FY 2018 Northeast Pasture Consortium Conference Proceedings

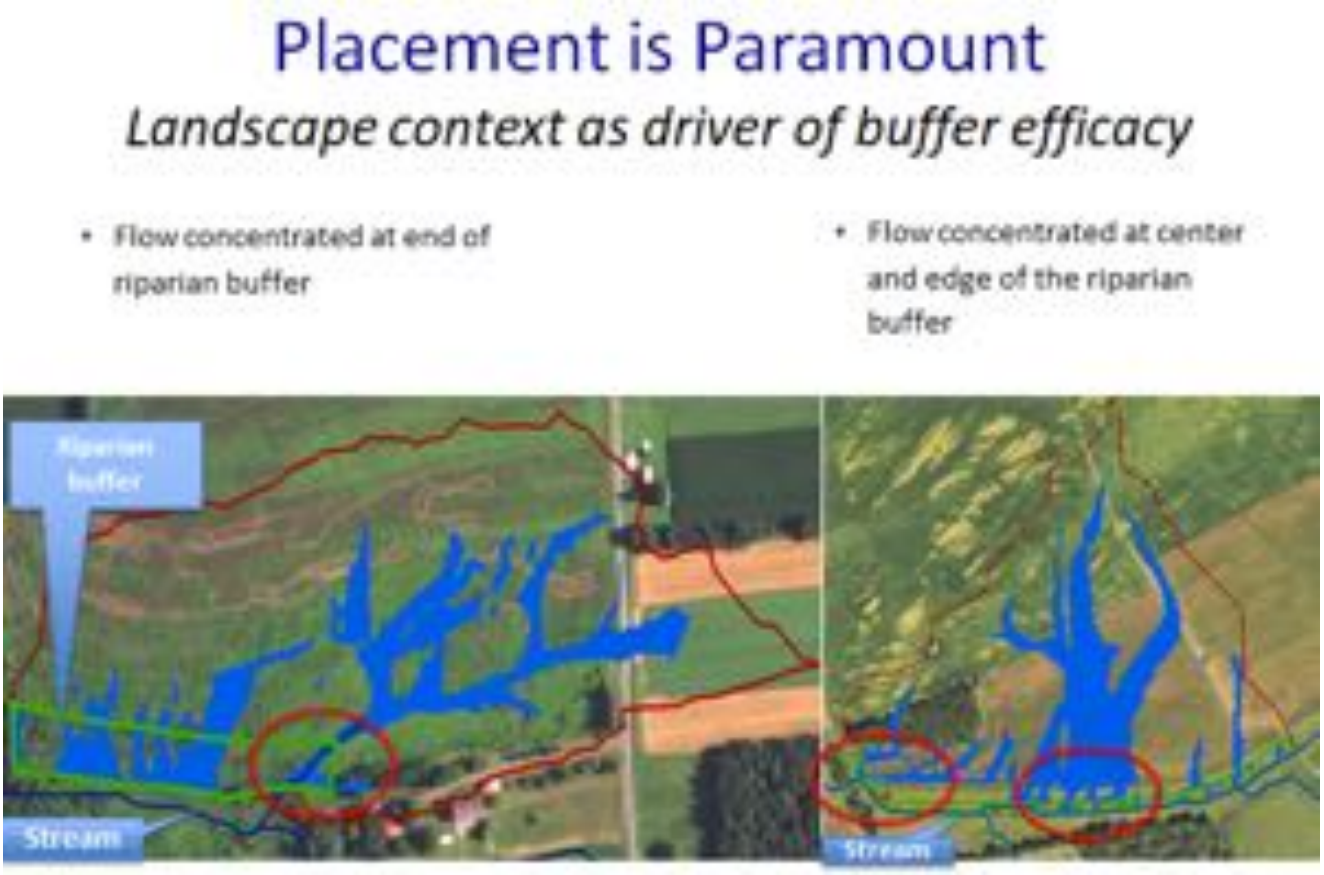
Sixty-three people attended and participated in the Northeast Pasture Consortium (NEPC) Conference held at The Century House in Latham, New York on January 25 and 26. We had a scare earlier in the week of the Conference as the federal government closed its doors on Monday. However, by Monday evening another continuing resolution was passed by Congress and signed by the President. Executive Director, James Cropper, quickly later that evening emailed the Chief of the Natural Resources Conservation Service (NRCS) and the Administrator of Agricultural Research Service (ARS) to request that they reinstate travel for their employees who had already registered and made reservations to be at our Conference. They promptly did reinstate their employees' travel. Our Conference covered many of the research and education priorities that our stakeholders have asked us to work on. Nine continuing education units were approved for Certified Crop Advisers and Certified Forage and Grassland Professionals by ASA-CSSA-SSSA and the American Forage and Grassland Council, respectively.

Session 1 - Riparian Area Management in Pastures

Our first technical session on January 25 was on *Riparian Area Management in Pastures*. This topic has been a focus of our Consortium for several years as we prefer to see a more holistic approach to managing pastures in riparian areas, rather than merely fencing off the streams running through them to exclude livestock entry to the water and streambanks. Most often pasture grazing management outside the exclusion area is still wanting and is grazed much too intensely. This leads to contaminated runoff leaving the pasture, more than likely entering the stream unfiltered. ARS and Penn State University have been working on a Riparian Conservation Planning Project for four years. This session was held to up-date our stakeholders on their progress on evaluating riparian areas on pasturelands and coming up with conservation options that reduce the impact of grazing on riparian areas and stream water quality. Two co-workers from the Project Team presented their findings. Erick Hagan, Riparian Conservation Planning Project Coordinator for ARS, presentation was on *Shifting Perspectives in Riparian Conservation - Trade-offs, Options and Opportunities in Managed Ecosystems*. He introduced the topic by outlining their objectives: Create an objective justification for flexible riparian management (from farmers to policy makers), work with state and national programs to assess riparian buffers and make recommendations on where grass and forest riparian buffers work best, and avoid "bait and switch" tactics by looking across the ecosystem services of the riparian area and see which services are in play and others that are not. The second speaker was Michael Nassry, Research Associate, Pennsylvania State University Riparia, who presented the *Riparian Ecosystem Services Assessment* and *Findings from Runoff Assessment Work*. Then Eric wrapped up the Project Team findings with their *Model Results Quantifying the Different Performance of Riparian Buffers*.

A summary of their findings is that there is no magic bullet, such as livestock exclusion from surface waters (streams or ponds). It requires best management practices be applied in the upland areas and floodplains, not just riparian buffers at water's edge. Grassed and forested riparian buffers both have their good points and their weaknesses. Grassed riparian zones may be better for erosion control (esp. small areas/small streams), infiltration/diffusion of runoff, and drawing down nutrients (if harvested). Forested riparian zones may be better for stream bank protection (larger streams), denitrification (in-stream), and wildlife habitat (stream & buffer). Both can be undone by a site's stream morphology, riparian soils/geology/hydrology, legacy sediments, and nutrients, and upslope/up-watershed conditions (including management). One big issue with linear riparian buffers along streams is rarely is there diffuse flow across the buffer from upslope areas to the stream. Most often water concentrates before reaching the stream buffer sometimes creating a gully or is a small feeder stream. There can be several feet of a buffer doing little to filter runoff and small areas that are overwhelmed by runoff flows. When

looking at actively farmed areas try to do the best possible to meet water quality goals. Never compare an agriculture riparian area to a mature riparian forest area, the landuse decision was made long ago as to what it was to be under previous and current ownership. Most farms cannot give up productive agricultural land for some societal benefit without compensation. Evidence suggests buffers can become sources of phosphorus pollution, especially if they can be remobilized by flood water. Buffers can denitrify nitrogen when they are on saturated and high organic soils. Not all riparian buffers are in such a setting, however. Most water delivered to streams enters along low-order (small feeder) ones. Larger streams do not receive much direct flow into them from adjacent land. Since low order streams are far-flung, they are not easy to surround with buffers which take up a lot of productive land and fencing them all off is expensive and impractical. In this instance, a grazing management plan that is followed for pastures in these areas keeps a healthy sod in place and is a much easier and more cost-effective treatment with no land retirement required. Therefore, introducing flexibility in riparian management requires a common understanding of production and environmental concerns.



Buffer on left has some diffuse flow across it, but at red circle a small stream of concentrated flow escapes being filtered. Right buffer ponds runoff water behind it and allows it to trickle through at several low spots as concentrated flows and at downstream end diverts runoff along itself and drops it into the stream at a point as unfiltered concentrated flow that is likely to be highly contaminated.

The Project Team is working with state and national programs to assess buffers and make recommendations. They are looking at the performance of Conservation Reserve Easement Program (CREP) buffers in Chesapeake Watershed. They toured three states: Pennsylvania, Virginia, and Maryland. Four USDA agencies are involved the Agricultural Research Service, Farm Service Agency, Forest Service,

and Natural Resources Conservation Service. The Project Team did field surveys on 150 CREP (CP-22) sites with state foresters. They determined runoff flow patterns through (and around) CREP buffers. They then modeled nutrient and sediment removal by CREP buffers.

Field surveys were conducted using the Stream-Wetland-Riparian (SWR) Index to determine aquatic ecosystem conditions at each site. It is an integrated model that does floodplain-wetland measurements and in-stream measurements of stream habitat assessment scoring, stream incision ratio, and number of stream stressors present. Sedimentation is an example of a stream stressor. What they found out in the Chesapeake Bay was:

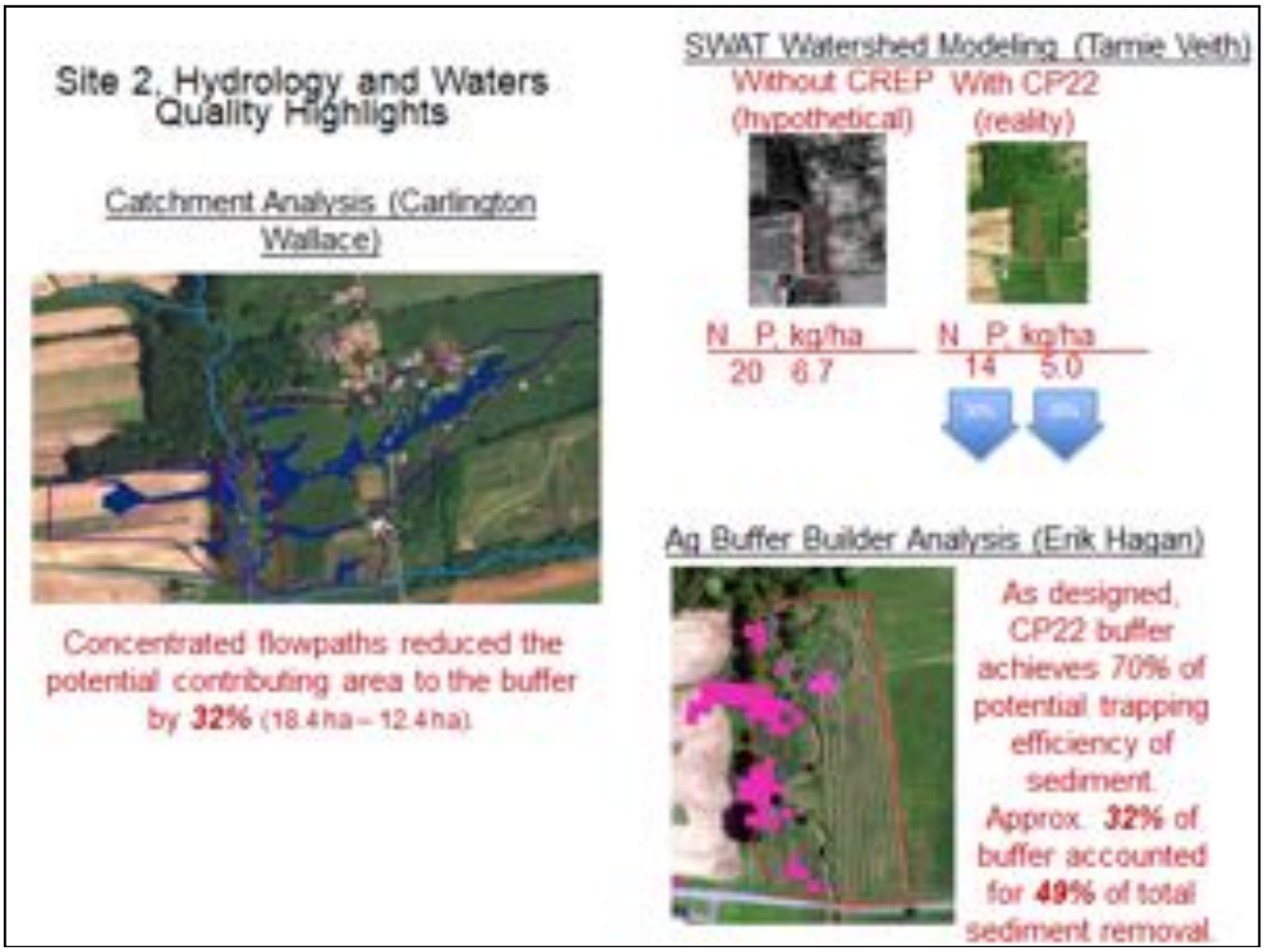
- Riparian buffers - 88% located at headwaters (out of 8,000). Longer buffers along mainstems.
- Variable buffer widths - Narrow buffers in headwaters (adj. width), no variable (wider) width at converging areas where more runoff crosses over, and buffer slope - relates to buffer widths.
- Stream Wetland Riparian Index - Averaged as suboptimal (0.63). Typical of natural buffers but can improve. Northern Appalachian Plateau has most optimal sites, but also less agriculture.
- Physiographic regions - Significant differences were observed. Piedmont and Coastal Plain have most issues as they have more agriculture land.

