediation:** In high nutrient fields – particularly fields with long histories of manure application that display excessive levels of phosphorous. Traditional cover cropping captures and holds nutrients in the cover crop, and then returns the nutrients at incorporation. However, animal production systems typically put more nutrients from manure into the fields than what crops can take up, so the captured nutrients, *especially* the phosphorous, do not need to be returned to the soil in the cover crop. Dual-purpose cover crops instead remove excess nutrients from the field and remediate high levels. This is especially important for dairies dependent on corn silage. Harvesting cover crops from those high nutrient fields can be integrated into your overall nutrient management plan and improve on-farm nutrient balances.
- 3) Resiliency:** Fall and spring cover crops create two additional opportunities to produce forage outside of the primary growing season. If summer yields are poor, fall cover crops can compensate. If stored feed seems like it will not last, then spring harvested cover crops can fill in the gap. In both cases, off-farm feed purchases can be reduced and on-farm resiliency to environmental effects and economic fluctuations is increased.

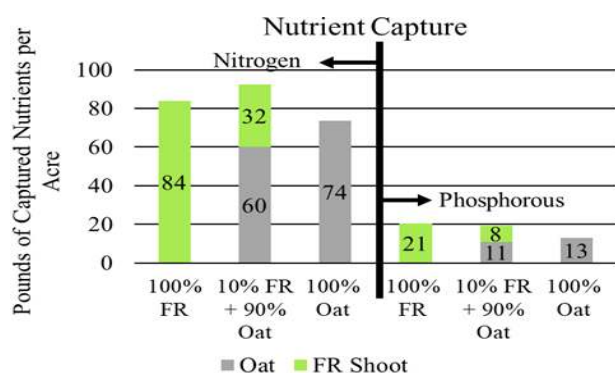
For the past four years we have been studying forage radish and oat mixtures for fall grazing, as well as pure stands of rye, wheat, or triticale for spring harvest. These crops have been studied at the UMass research farm, at the UVM research farm, and on-farm with local dairy and beef producers. Read on in this issue to learn more about using this strategy on your own farm.

## Grazing Season Extension with Fall Forage Radish and Oats

Sam Corcoran and Masoud Hashemi

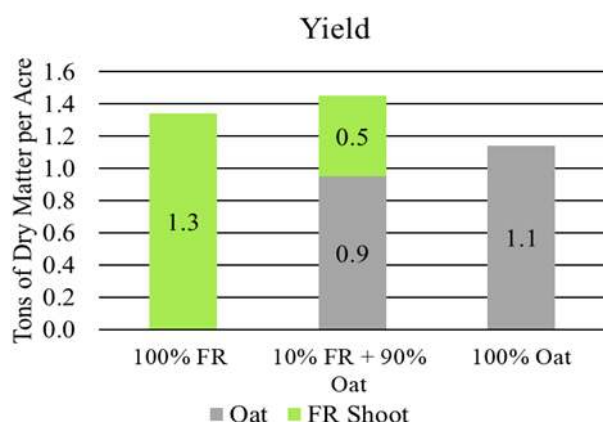
Forage/tillage radish, (*Raphanus longipinnatus*) and oats (*Avena sativa*) should be planted from mid-August to the second week of September in order to be used for fall grazing. At 60 days after planting, the dual-purpose cover crops have captured nutrients from the soil (**figure one**) and are ready for grazing or feeding as a green chop (**figure two**). Mixed oat and FR will yield more and capture more nutrients on a piece of land than a monoculture of either crop.

The plants will tolerate a few mild frosts before they winterkill. Plan to graze or chop at 60 days or before the first frost. Plants can continue to be grazed after a mild frost. Due to the short growing season, plants will stay lush and sweet.



**Figure one (above):** Nitrogen and phosphorous captured in the above ground plant parts of FR and oat in a mixture that was seeded at 90% oat and 10% FR.

**Figure two (below):** Yield in a 10 FR/90 Oat mixture; about 1/3 of the dry weight comes from FR, while the rest comes from oat.



With any crop mixture, the first consideration is balancing the seeding ratio to achieve the desired characteristics of the final, composite crop. In our study, we compared forage radish and oat mixtures that were adjusted based on a 110 lbs. A<sup>-1</sup> seeding rate for oat (100% oat) and 8 lbs. A<sup>-1</sup> seeding rate for forage radish (100% FR). We used a replacement method to create four mixtures (**table one**).

For use as a dual-purpose cover crop, seed oat at 100 lbs. A<sup>-1</sup> (90%) and about 1 lb. FR A<sup>-1</sup> (10%). This will result in a final crop that is 35% FR and 65% oat by dry weight, that contains 17% crude protein (CP), and is mild in palatability. On average, seeds cost \$85/A and produce 1.4 tons (dry weight); in other words, it costs \$30 per 1000 lbs. of forage.

Animals may have an adjustment period as they acclimate to the FR “flavor”, which comes from a compound made by the plant called glucosinolates. This is the same compound responsible for the spiciness of mustard and the effects of biofumigation. However, the daikon-style tillage/forage radish greens are far milder than most radish and brassica relatives. This mixture is particularly suitable for beef cattle, dry cows, sheep, and goats; even chickens can be brought into the mix.

After grazing or green chop, the FR and oats will leave minimal residue and require no spring cleanup. However, even after harvest, their roots will continue to hold the soil in place, and decaying roots and crop residue will feed the soil microbes and build soil organic matter. The best part is, the FR taproot left behind will still provide their trademark compaction alleviation and gentle soil aeration.