The second step in the Chesapeake Bay assessment of riparian buffers was watershed modeling to predict water quality impacts of the buffers. First objective was to evaluate concentrated flow paths and hydrologic (bypass) features affecting riparian buffers (CP22) effectiveness. Forested riparian buffer flow path analysis was done using high resolution Light Detection and Ranging (LiDAR) digital elevation model (DEM). It is a surveying method that measures distance to a target by illuminating the target with pulsed laser light and measuring the reflected pulses with a sensor. Differences in laser return times and wavelengths can then be used to make digital 3-D representations of the target. This allows the user to detect concentrated flow paths crossing buffers to gauge their effectiveness. Larger flow paths may need to be made into grassed waterways upstream of the buffer to maximize the efficiency of a now conservation management system (waterway + buffer). Watershed modeling is done using the Soil & Water Assessment Tool (SWAT). SWAT allows us to look at the combination of conservation practices in a watershed and determine their effectiveness in keeping nutrients and sediments out of the stream. This tool allows the quantification of nutrient and sediment reduction benefits of the current CREP program. It does this by simulating N, P and sediment losses on daily time-step evaluating 3 riparian buffer scenarios:

- Pre-CREP cropland (no buffer installed)
- CP-21: established grass
- CP-22: mature forest

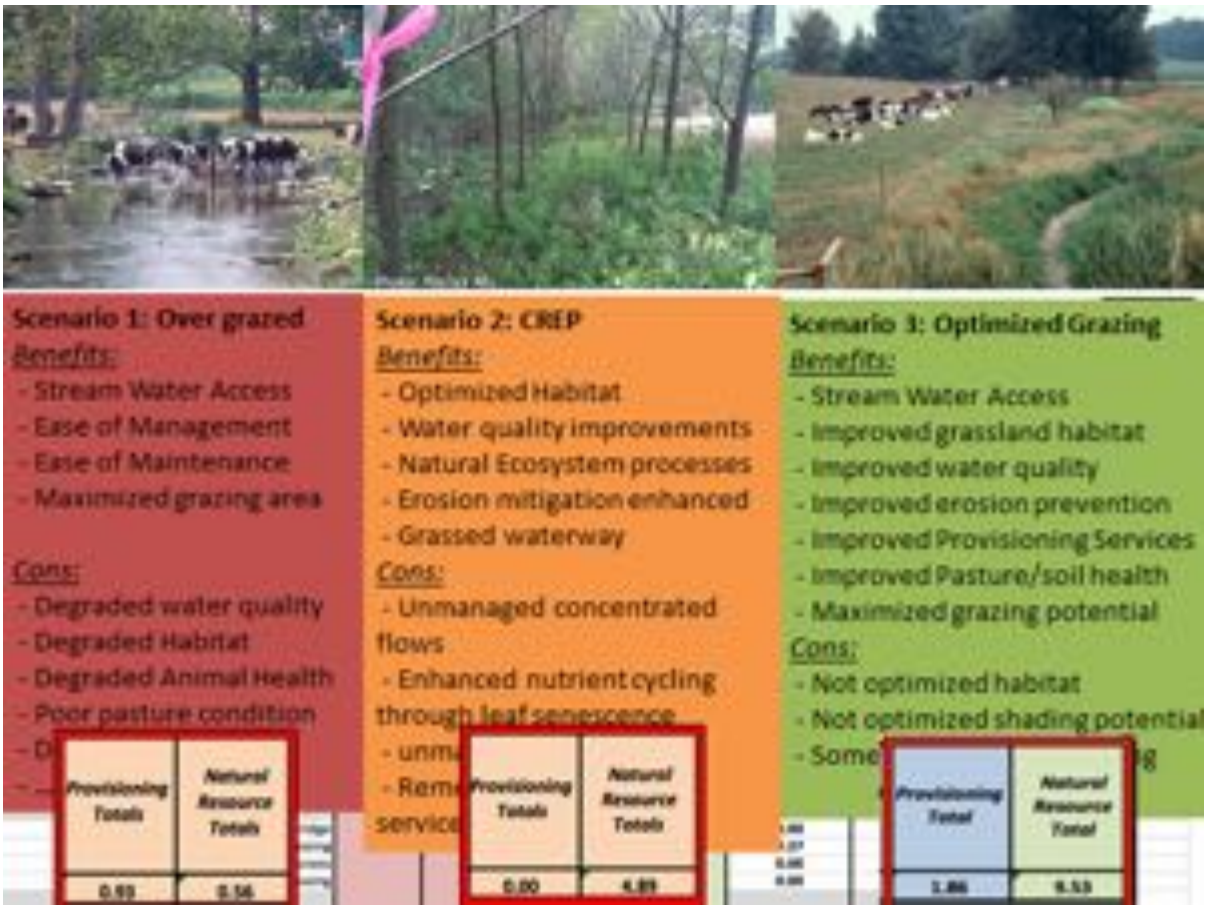
Average annual losses are compared across the three scenarios. It does this locally: differences in transport behavior, and across CREPs: total versus effective contributing areas. Once this assessment is done a new tool, Ag Buffer Builder, a performance-based buffer locating tool can show the conservation planner which areas along a stream are the most effective places to install a buffer. The problem up to this point was to put down a blanket buffer along the whole reach of a stream whether or not any water flowed across it all for varying distances. In one example using Ag Buffer Builder analysis, as designed, one CP22 buffer achieved 86% of potential trapping efficiency of sediment. Approximately, 35% of the buffer accounted for 74% of total sediment removal. The use of Ag Buffer Builder can show the conservation planner how to build a better buffer to reduce nitrogen (N) and phosphorus (P) losses to a stream. In one example, the current buffer only reduced N loads by 30% and P loads by 25%. After Ag Builder analysis, the buffer system was improved to treat bypass flows that eluded the original buffer

reducing N loads by 50% and P by 39% from the unbuffered condition. Much improved, but it also shows that riparian buffers are not the total solution in reducing sediment, N, and P loads to streams. It is the last defense, although some streams can effectively scrub out some additional N along its way downstream.



Once the ecological assessment and watershed modeling is done the final step is to use the Production and Conservation Trade-offs (PACT), an ARS/Penn State assessment tool that came from our grazing in the riparian area project. Comprehensive but does not include impact/quality gradients (either/or). Management flexibility focused on outcomes where different strategies can produce desired ecosystem services using a multifunctional approach. Rating performance of all possible management practices is based upon the literature on their effect on different ecosystem services. These ecosystem services are broken down into three broad categories: provisioning, regulating, and supporting. Generally, the regulating and supporting categories are lumped into an overarching natural resource category. Using pastures as the landuse, three scenarios were evaluated using PACT. Scenario 1: Over-grazed pasture along a stream where cattle had total access to the entire stream reach. It scored relatively well for Provisioning services (0.93), but very low for Natural Resource (0.56). Scenario 2: CREP conservation easement so no longer pasture. It had a Provisioning score of (0.00) since it no longer provides any forage or water to livestock, but it does have a relatively high Natural Resource score of (4.89). Scenario 3: Optimized grazing of the pasture with restricted stream water access. This had a provisioning score of

(1.86) due to better forage production, access to stream water, and maximized forage utilization by the cattle. Meanwhile, it scored even higher than CREP in its Natural Resources score (9.53) due to better soil health, reduced soil erosion, better water quality, and improved grassland habitat than when it was continuously grazed in its entirety with unrestricted access to the stream.



PACT Analysis of a stream managed under 3 scenarios: overgrazed, enrolled in CREP with a wooded buffer, and with a narrow grassed buffer fenced from grazing livestock. Note that the over-grazed stream corridor has half the provisioning score that the optimized grazing scenario and a very low natural resource protection score. Under CREP no grazing occurs and results with a zero for provisioning and a natural resource score only slightly more than half of the natural resource score of the optimized grazing scenario. Picture of optimized grazing scenario is one taken within a year or two of the streamside vegetation naturalizing. In a few years, it will be a forested buffer if left to natural ecological succession progression as it is predisposed to do in the Northeast.

This three-step procedure has been well tested now using the Chesapeake Bay CREP study. It is about ready for use by conservation planners that want to work with farmers to improve riparian pastures by implementing a grazing plan that provides more forage to livestock while enhancing natural resource ecosystem services, such as better fishery habitat and stream water quality. The take-home message is: Flexibility is key. Both sides (farmers & policy makers) must recognize the opportunity to enhance both pastures and the environment. Buffer efficacy is contingent on the Site Explicit Context, Landscape Context, and Management Context. Riparian pastures can act as buffers when they are well grassed and rested from livestock activity for up to 6 weeks between grazing events. These pastures

also should be avoided during the winter season and during and shortly after wet weather.

Morgan Hartman, Owner and Operator, Black Queen Angus Farm, LLC, Berlin, NY wrapped up this session with a "*Farmer Perspective on Managing Riparian Area Pastures*". Morgan has over a mile of fenced-off trout stream that transect his pastures. He now advocates the use of a single fence on one side along a stream and using polywire temporary fencing to rotationally graze riparian pastures. If total exclusion from streams is going to continue to be policy, he also advocates that anyone with a CRP contract involving riparian pastures allow their contract to expire to gain flexibility in how they manage their riparian pastures. He agreed with Erik and Michael that a flexible approach to riparian area pastures is the best way to protect the environment and provide forage for livestock. This flexible approach is often stifled by policy and regulations. He said Maryland has been locked into livestock exclusion fencing now for four years. He advocates results-oriented planning and application of conservation (best management) practices. Do the practices have a positive impact to solve resource problems? He mentioned that Dr. Jeff Herrick was working on a tool called Land Potential Knowledge System (Land PKS) that is results-oriented. Dynamic soil property data and information is used for conservation planning and natural resource management. As several farmer speakers have said in the past at our Conferences, Morgan wants and needs more technical help from agencies such as Natural Resources Conservation Service (NRCS), and more educational information from agencies such as Extension.

During the question and answer period, Joe Hatton requested that ARS deliver Ag Buffer Builder and the PACT tool to the National Employee Development Center of NRCS so that their conservationists and engineers can be trained to use these tools in conservation planning with farmers.

Session 2 – Private Sector and Public Sector Breakout Sessions

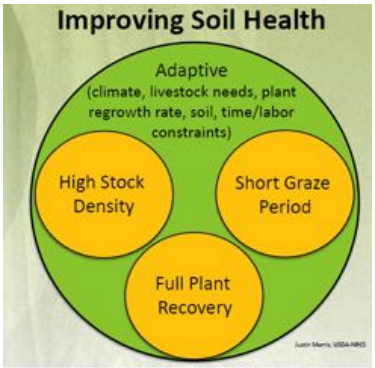
The rest of the morning was devoted to two concurrent sessions, a Private Sector Breakout Session moderated by Angus Johnson, that discussed the renewal the Stakeholder Action Committee and a Public Sector Breakout Session led by Jennifer Colby that discussed Riparian Area Grazing Management implementation strategies. Eighteen people attended the Private Sector session. The Executive Committee had asked Angus to chair the stakeholders action committee. He stated that two duties of the committee were: 1) to provide local education on the Consortium's mission and function, and 2) work with elected officials concerning efforts and focus of the Northeast Pasture Consortium. It was agreed by those present to find a co-chairman within six months. It was also agreed to have a secretary for the group. Two names were suggested to serve on the Executive Committee. They were Kevin Jablonski and Gary Burley. Cliff Hawbaker suggested a research and educational need for producer testing of fatty acids and having choices of lab work. Discussion ensued about promoting the goals and priorities of the NEPC. There was also discussion about membership and funding. Possible funding could be by attendance at the annual conference.

At the Public Sector session, discussion ensued on how to implement a flexible Riparian Area Grazing Management approach to planning and application. There was a consensus that we can see at the field level that a flexible approach to managing grazing in riparian area pastures is desirable and effective. However, programs planned at the state and federal level can be rigid allowing little deviation from how buffers are planned and installed. Most often they call for total livestock exclusion from streams when there are work-around methods that would protect or enhance wildlife habitat and water quality and allow livestock farmers to utilize their riparian pastures productively for their grazing livestock.

Earlier in the morning we learned how Ag Buffer Builder and SWAT work together to evaluate buffer effectiveness as installed or to aid in the design of more useful buffers that do not squander productive pastureland or cropland as a linear buffer does with areas that do little to nothing to buffer surface waters from sediment and nutrients or are too narrow to be effective elsewhere along their length where runoff does flow across the buffer, it was evident that these tools need to be implemented by NRCS and other technical service providers. One observation made by Upper Susquehanna Coalition employee was especially perceptive "Buffers are implemented and left alone – landowners don't know how to bring that buffer to functionality." In truth, it is doubtful that that most planners and technicians know how to bring a buffer to functionality as it was clearly demonstrated earlier that many already installed buffers have missed the mark in being totally functional. Many are bypassed by feeder streams or have areas that have no runoff passing through them or are not wide enough in other places. Livestock exclusion fences along streams are also left alone once installed. Who, but the land operator, knows whether they remain functional or not as time goes by and floodwaters rise and fall along streams with out-of-bank flows during major runoff events? Bottomline: "Any system needs to be adaptive and monitored so producers can easily manage it as circumstances change", quipped an NRCS employee.

Session 3 – Pastures and Soil Health

Session 3 – *Pastures and Soil Health* was the first afternoon session. Soil health is a more recent addition to our research and education priorities. Justin Morris, Regional Soil Health Specialist MN-WI, USDA-NRCS Soil Health Division, Madison, WI kicked off this session with a presentation entitled: *Improving Soil Health through Adaptive Grazing Management*. He opened his presentation with a definition for soil health: "The capacity of a soil to function as a vital, living ecosystem that sustains plants, animals, and humans." It focuses on feeding soil biology which feeds the plant, the biological characteristics (living) part of the soil, such as earthworms, dung beetles, and micro-organisms, and soil properties, such as aggregate stability, organic matter content, and infiltration capacity, that impact soil health for good or bad. Soil health all starts with the sun's energy captured by plant life. This allows the soil food web to begin as microorganisms and herbivore insects consume the organic matter produced by the plants that in turn are preyed upon by predatory insects and animals. All this living activity in a soil impacts its health in a positive way if not interfered with. Soil biology has the biggest impact of the three things that impact soil: biological, physical, and chemical properties as it can alter the other two as time goes on.



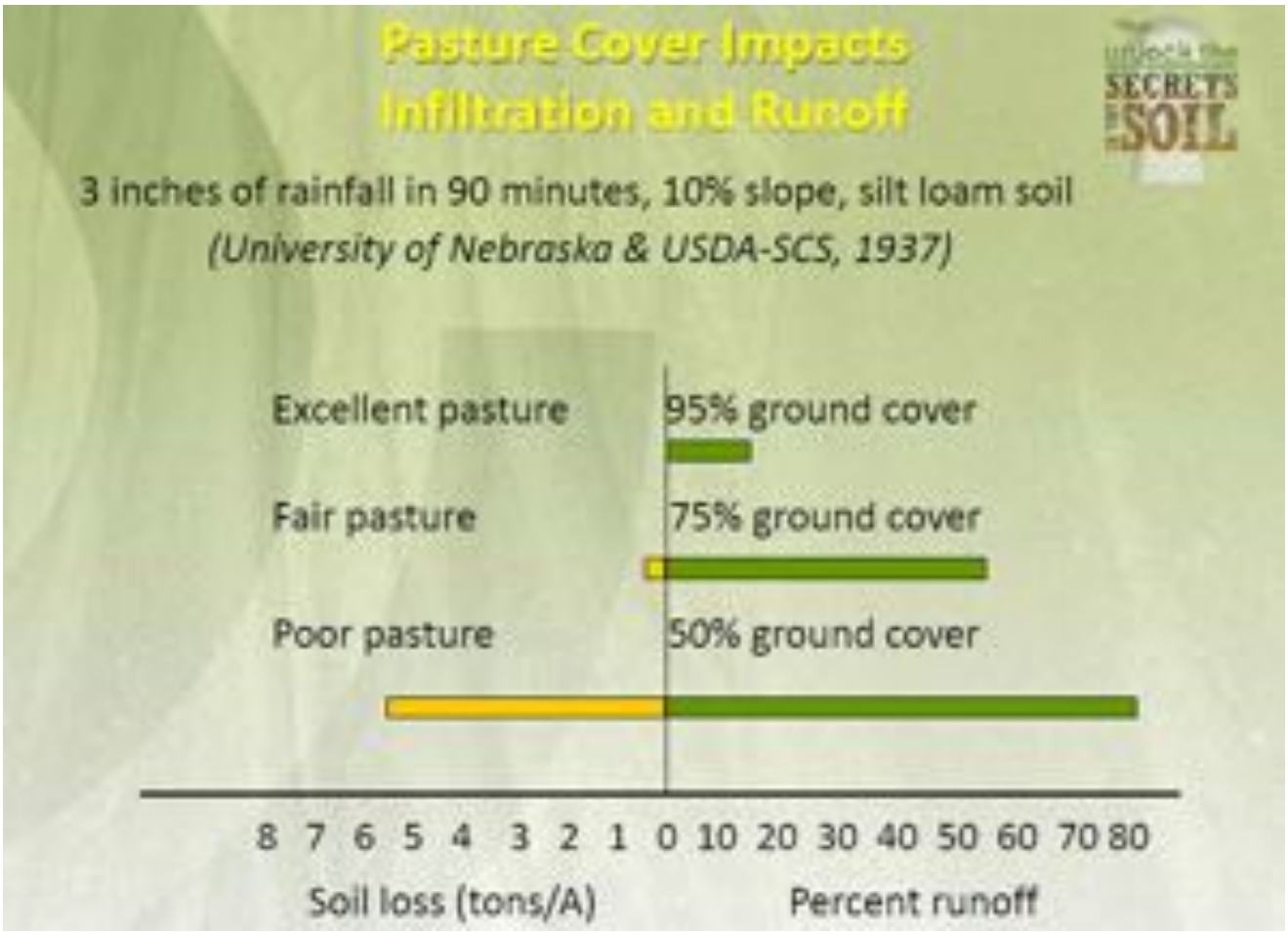
Adaptive Grazing Management

In pastures, we can improve soil health by following adaptive grazing management principles as shown in the adjacent figure. As grazing management affects all four ecosystem processes: water cycle, mineral cycle, energy flow, and biodiversity (community dynamics). Soil Health Planning Principles: Minimize "chronic" disturbance to soil and plants, maximize soil cover, use diversity of plants to add diversity to soil micro-organisms, and provide continuous living roots. The goal is to create the most favorable habitat possible for the soil organisms. Chronic disturbance of a pasture most commonly is allowing overgrazing to occur, seasonally or months at a time, so that much of the vegetative cover is lost. Trailing by livestock to get to a single source of water, feed, shade, and salt is another chronic disturbance in expansive pastures not rotationally grazed. Livestock heavy use areas around water, feed, and salt licks and under shade are also chronic disturbance and are bare of vegetation.

To minimize "Chronic" Disturbance:
- Keep livestock in one area only long enough to ideally graze an individual plant once, not twice.
- Rotate livestock only as fast as the rate at which plants are re-growing.
- Monitoring is essential to knowing how quickly to move the livestock. (Observe stubble height and move them if grass stubble is down to 3-4 inches on orchardgrass and tall or meadow fescue.)
- The faster plants grow; the faster livestock should be moving from paddock to paddock.
- Provide water and salt at every paddock.

Overgrazing, trailing to and from water trough, heavy use area of bare soil around trough results in poor animal performance and deteriorating soil health. Note cow to the right with a very noticeable triangle in front of her hipbone, a sign of poor body condition. Lots of bare ground throughout pasture.

Maximizing soil cover provides these benefits:
- Shades soil surface lowering soil surface temperatures
- Higher humidity at soil surface that enhances residue and mineral recycling
- Enhanced environment (cooler & more humid) for macro-arthropods and earthworms to utilize manure and plant residues
- Less soil moisture evaporates
- More soil moisture to grow forage as more precipitation infiltrates the soil in a good sod cover.
- Plants become more drought tolerant due to stronger and deeper root growth
- Increased nutrient cycling
- Greater plant growth as there is increased soil moisture & cooler soils and there are no bare spots.
- Days of grazing increases as summer slump lessens and fall growth is prolonged
- Days of supplemental feeding decrease
- Reduced costs, and
- Increased income from improved weight gain and/or milk flow.



Use diversity of plants to add diversity to soil micro-organisms. We encourage more diversity in our pastures by:

- Not overgrazing them,
- Shortening the graze period so no species is targeted for preferential selection,
- Allow long enough recovery for all plants, and
- Reduce diet selectivity by increasing stock density, not stocking rate (Stated differently but same effect as second bullet, grazing period must be shortened when stock density is increased.)

Provide continuous living roots by:

- Keep livestock in one area only long enough to graze an individual plant once, not twice.
- Rotate livestock only as fast as the rate at which plants are re-growing.
- Monitoring is essential to knowing how quickly to move the livestock.
- The faster plants grow; the faster livestock should be cycling through the pastures.

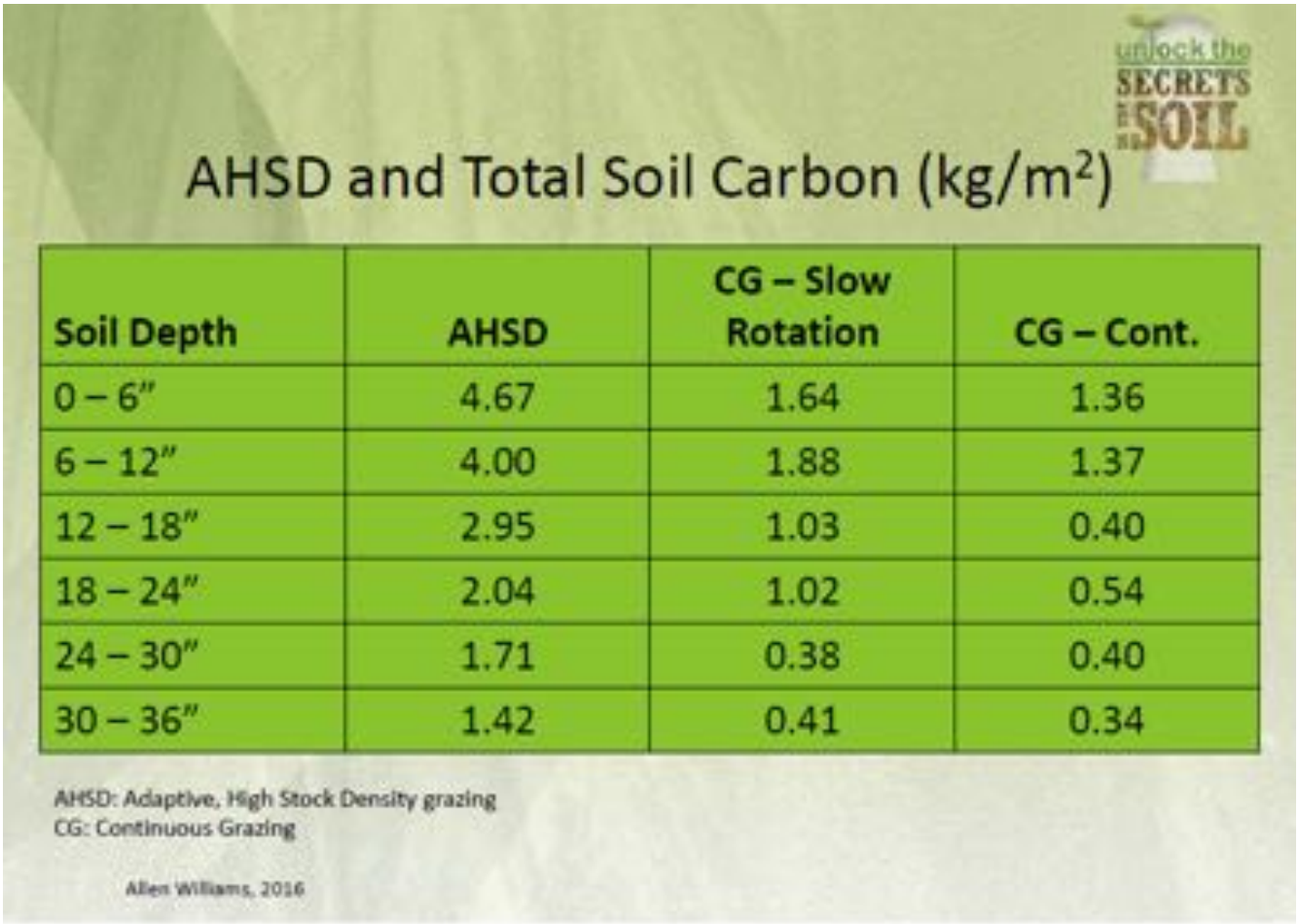
Grazing management affects soil biology. Multi-paddock grazing system was the highest in total fungi count. The ratio of total fungi to total bacteria was the highest (3:1) in the multi-paddock grazing system versus all other treatments (1:1): Heavy continuous, light continuous, and grazing exclosure. A high fungus to bacteria ratio in the pasture soil indicates higher potential for plants to extract more water and nutrients from the soil. This is due to the fungi being predominantly mycorrhizal fungi. They act as extensions to plant roots. This type of fungi may also help retain nutrients in the root zone.