<i>Seed Mix</i>	<i>FR Seeds (lbs. A<sup>-1</sup>)</i>	<i>Oat Seeds (lbs. A<sup>-1</sup>)</i>
<i>100% FR</i>	8	0
<i>40 FR/60 Oat</i>	3.2	66
<i>30 FR/70 Oat</i>	2.4	77
<i>20 FR/80 Oat</i>	1.6	88
<i>10 FR/90 Oat</i>	0.8	99
<i>100% Oat</i>	0	110

**Table One:** Seeding ratios tested in 2015, 2016, and 2017 at the UMass Agronomy Research Farm in South Deerfield, MA.

If adjusting the seeding ratio, it is best to reduce the amount of forage radish relative to oat, rather than to increase it. Increasing forage radish in the feed ration can result in decreased palatability, dry matter intake, and thus animal performance. It is also important to note that the yield does not respond proportionally to changes in the seeding ratio. For example, bumping the FR seeding in the mix have little to no effect on the crop composition (**figure three**), but it did affect the ability of the mixture to capture nutrients (**figure two**).

**Figure three:** Proportion of the harvested dry matter that comes from forage radish or from oat, based on seeding ratio.



This research in this project was generously supported by Northeast SARE. To read the full project report, please visit <https://projects.sare.org/search-projects/> and search project number GNE15-102.

## Enhancing sustainability and resiliency of apple orchards in New England through cover cropping

*Hoveizeh Karimi, Wes Autio*



*Fig. 1. Forage radish fleshy root*

Poor soil health, which includes low soil organic matter, soil compaction and waterlogging in driveways is a common problem among apple orchards in New England. Eliminating weeds within tree rows by using herbicides and mowing perennial native vegetation in driveways are the most common orchard floor management practices in this region. Although native vegetation partially prevents soil erosion in driveways, cover cropping is being considered as a powerful conservation tool for natural soil fertility enhancement, improvement of water infiltration capacity, increasing soil organic matter, and, accordingly, microbial population and activity.

Forage radish, a fall brassica cover crop, has a large taproot that breaks layers of compaction and increases soil pore spaces by penetrating to a depth of one to two feet. The fleshy root of forage radish creates channels, which help remove surplus water in the spring. In addition, the decomposition of forage radish residues releases nitrogen. This cover crop is killed by hard frost. As a result, competition for water and nutrients between cover crops and trees is avoided in the spring, as is the need for herbicide or mechanical termination.

Few studies have been conducted to evaluate forage radish cover crops in orchard systems, and this research aims to assess the feasibility and effectiveness of using different forage radish cover crop mixes as pre/post plant groundcovers in establishing new apple orchards.

This experiment has been conducted at the University of Massachusetts Cold Spring Orchard Research & Education Center in Belchertown. Cover crop treatments include forage radish (FR), crimson clover and forage radish (FR+CC), mixture of oat, crimson clover, and forage radish (FR+O+CC), and no cover crop as the control. Cover crops were planted August 2016, one year before orchard establishment, as a pre-plant treatment, and the following fall as a groundcover between apple tree rows in the given plots.



*Figure 1. Cover crops are planted between apple tree rows in late summer and are killed over the winter.  
Fall 2017(left), winter 2017(center), spring 2018(right)*

Results indicated that soil mechanical resistance decreased after cover cropping in spring. FR and FR+O+CC mixture showed the lowest compaction in spring 2017 and 2018 respectively, whereas the highest soil compaction was observed in control every year.

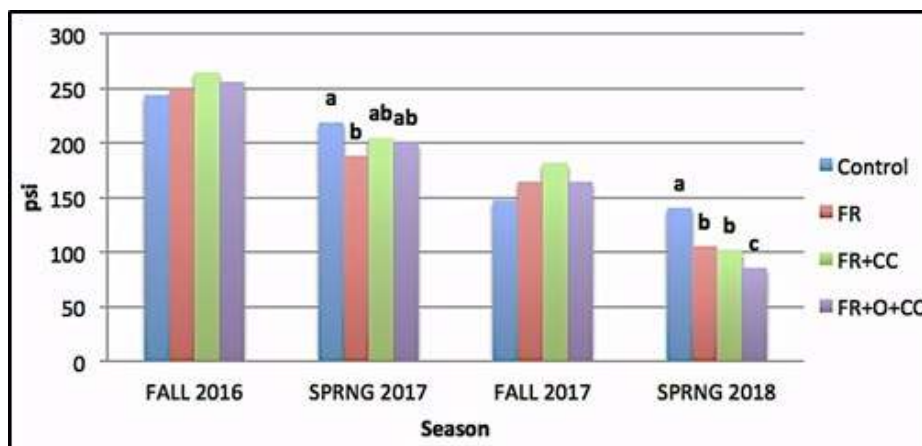


Figure 2. Soil mechanical resistance changes at a depth of 6 inches

Soil bulk density was significantly lower in cover crop treatments than the control. Also, moisture content in top 6" layer of soil was higher in all forage radish treatments in comparison with the control. These results showed that utilizing cover crops may improve soil porosity and moisture content due to alleviating soil compaction.

Table 1. Soil bulk density and gravimetric soil moisture (Fall 2017)

Treatment	Bulk Density (g/cm <sup>3</sup> )	Moisture Content (%)
Control	1.40 a	19.2 b
FR	1.34 b	21.2 ab
FR+CC	1.34 b	21.7 a
FR+O+CC	1.35 b	23.0 a

This project is still in progress, and obtaining further results such as impacts of cover cropping on apple tree growth requires the experiment to be repeated.