What is meant by "overgrazing"? When a plant that has been grazed severely in the growing season gets grazed severely again while almost solely using energy it has taken from its crown, stem bases, or roots to re-establish leaf growth. There are three ways to overgraze:

1. When animals remain too long in a paddock while plants are growing fast.
2. When animals leave the paddock but return too soon while plants are growing slowly.
3. When the plant is growing new leaf from stored energy in early spring (breaking dormancy).

Since high density stocking has been mentioned, here are some stock density basics:

- Stock density will vary over time depending on forage conditions and animal intake needs status.
- Make changes gradually in stock density over time.
- Monitor daily to see how contented the animals are.
- Because forage conditions and animal nutrient demands are constantly in flux, monitor daily to gauge if forage is being over-or under-allocated for the herd and adjust the paddock size accordingly.
- Always focus on animal performance. Never stress the animals by limiting intake, otherwise gains or milk flow and body condition will suffer.



Soil organic matter (soil carbon) is the building block for soil health. Rotational stocking of livestock on pastures, such as AHSD, increases carbon in the soil profile significantly over pastures grazed on a continuous basis. More root turnover occurs when grazed intensely, then rested, repeatedly.

Fast track to soil health on pastures requires getting the soil pH and fertility in the optimum range for the forage species growing in them, managing for 95% soil cover – green leaf and brown(residue), using high density grazing and moving them as soon as stubble height minimums are reached for quick regrowth (Leave half, take half of the forage [not in inches, but in pounds]), and using recovery periods that allow most pasture paddocks to recover to 8-10 inches of forage height and/or before yellowing of older leaves begins before grazing them again. Adaptive grazing management requires monitoring livestock and grass and knowing the type of forage quality needed for the grazing herd. Rule of thumb dates vary by region and by pasture plant community and herd/flock forage quality and intake needs.

The second speaker for this session was David Llewellyn, Director of Farm Stewardship at Glynwood, Cold Spring, NY. The presentation title was *Soil Health and Climate Resilience for Pasture-Based Livestock Farmers*. David reported on a SARE partnership grant that seeks to increase soil health and climate resilience education for pasture-based livestock farmers. A Soil Health Field Day, August 23rd was held at the Hudson Valley Farm Business Incubator in New Paltz, NY. Cornell Cooperative Extension, Natural Resources Conservation Service, and the University of Massachusetts participated in the Soil Health Field Day with Glynwood. David covered soil quality, soil health, testing, interpretation, and how to mitigate soil health constraints in pastures. He defined soil quality as how well the soil can sustain plant and animal health. The capacity of a soil to function. He reported that there are two soil health testing kits available: Cornell's Soil Health Assessment at http://soilhealth.cals.cornell.edu/, costing $50-150 and Woods End for $55 at https://woodsend.org/soil-health-test/. The physical indicators measured by soil health testing kits are available water capacity, soil surface hardness in top 6 inches, subsurface hardness at the 6-18-inch depth, and aggregate stability. The biological indicators measured are organic matter (OM), ACE Soil Protein Index (amount of OM present as proteins), respiration by the soil microbes, and active carbon (portion of OM that is easily used as food by microbes). The chemical indicators measured are pH (soil acidity - determines what nutrients a plant can take up – most taken up when pH ranges between 6.2-6.8.), phosphorus, potassium, and minor essential elements for plant growth. Identifying your limiting factors of your pasture soils is necessary to grow a good forage crop for your livestock. Once they are identified, you can work to improve them. For physical constraints:

- Available Water Capacity - build soil to hold more water via rotational grazing, add stable, finished compost (manure is ok) and reduce tillage if you are in the re-seeding practice of growing annuals.
- Surface Hardness - stay off wet fields with cattle or machinery; control/minimize vehicle access and lighten loads; use an aerator or keyline plow
- Subsurface Hardness - reduce/eliminate use of moldboard plow if reseeding; use chisel or keyline plow, forage (tillage) radish. (Compaction is a top constraint given the agricultural history of pasture/hayfields. It stunts root growth and impairs soil drainage.)
- Aggregate Stability - add fresh organic materials; reduce tillage; increase legume percentage in forage stand.

For biological constraints, the improvement practices are similar:

- Organic Matter - add manure, compost; reduce tillage, on pastures rotationally graze them.
- ACE Soil Protein Index - organic N source needs to be low in C; fresh manure is good; reduce tillage
- Respiration - reduce compaction with aerator or keyline; increase diverse OM, avoid grazing wet soil pastures.
- Active Carbon - add manure, compost; reduce tillage, on pastures rotationally graze them.

With chemical constraints, improvement practices differ considerably from the physical and biological constraints:

- pH - lime, but check Mg levels first by soil testing, get agronomic advice. Apply either dolomitic or high calcium lime depending on Mg level in the soil and agronomic advice given.
- Phosphorus - add P per soil test if it is low; adjust pH to 6.2 - 6.8; if it is high, stop adding OM, extra manure, and P. Drawdown P by taking off a first crop hay cutting and feeding it elsewhere.
- Potassium - add K per soil test via manure, compost, or fertilizer; if it is high, extract via cover crops or hay. Caution – grazed crops do not remove nutrients; the livestock do when milk or they are sold.
- Minor Elements - add via fertilizer if low per soil test, get agronomic advice; build soil OM, reduce or eliminate tillage to build mycorrhizal fungal population.

Their SARE grant supports the development of a pasture improvement demonstration area at Glynwood's Hudson Valley Farm Business Incubator, located at Mohonk Preserve in New Paltz. The demonstration showcases pasture improvement methods for common soil health constraints in our region, such as soil compaction and poor drainage. The pasture improvement treatments include application of limestone and compost, rotational grazing of ruminant animals, and the use of a keyline plow to mitigate soil compaction issues. (Keyline plow is a tillage implement designed to renovate pasture and redirect groundwater without creating a lot of surface disturbance. It creates a channel or pathway for drainage and penetration of roots.) For the purposes of this demonstration, we will use the keyline for breaking surface and subsurface compaction. So, this will be done in straight lines. The demonstration area includes sixteen plots with every combination of these treatments, plus a control plot. They sent numerous soil samples to the Cornell Soil Health Lab in the fall of 2016 for baseline data from which Glynwood staff and project collaborators will measure outcomes. Each fall, staff will sample soil for follow up analysis to measure the impact of the various treatments.

keyline plow shank and coulter assembly

Since implementing the project, they have conducted forage species counts in the treatment areas to collect baseline information about the native (existing) pasture plants. Over time, they anticipate an increase in the percentage of desirable species as soil health improves in these pastures.

The team has also conducted worm counts in the sixteen demonstration plots by digging up 1' x 1' sample areas. The process takes about 10-15 minutes per sample, if you have a digging machine-like Dave Llewellyn on your team. Worm counts more than 10 are considered an indicator of good soil health. Glynwood's initial worm counts averaged 18.5 worms per square foot. We expect those numbers to climb as we mitigate soil health constraints, such as deeper root systems (more habitat for things in the soil food web, more food sources), improved aeration + drainage (worms dig those things), higher pH (preferable to worms), and increased organic matter (food for worms).

The second demonstration component of the SARE grant is the utilization of warm season annual forage as an effective strategy for improving risk management for graziers in mid-summer. Glynwood staff recently seeded a mix of brown mid-rib (BMR) sorghum, pearl millet and crimson clover to be grazed by cattle during the hottest stretch of the summer. Pastures in our region are composed predominantly of cool season perennial plants, which slowdown in the summer. Too frequently in recent years, intense stretches of heat have forced area farmers to purchase hay when forage has been inadequate in the summer. Production of warm season annual forage is a way to create a backstop in the event of inadequate forage. Glynwood staff and partners will compare the cost of production and value of forage against the market rate for hay in the mid-summer. Our intent – measure outcomes + economic benefit with CCE + UMass. How much feed did we produce? How much labor? Cost of seed? Value of feed? Given our variable climate, seeding warm season annuals is a good backstop against a scorching summer. The forage will be high quality and useful, even in a mid-summer, but in a hot one – this is a good climate resilience strategy. Feeding standing forage to happily grazing animals while other farmers are scrambling to source hay in the summer.

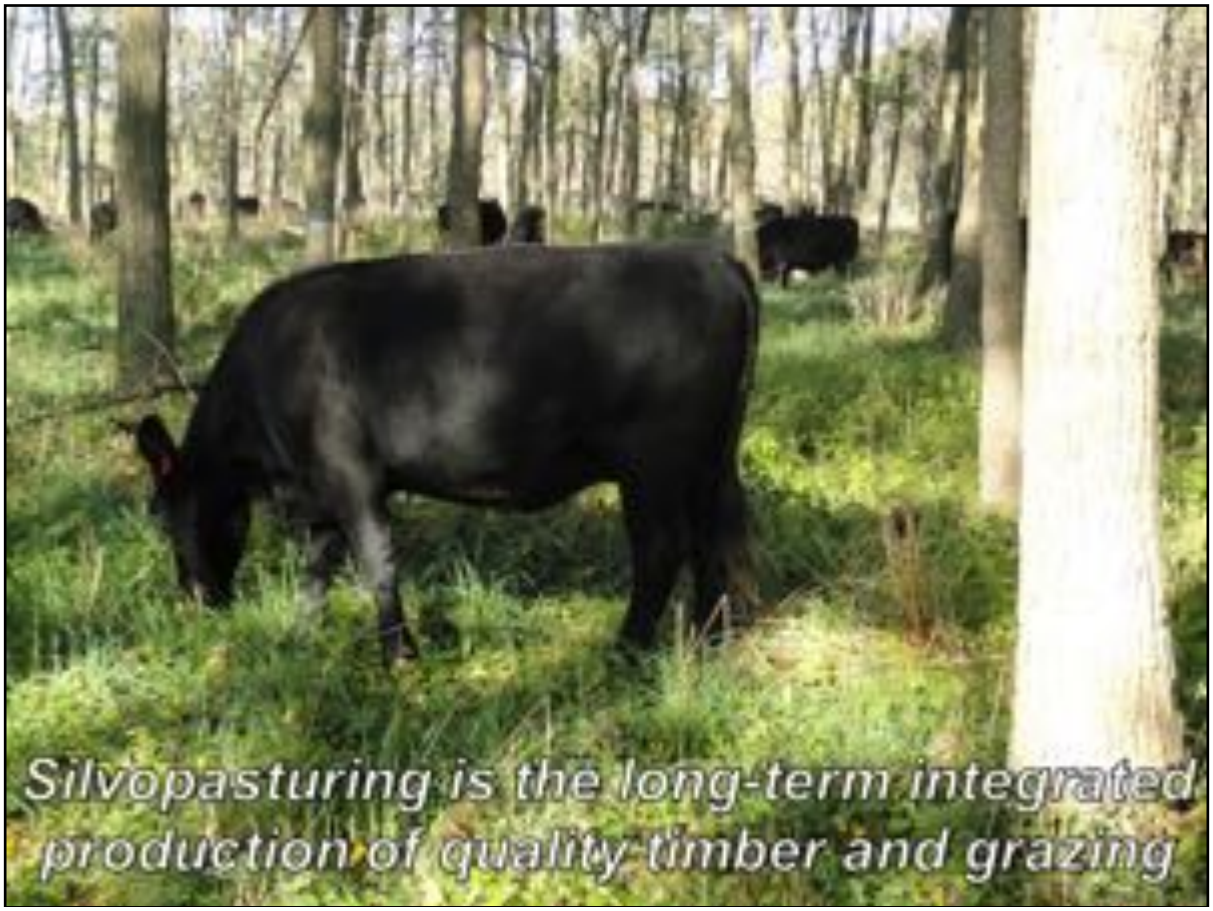
Cattle grazing brown midrib sorghum and millet in midsummer. Strip graze to reduce wastage by trampling and fouling of the lush forage.

Session 4 - Silvopasture Update

This session was given by Brett Chedzoy, SCNY Ag Team-Forestry Specialist & Senior Resource Educator, Montour Falls, NY. His presentation title was: *Silvopasturing Updates on Progress in the Northeast*. Brett defined silvopasturing as the long-term integrated production of quality timber and grazing

on the same land. It can be done two ways, adding woods to pasture, or adding pasture to woods. Many popular press and research articles have been written to promote silvopasturing, such as in *Farm* magazine that serves PA, NY, and New England, *On Pasture* e-newsletter, *Graze* magazine, *Journal of Forestry*, and a publication, *Photo Guide to Northeastern United States Silvopasture*, by the Northeastern States Research Cooperative through funding from the USDA Forest Service. Educational venues include:

- Two dedicated conferences (2011 and 2014),
- Five "day course" trainings in four states,
- Dozen presentations at major conferences, including the Grassfed Exchange and Society of American Foresters,
- Dozen webinars,
- Many dozens of presentations at professional development trainings and other conferences, and
- *www.silvopasture.ning.com* forum (currently 320 members**).**

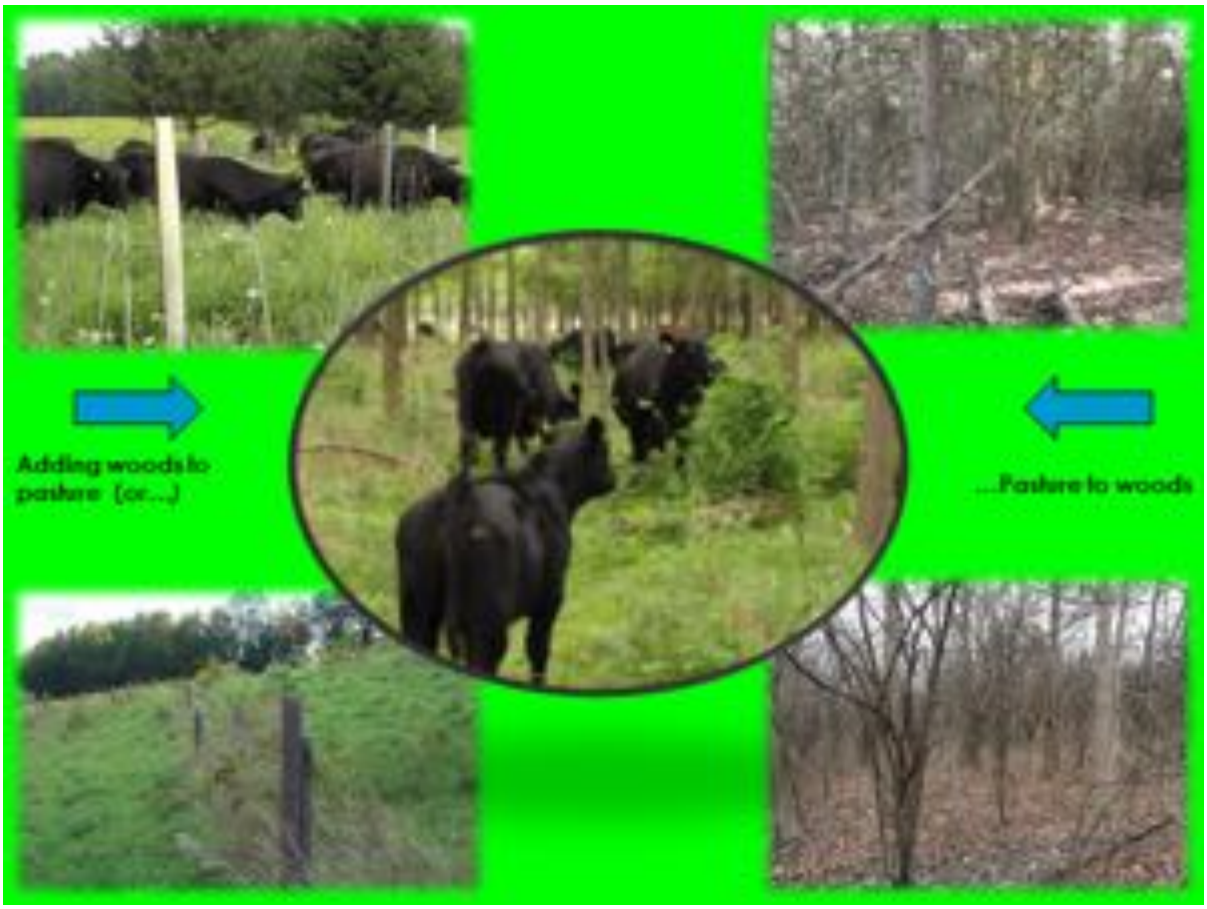


Angus cattle on silvopasture. Note three trees with blue bands are marked for removal to open up tree canopy to let more light get down to the grass.

Looking to the future, these are some priorities for silvopasture research and education:

1) Viable methodologies for the reclamation and restoration of invasive brushlands and degraded woodlots,
2) The economics of silvopasturing,

3) Soil health and ecosystem services benefits,
4) Using animal impact to manage vegetation in silvopastures,
5) Health and welfare benefits for livestock,
6) And lastly, what are the alternatives?



Adding trees to pastures requires protecting planted saplings from livestock damage. More commonly in the Northeast understocked or degraded forests are converted to silvopasture. Consult with a professional forester before embarking on a silvopasture system in either case.

Brett concluded his presentation with a Forest Connect questionnaire that helps farmers make a good decision on whether they have a good site to practice silvopasture on, "Evaluating the Potential of a Site for Silvopasture Development". This can be accessed on the Web at: http://blogs.cornell.edu/ccednrpublications/miscellaneous-forestry/. Near the top of the page, hover on Forestry, a pop-up appears. Select Agroforestry-Silvopasture. It sends you to a new publication list. In that list, select Silvopasture Site Assessment, this will bring up a pdf file with the title shown above.

Poster Paper session

The *Poster Paper* session followed. Six poster papers were displayed in the White Ballroom. The papers are listed below:

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Grazing Guide: What can the Northeast Pasture Consortium website offer?
Goslee, Sarah
Ecologist, USDA-ARS Pasture Systems & Watershed Management Research Unit, University Park, PA

Pasture Plants of the Northeastern US
Gonet, Jeff[1] and Sarah Goslee[2]
[1]Agricultural Science Research Technician and
[2]Ecologist, USDA-ARS Pasture Systems & Watershed Management Research Unit, University Park, PA.

Upper Susquehanna Coalition Comprehensive Riparian Buffer Program
Brinkley, Lydia[1] and Troy Bishopp[2]
[1]Buffer Coordinator for the Upper Susquehanna Coalition/Tioga Co. SWCD, 183 Corporate Drive, Owego, NY.
[2]Upper Susquehanna Coalition East Regional Grazing Specialist/Madison County Soil and Water Conservation District, Hamilton, NY.

Can Grazing Selectivity Reduce Fatty Acid Intake Decline in Mature Annual Forages?
Goossen, Caleb[1], Sidney Bosworth[2], and Jana Kraft[3]
[1]Ph.D. Candidate, Department of Plant & Soil Science
[2]Associate Extension Professor of Agronomy, Department of Plant & Soil Science
[3]Research Assistant Professor, Department of Animal & Veterinary Sciences, University of Vermont, Burlington, VT

Deep-Bed Pack Livestock Facility Planning Tool
Bredeweg, Sally[1], Brian Jerose[2], Jennifer Colby[3], Bob Thompson[4], and Juan Alvez[3]
[1]P.E., USDA-NRCS, Oregon State Office,
[2]Managing Partner, Agrilab Technologies LLC, Enosburg, VT
[3]University of Vermont Extension, Center for Sustainable Agriculture, VT Pasture Network, Burlington, VT
[4]Civil Engineer, USDA-NRCS, Vermont State Office, Colchester, VT

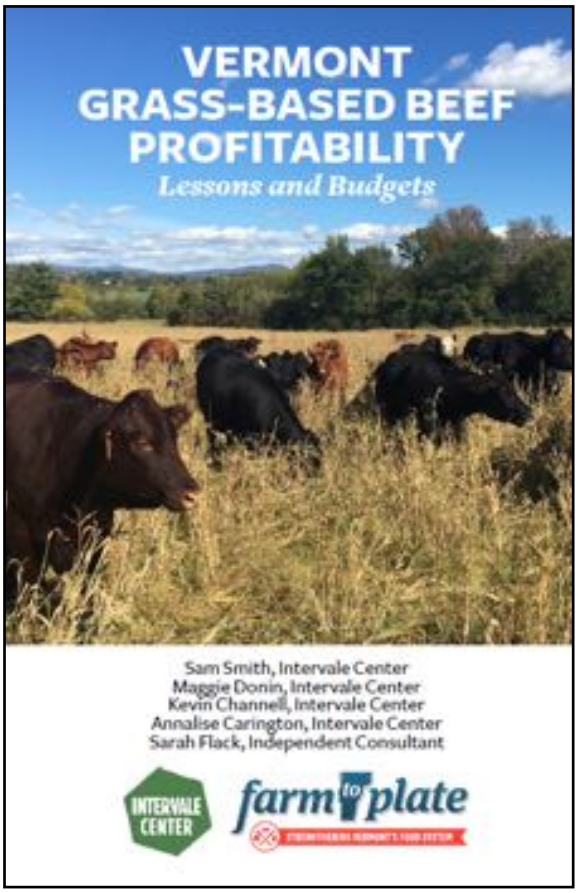
Studying the Effect of Bovine Milk Consumption on the Human Gut Microbiota Using TWINSHIME (Twin-Simulator of the Human Intestinal Microbial Ecology)
Firrman, J.A., L.S. Liu, and P. Tomasula
Dairy & Functional Foods Research Unit, USDA-ARS, ERRC, Wyndmoor, PA

Session 5 – Beef Viability Case Studies

Session 5 – *Beef Viability Case Studies* followed the Poster Paper Session with Sam Smith, Farm Business Specialist, Intervale Center, Burlington, VT presenting *Beef Viability Case Studies* via Skype. Several grass-fed beef farms have sprung up in Vermont. Case studies were conducted to see what production models these farms were using. The study group kept good records and were realistic about their goals. When the study was first initiated, grass-fed beef sold for $3.00 per pound hanging weight. It is now down to $2.60 per pound. The beef cattle range in size from small to medium framed feeders to large framed cattle in the study group. It is essential to understand the herd's potential to finish to grade as the meat market demands in reasonable time (20 months from birth to slaughter). Bigger

frame cattle not necessarily better, average daily gain genetic potential is more important. It is important for grass-fed beef farmers to avoid Jim Gerrish's cardinal sins of grazing: starting grazing too soon in the spring, grazing pastures too short, and coming back too soon to stock cattle on a previously grazed area. This is especially true if the aim is to achieve a good average daily gain (ADG) of at least 2 pounds per day. Otherwise, it would be difficult to get a feeder to meat market size and grade in 20 months. Sam said that a 200-day grazing season for Vermont is "optimistic". A 180-day grazing season is more realistic unless extending the grazing season by growing brassicas or stock-piling fescue for late fall and early winter grazing. A good feeder program requires:

- Selling grass-fed and -finished meat at a price above costs of production + profit margin.
- Lowering overhead by leasing pasture (cheaper than owning pastureland).
- Improving stock density but moving the cattle more often so as not to restrict intake.
- Shoot for the highest ADG possible with the genetics available and a productive pasture sward - track it to be sure it is being maintained on average throughout feeding period.
- Decrease days on farm by not over finishing the cattle or not securing a spot ahead of time at the meat processing plant.
- Reduce the days of feeding stored feed, it is more expensive than pasture.
- Shoot for a 20-month harvest of cattle window – Not achieved with low quality hay or pasture.



Intervale Center produced a *Grass-Fed Beef Profitability Guide* in 2018 as a pdf file. This can be retrieved at: https://www.intervale.org/resources-for-farmers. Click on *Grass-Fed Beef Profitability Guide* from the list under Intervale Center Resources to download the report. It is well written and should be invaluable to anyone involved in the grass-based beef industry.

The Northeast Pasture Consortium is heartened by the interest in grass-fed and -finished beef as it was one of our first research and education priorities that we tackled.

Session 6 - Soil Health and its Impact on Human Health

Session 6 - *Soil Health and its Impact on Human Health* was the last Thursday afternoon session with Didi Pershouse, Director, The Center for Sustainable Medicine & Board Member, Soil Carbon

Coalition, Thetford Center, VT presenting *The Ecology of Care*. Microbes are in the air, water, plant, soil, and the human gut. Healthy topsoil is a living, carbon-rich sponge that soaks up water. The ground cover on cropland is reduced from sod, as in pasture, with near 100% cover to conventional tillage with near 0% cover. Rainfall simulator demonstrations show that with a sod from a healthy pasture there is practically no runoff and lots of infiltration into the soil as compared to clean tillage where there is practically no infiltration and a lot of runoff. The cause of this vast difference is due both to the amount of ground cover and the differences in soil structure resulting from widely different tillage practices from zero to full tillage.

From left to right the ground cover is reduced from sod with near 100% cover to full tillage with near 0% cover from previous crop's residue. The demonstration shows that with sod there is practically no runoff (near empty but clear water in front jar) and lots of infiltration (half full rear jar) as compared to clean tillage (far right) where there is practically no infiltration (near empty rear jar) and a lot of runoff (front jar half full of dirty water). The cause of this vast difference is due both to the amount of ground cover and soil structure differences going from excellent in sod to poorer and poorer with increased/inversion tillage operations.

Didi remarked "Perennial foods, wild foods, and pasture-raised animal products are some of the few places we can still get nutrients that have been intelligently sorted, into the right concentrations, ratios, and balances. We need them to maintain our own intelligence and immunity." She then went on to explain about The Biotic Pump. It is how natural landscapes create their own rain, climates, and health with the aid of microbes. The work of microbes in landscapes can provide:

- Abundant clean water, for everyone.
- Pleasant livable temperatures and weather, around the world

- Protection from floods, drought, wildfire
- Nutrient dense food to grow healthy people, plants, and animals.
- Strong local economies
- Resilient communities inside and outside our bodies, above and below the ground.

Gut Microbes (in humans and animals):

- Compete with pathogens at same receptor sites,
- Teach our immune systems how to behave,
- Influence gastrointestinal, metabolic, neuroendocrine, and circulatory functions,
- Influence drug metabolism and toxicity (side effects),
- Influence calorific availability (blood sugar & weight gain),
- Influence post-surgical recovery times,
- Form barricades against disease-causing bacteria,
- Influence our moods,
- Make our neurotransmitters, and
- Turn on brain development.

Healthy topsoil is the mucosal membrane of the land. An intelligent filter that provides a layer of protection, digestion, respiration, immunity, development, and regeneration of life. Soil is living tissue, with a microbiome, very much like any other being. There are principles to keep it healthy. Microbes are the quiet working class of the world providing our goods and services. We need to stop killing them.

The "Anti-Biotic" Pump: How humans have created their own climates, deserts, and health crises. How many of the issues of climate change can we address by restoring the "soil carbon sponge"? She cited: "The issue is that, over vast areas of the world, the biosphere is not doing enough work. With livestock confined, and crop monocultures dependent on fossil energy to maintain them, too many of the animals are in prison, too many of the plants are on welfare, and too many of the microbes are dead." -- Peter Donovan, Soil Carbon Coalition Founder.

Why not provide people opportunities to observe and think about whole systems landscape function while they upload observations to a shared map of data? www.atlasbiowork.com Didi showed several pictures of young children learning about soil health. The first soil health achievement award in 4H was awarded to Atlas Biowork she proudly announced. They are also providing mutual support and ongoing learning groups for farmers. Their motto is "Start with a goal, not a problem." Figure out what your community wants…. Then hire farmers to create the conditions that will provide it. (Editor's note: Farmers prefer to own at least some of their farmland. The land that they do rent is not a hiring situation whether it be cash rent or crop shares. They are loath to follow anyone's dictates but their own.)

Cheese Tasting Session

Early Thursday evening after the afternoon conference program, Gary and Betty Burley, East Hill Farms, Warsaw, NY, hosted a raw milk cheese tasting party before Conference dinner. They produce several varieties of cheese from their dairy cows' milk. It is cave-aged as done in France. It is good.

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Producer Showcase Session

The Thursday evening *Producer Showcase* ran from 7:00 PM to 9:00 PM. Two New York dairymen were featured, Bruce Rivington and Eric Sheffer.

Bruce Rivington was first up and introduced us to *Churning Up Butter Profits: A Grass-Fed Dairy's Value-Added Adventure*. He and his family moved from Canada to Kriemhild Dairy Farms, Hamilton, NY. The farm is bisected by NY Route 12B so two cattle passes were built underneath the highway. They rotationally stock their dairy cows on pasture. They have a 44-cow milking parlor and a hoop barn for a freestall facility where supplemental feed is fed to the cows.

Kriemhild Dairy Farm, Hamilton, NY. One of the cattle passes under NY Route 12B appears left center of photo allowing cows to go from pasture to milking parlor without crossing the highway.

Bruce quoted Sonny Golden "...You plant corn. What Grows? Grass. You plant soybeans. What Grows? Grass. You plant barley. What grows? Grass. Why aren't you growing grass?!"

Bruce put in a plug for Sarah Flack's new book *The Art and Science of Grazing*. Sarah has been a long-time member of the Northeast Pasture Consortium and is a grazing consultant from Vermont.

His dairy farm calves over 400 head seasonally in early to mid-March. The herd is pure Ayrshires and Jersey-Ayrshire crosses. Before deciding to settle down in Hamilton, NY they looked at 18 farms around the eastern US as far south as North Carolina. They moved to New York in 2000.

Among his slides he had one video picture that shows a dairy cow grazing grass in slow motion; showing how she grasped the grass with her tongue to pull it into her mouth. This is possible when the grass is at the proper height for grazing. He prefers short grasses that he refers to as native grasses. The pictured grass looked to be 6 to 8 inches tall and nicely vegetative and lush. He feels his pastures will

revert to mostly bluegrass and white clover eventually.

Kriemhild Farm grazing dairy cow grasping grass with her tongue to pull it into her mouth to get a full bite. It is important to have grass tall enough for dairy cows to get a full bite each time to maximize their grazing efficiency and intake. Still shot from the video.

Bruce quoted another person that sums up how he feeds his cows: "The biggest mistake a farmer can make is to feed a cow to her genetic potential" - Michael Murphy.

In 2010 an economic development coordinator contacted him to see if he would want to produce a value-added product. He decided to build a creamery and produce meadow butter under the brand name Kriemhild Dairy Farms. The butter is only produced from grass-fed cows. It was a fortuitous move as in 2014 on the cover of *Time* magazine there was a picture of butter with the title "Eat Butter".

They produce butter by sending their cream to a local milk plant for churning. They take the churned butter back to finalize it. They drain it to produce popcorn sized curds and then cream it. They then pack it into different sized packages. They work with seven distributors to market the butter. Their butter is sold by a well-known grocery chain, Trader Joe's. The wife of a Trader Joe's vice president by a chance sampling led to her endorsing it to her husband. Whole Foods also carries the butter as well. Many high-end restaurants also buy the butter. One Manhattan, NY restaurant orders 10 pounds a day. The butter is sold over a wide part of the Northeast from New Hampshire to Pennsylvania and New Jersey. They have been selling it at farmer's markets but may only go to two this year. They also have a farm store. Besides the meadow butter, they also produce cultured butter. It is 85% butterfat. It is used to make croissants and other high-end pastries. It makes a flakier crust. The cultured butter is sold in

one-pound packages. When they start processing their butter at their own facility completely, they will also sell buttermilk.

Kriemhild Dairy Farm pasture and laneway layout. Laneways are the wider dark lines. They give access to each pasture and paddock.

Eric Sheffer, our second speaker, is a dairyman that just transitioned to organic milk production. His presentation says it all, *Transitioning to Organic Dairying in a Troubled Time*. The troubled time is the very low milk prices received at the farm. Eric is a partner of Sheffer's Grassland Dairy, LLC with his Father. The farm has been in the family for 6 generations from 1774. When Eric returned to the farm after graduating from Cornell, he and his Father raised dairy heifers and the farm was known as Sheffer's Heifers. The early years of planning the dairy was to expand their facilities and pasture base. They went back to what Granddad did, use pasture to feed their livestock. Timing – Dad started to build a new barn while Eric was at Cornell. Capital – Need family or an investor to get into farming today. Why not organic? Eric went to Cornell, but his instructors questioned why he wanted to have his cattle on pastures. He visited Gary Burley's dairy farm to see how that family were able to grow into a large dairy operation while pasturing their cattle. In 2006-7, they had 115 acres of pasture. At that time, their cattle genetics prohibited them going organic. They started out with 12-cow swing parlor that they expanded to 18 and they left room for 2 more. They still have their first cow. She is 12 years old now. They do intensive rotational grazing. They supplement that diet with less than 12 pounds of grain per cow per day. Cropping is kept simple. The equipment is small and minimal to keep expenses down. They began crossbreeding their cows with New Zealand genetics early on but are now using US genetics. Heifer calves are bottle barrel fed until they are weaned on grass. By 2008, they had 100 milk cows.

Sheffer's Grassland Dairy milking parlor shortly after construction

The economic challenges faced by Sheffer's Grassland Dairy have been:
1) Return on Equity (ROE) swings of -8% to +23%
2) Herd growth led to needed investments
    a) Machinery
    b) Barns
    c) Added pasture
    d) Parlor size increases
    e) Added laneway and water

Farm growth has been quick. Growing out of necessity to stay economically viable. They have gone from 100 cows to 235 in 7 years. Hitting troubled times, especially in 2009 dairy prices and now. They were faced with overcrowding as they expanded their herd so they added a 244-foot barn to alleviate that. They also maxed out pasture base so in 2014 they bought additional land that adjoined their farm. They now have 270 acres of pasture. Double what they had starting out.

Sheffer's Grassland Dairy cows on rotational pasture

2014 was a light bulb year as milk prices were high. They had the land and experience in feed purchasing, cow health, and grazing management. It was time to switch to organic milk production.
Why switch?
- Timing
- Market strength and indicators, and
- Proven success with the bank.

The land transition in the early stages of transitioning to organic milk production:
- No large changes because of our basic management – pastures already in place,
- Missing urea nitrogen fertilizer, especially with some dry seasons,

- Investing in equipment for minimum till management and manure hauling, and
- Expansion of fencing and pasture base to ensure adequate grass for diet cost and certification. Thirty acres of woodland were cleared to add to pasture acres.

Building the organic business model required these steps:

- Started meeting with industry people early in the process for budgeting and prep,
- Met with major organic milk handlers during the first year of transition,
- Organic versus Grassfed Organic (no grain feeding) [Opted to supplement grass with grain], and
- Began building forage and grain connections and invested in some grain infrastructure to take advantage of our size.

After careful consideration, they decided to work on a first cost plus agreement with Stonyfield Organic. They wanted a change from the typical dairy relationships and wanted a partnership that promoted a mutually beneficial relationship. A lot of trust was established between both parties and countless hours were spent to make it successful.

Eric Sheffer and his family proudly pose at the farm sign that their milk goes to Stonyfield Organic.

The cow transition into organic milk production included:

1) Very little diet change because of their intensive grazing management, however
   a) Loss of Rumensin (Feed additive to help cows get more energy from the feed fed to them.),
   b) Loss of corn silage,
2) Planning for cow comfort investment,
3) Cow health a success (somatic cell-count usually 150,000 or less), and
4) Lessons learned with nutrition and grazing management.

What is next for Sheffer's Grassland Dairy?

- Better not Bigger (for now)
- Finishing and capitalizing on the barn expansion
- Dairy Grazing Apprenticeship (labor source while training someone to become a dairyman)
- Focusing on building working capital
- Investing in grazing-based improvements, as well as minor investments in balage production.

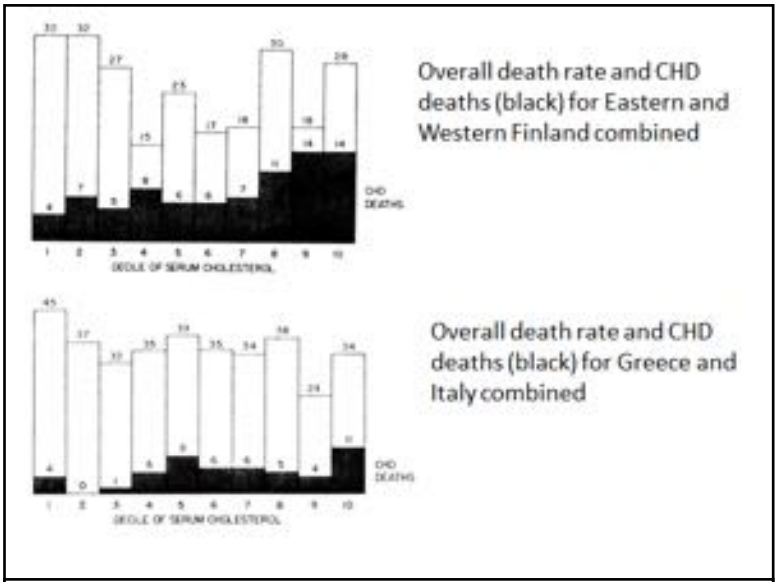
Major challenges in the organic market

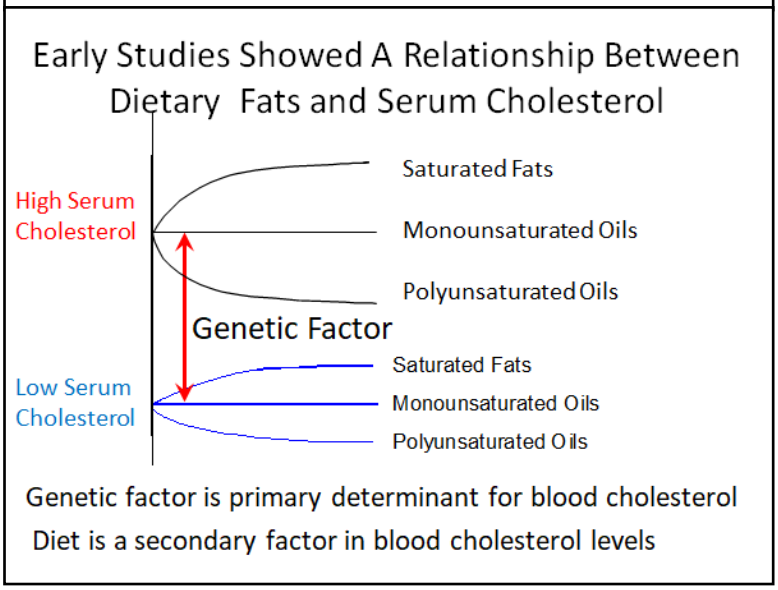
- Growing farm size and shrinking farm numbers
- Oversupply and depressed prices
- Certification dishonesty?
- Growing alternative markets

Session 7 – The Saturated versus Unsaturated Dietary Fat Controversy as it relates to Pasture-raised Dairy and Meat Products

On Friday, January 26, the last technical session was presented at 8:00 AM, Session 7 – *The Saturated versus Unsaturated Dietary Fat Controversy as it relates to Pasture-raised Dairy and Meat Products*. Our 2017 Conference concentrated on how pasture fed milk and meat products differed in fatty acid composition from confinement fed milk and meat products and how those fatty acids might be affected by processing and cooking. We also learned from nutritionists and dieticians that these fatty acids in pasture fed products tended to be the ones considered to be more heart healthy or more favorable to human health generally. After our Conference in March another conference was held in June that had experts speak out that people have been misled about saturated fats clogging our arteries. We invited two of those speakers at this year's NEPC Conference. What if we feed our livestock to change fatty acid composition in meat and milk and find out that the old nutritional science has it all wrong?

Our first speaker was Dr. Glen Lawrence, Professor of Chemistry and Biochemistry at Long Island University in Brooklyn, NY. His presentation title was: *Good Fat versus Bad Fat: How Did They Get It So Wrong*? He started his talk by asking the question, "Which is healthier? Vegetable oil or butter and coconut oil? Today's concensus answer is vegetable oil. But is it? A Framingham Heart Study published by Kannel, W. B. et al. in 1961 with early results indicated that as serum cholesterol levels increased from low (<200 mg/dl) to medium (200-240 mg/dl) incidence of death due coronary heart disease (CHD) went from 10% to 12% and if above 240 mg/dl to 18%. However, this is but one cause of coronary heart disease. The other risk factors are smoking, hypertension, and diabetes. Data from Ancel Keys' 7 Countries Study also showed a trend of more deaths due to coronary heart disease as serum cholesterol levels rose. However, Glen asked "Can we conclude that an increase of 6 mg/dl cholesterol in blood means one more heart attack death per 1000 people, or increased risk of 0.1 %?" Going from





180 mg/dl (low) to 240 mg/dl (border-line high), would increase death risk by only 1%. (Anything above 240 usually indicates dietary changes to reduce cholesterol levels, or if that fails, going on a statin.) The next figure showing data from Ancel Keys' 7 Countries Study on deaths from all causes shows propensity of more deaths from other causes than from cholesterol. In fact, one site chosen, Ushibuka, Japan, skewed the data in the figure due to mercury poisoning causing many deaths and it was only 40 miles from the Nagasaki where radiation from an atomic bomb could have also been a factor. Overall death rate and CHD deaths for Eastern and Western Finland combined when compared with overall death rate and CHD deaths for Greece and Italy combined gave rise to the Mediterranean Diet (olive oil) being touted as being more heart healthy (See Chart Comparison). Early studies showed a relationship between dietary fats and serum cholesterol. However, genetic factor is primary determinant for blood cholesterol. Diet is a secondary factor in blood cholesterol levels. If one looks at the CHD death rate for Greece and Italy over all serum cholesterol levels, it mattered little what their cholesterol was, there was a spike in deaths at the 5 decile level, but rather level overall until decile 10 when deaths spiked again at 11. Even the Finnish data on deaths is rather flat until decile of serum cholesterol 8 is reached and deciles 9 and 10 deaths are double of the lower decile levels. Changes in intake of saturated fats, mono-unsaturated fats, and polyunsaturated fats made a difference, but the increase or decrease in serum cholesterol levels is much smaller than the genetic factor effects on blood cholesterol levels. Other early studies:

- Diets prepared with only butter or coconut oil as fat sources increased levels of serum cholesterol in confined people.
- Diets prepared with vegetable oil as the major source of fat lowered levels of serum cholesterol in confined people.
- In one study, a control diet resulted in 250 mg/dL serum cholesterol during one leg of the study but resulted in 225 mg/dL serum cholesterol during another leg of the study.

Later studies in the 90's compared olive oil and palm oil in a free-living population. The results were much different. Choudhry experimental setup:

- Olive oil: Sat, 14%, MUFA, 78%, PUFA, 8%
- Palm oil: Sat, 45%, MUFA, 43%, PUFA, 11%
- Subjects fed palm oil diets for 30 days, with crossover to olive oil for 30 days or vice versa.
- Subjects were young healthy men and women

Results from the Choudhry experiment

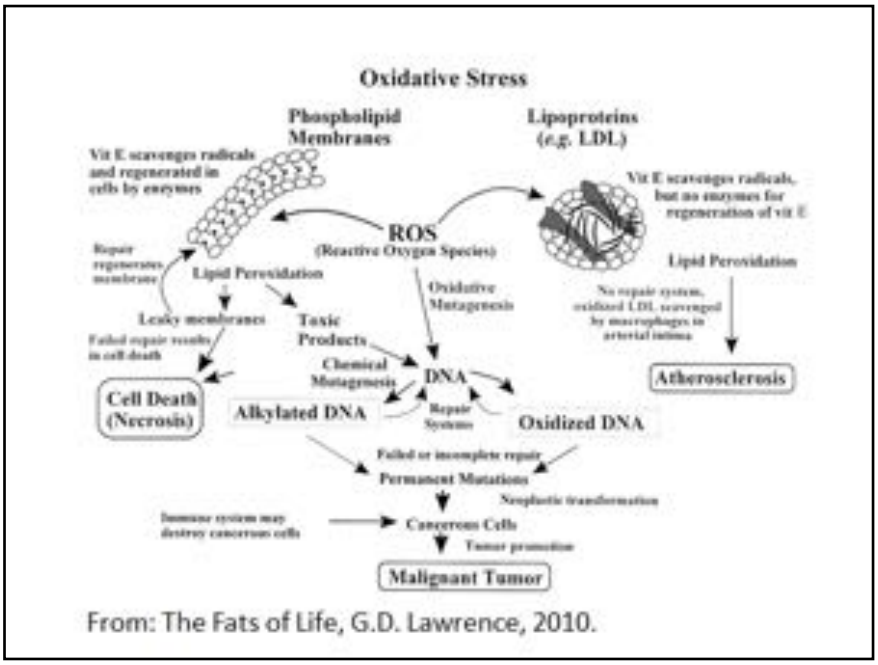
Variable	Normal Diet	Palm oil Diet	Olive oil Diet
Body Weight (kilograms)	66	65.2	65.3
Total cholesterol (mmol/L)	5.53	4.65	4.63
Triglycerides (mmolIL)	1.18	0.97	0.95
HDL-cholesterol (mmol/L)	1.28	0.91	0.8
LDL-cholesterol (mmol/L)	3.63	3.33	3.41
Tot Chol:HDL-Chol	4.32	5.11	5.79

Note that total cholesterol was reduced by both palm oil and olive oil over the normal diet to the same extent even though palm oil is much higher in saturated fat than olive oil. There was little change in bad cholesterol levels (LDL). Both palm oil and olive oil lowered good cholesterol (HDL) levels, but olive oil was the lowest of the three diets. The total cholesterol to HDL-cholesterol ratio was better for the normal diet although just above the range limit considered healthy of 2.0-4.0 standard. Meanwhile, the olive oil diet was the worst.

Data skewed regarding influence of replacing saturated fats with polyunsaturated vegetable oils. Many studies were not published when the data did not agree with the hypothesis (data selection and publishing bias!)

Dietary Guidelines for Americans (1980 to 2015). Long time with little change due to conformity and with disastrous results:

- Guideline - Reduce total dietary fat intake (Consequently, carbohydrates replaced fats, and sugar consumption increased dramatically.)
- Guideline - Reduce saturated fats (Vegetable oils were recommended to replace saturated fats, such as butter, to lower serum cholesterol.)
- Low fat replaced full fat dairy products (There goes your omega-3 fatty acid, the good one.)
- Consequently, sweetened juices (or soft drinks) replaced milk for many children.
- Obesity increased by 2.5 times
- Type 2 diabetes increased by 4 to 5 times
- Asthma increased
- Heart disease increased
- Metabolic syndrome increased
- Other inflammatory diseases increased



Lipid peroxidation occurs in the human body. Polyunsaturated fatty acids (PUFA) are susceptible to oxidation. Some of these oxidation products are detrimental to health. Omega-3 PUFA are handled differently by the body than omega-6. Lipid peroxidation of omega-6 can lead to atherosclerosis and produce toxic products that can interfere with DNA repair or oxidize it that can lead to mutations and cancerous cells that can promote tumor formation. The bottom line of all this is that studies have shown less tumors in carcinogenesis, less inflammation, and slower blood clotting that should reduce risk of cardiovascular disease (CVD) with ω-3 fatty acids compared to ω-6 fatty acids in the diet. This is the reason why the ratio of omega-6 to omega-3 should be below 4.0 which is possible with pasture produced meat and milk. Saturated fats (SFA) do not oxidize when digested. Corn oil, containing a high-level omega-6 PUFA, is worse for arthritis than beef tallow (SFA). For good human health, there is a need to drop omega-6 consumption and increase omega-3 intake.

Conjugated linoleic acids (CLA) have been shown to have anti-inflammatory actions by MacRedmond, R. and Dorscheid, D.R. (2011). CLA reduces allergies, asthma, atherosclerosis, colitis, diabetes, and rheumatoid arthritis. They also credit CLA with two anti-cancer actions: Blocks tumor initiation and proliferation and promotes death of cancerous cells.

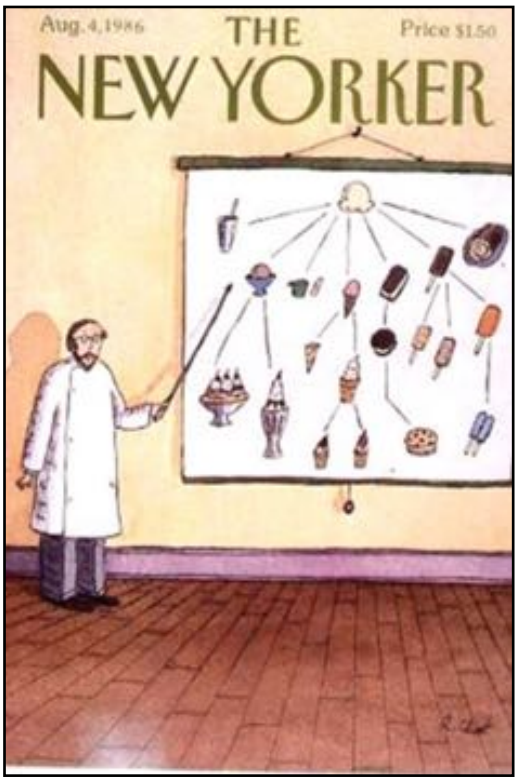
Saturated fatty acids and inflammation correlation has been often touted, but any augmentation of inflammation by saturated fatty acids is not necessarily from dietary sources. Also, the concentrations of palmitic acid, a SFA, needed to augment inflammatory cytokine release is 200 μM or more (>> serum concentration in vivo) while the concentration of PUFA derived lipid mediators needed to initiate an inflammatory response is only around 0.1 μM. Therefore, it is PUFA that causes inflammation, not saturated fats. A large proportion of dietary PUFA are converted to saturated and monounsaturated fatty acids for storage in body fat. This is probably how saturated fats were first considered to be the fat causing the inflammation.

Health Effects Attributed to Saturated Fatty Acids	Evidence to Support These Attributions
• Atherosclerosis (CVD)	• Not involved in mechanism
• Myocardial Infarction	• Not involved in mechanism
• Cancer	• Total fats for energy supply
• Inflammation	• Involved after initiation, not necessarily from diet
• Type 2 Diabetes	• Same as for inflammation
• Asthma	• Not involved in mechanisms
• Obesity	• Total caloric intake and other mechanisms involved

Consumption of high amounts of fructose (a sugar) when broken down during digestion creates modified and oxidized LDL that can lead to arthrosclerosis (CVD), formaldehyde and α-dicarbonyls that can cause asthma, cataracts, vascular damage, cross-linked proteins, and reduce oxygen delivery, triglycerides that are linked to abdominal obesity, insulin resistance, atherosclerosis, and non-alcoholic fatty liver disease, and uric acid that leads to gout, hypertension, kidney disease, and inflammation.

Glenn's concluding remarks were:

- Dietary omega-6 PUFA aggravate numerous diseases via lipid peroxidation (oxidative stress) and through bioactive eicosanoids.
- Inflammation is involved in many maladies that have proliferated since introduction of low fat, low saturated fat dietary recommendations.
- Low grade systemic inflammation increases with obesity and is invoked as a mechanism for insulin resistance and type 2 diabetes associated with obesity.
- Although saturated fatty acids can augment an immune response triggered by other factors, dietary palmitic acid would not necessarily be the major source for this phenomenon.
- Most adverse health effects erroneously attributed to saturated fatty acids are known to be exacerbated by high fructose consumption.



He last showed us a copy of The New Yorker magazine cover from 1986 and a title of a health article in it "It's Time to Reconsider Recommendations regarding Dietary Fats, Especially Dietary Saturated Fats Compared to Polyunsaturated Oils." It is about time that we really do reconsider before more tinkering with animal diets at the research level and farm level take place for no good reason.

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Our last presenter for this session was Dr. Adam Lock, Associate Professor, Dairy Cattle Nutrition, College of Agriculture & Natural Resources, Department of Animal Science, Michigan State University. The title of his presentation was *Separating Milk Fats from Fiction: Can We Alter Milk Fat Composition on Farm and do We Want/Need to Alter It?* He started his talk by quoting Capper & Bauman (2013) "The purpose of food is to supply nutrients within a balanced diet that sustains development, health, and well-being throughout the life cycle."

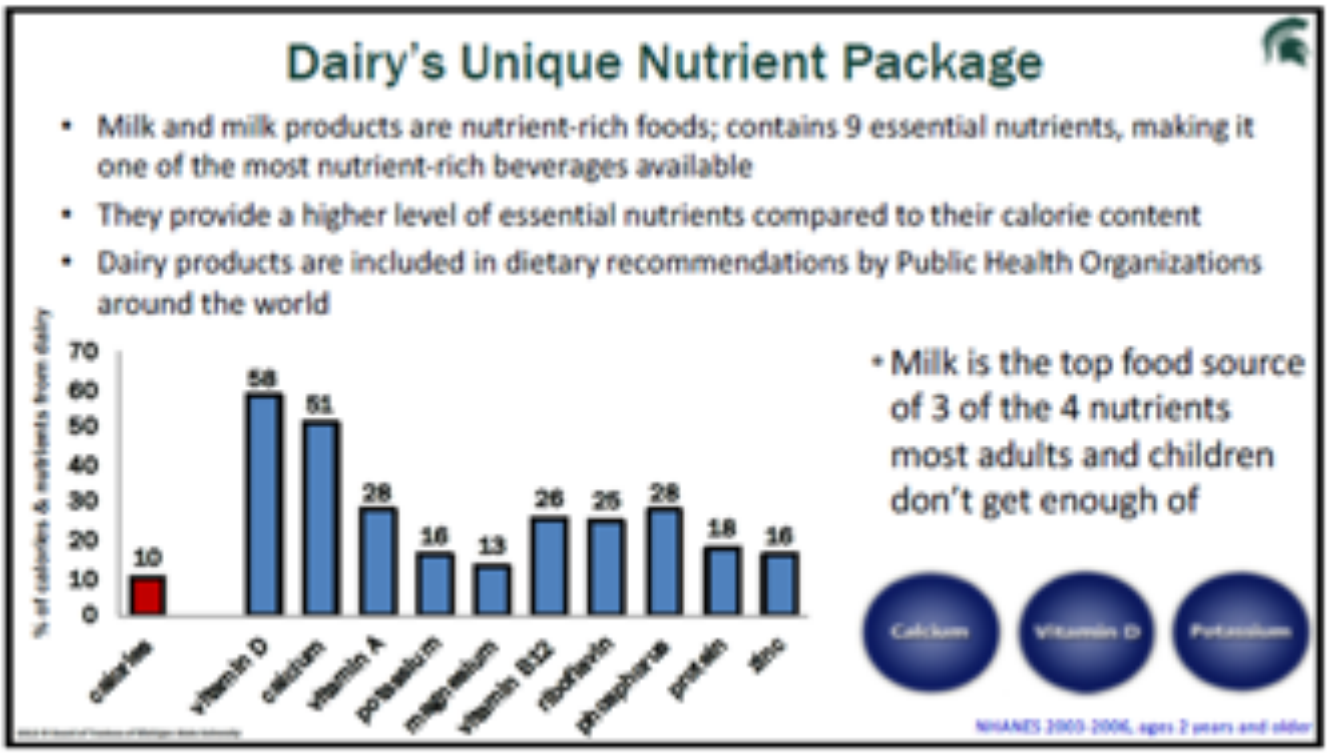
He asked: "What Does the Science Show?

- Do milk and other dairy products promote health maintenance and disease prevention?
  or
- Do milk and other dairy products have adverse effects on the maintenance of good health and is their consumption the cause of chronic diseases in humans?

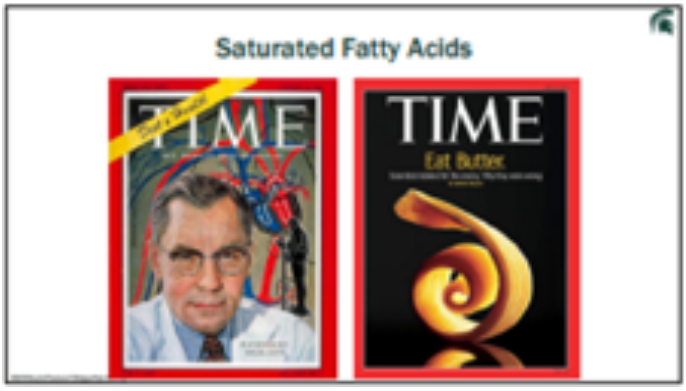
- Should we look at altering milk/milk fat composition?
  or
- Should we focus on promoting the unique role of dairy products in supplying essential nutrients and identifying the role of bioactive components in dairy products?

Dairy's Unique Nutrient Package:

- Milk and milk products are nutrient-rich foods; milk contains 9 essential nutrients, making it one of the most nutrient-rich beverages available.
- They provide a higher level of essential nutrients compared to their calorie content.
- Dairy products are in dietary recommendations world-wide by Public Health Organizations.
- Milk is the top food source of 3 of the 4 nutrients most adults and children do not get enough of, calcium, vitamin D, and potassium.



As Dr. Glen Lawrence said about fats in general, Adam said "New research and re-evaluation of previous research increasingly questions long-held dogma on the relationship between milk fat and human health". He also pointed out as did Glen that Ancel Keys originated the Diet-Heart Hypothesis that saturated fat was the cause of cardiovascular disease (CVD). Adam cited a review article done in 2000 that looked back at the Keys' original study and found that Keys only used 6 data points out of 22 available ones to get the good correlation he got in looking at death rate versus fat consumption based on percent of calories coming from fat. *Time* Magazine had Ancel Keys on their front cover in January 13, 1961 that sustained the myth about saturated fats being bad for your health. *Time* on June 22, 2014 with their front cover picture of a butter shaving admitted that scientists had been wrong for a quarter century about fat in the human diet. Headline read: "Eat Butter. Scientists labeled fat the enemy. Why they were wrong?" The same *Time* magazine front cover was displayed by Bruce Rivington at the Producer Showcase session.



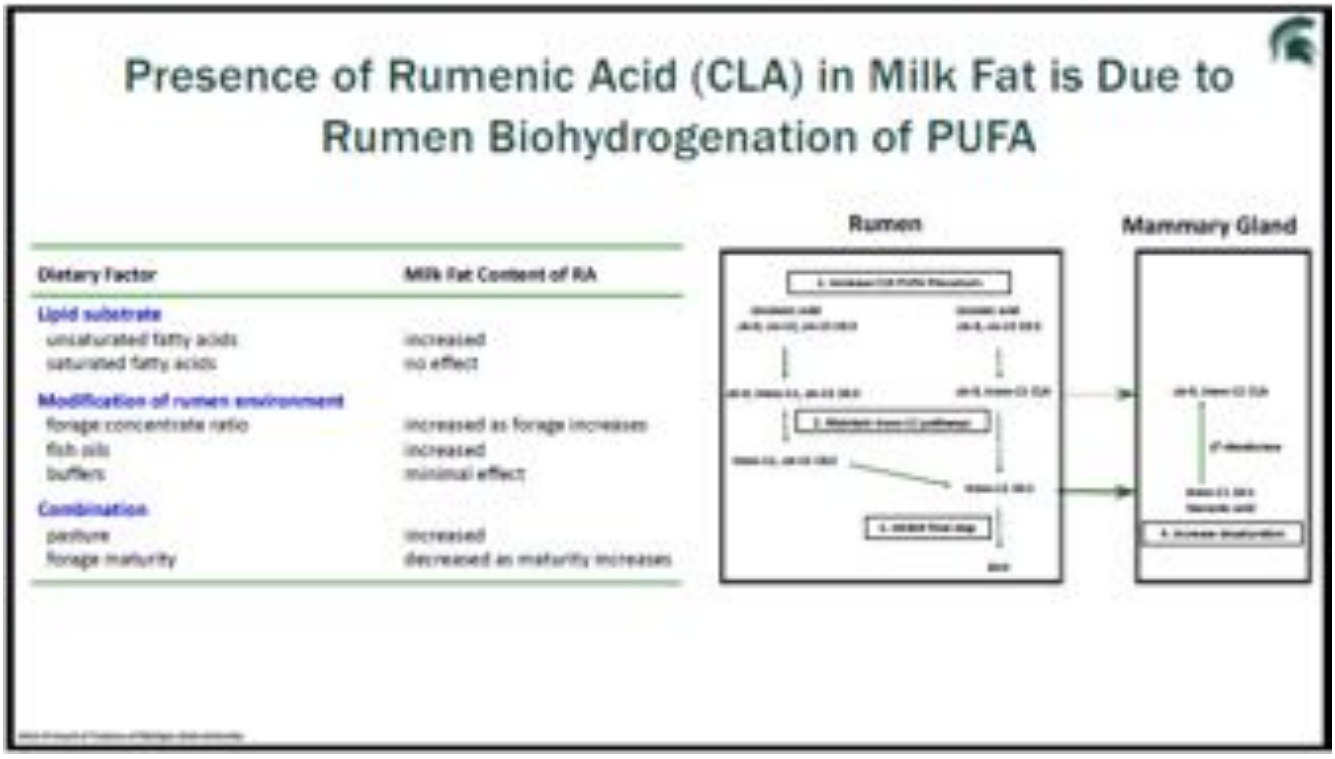
Adam cited the following three studies:

- "A meta-analysis of prospective epidemiologic studies showed that there is no significant evidence for concluding that dietary saturated fat is associated with an increased risk of CHD or CVD." Siri-Tarino et al. 2010. Am. J. Clin. Nutr. 19:91:535–546
- "After adjustment for demographics, lifestyle, and dietary cofounders, a higher intake of dairy SFA was associated with lower CVD risk. Associations between SFA and incident CVD depend on the food source; the consumption of dairy SFA is inversely associated with risk." de Oliveira Otto et al. 2012. Am. J. Clin. Nutr. 96:397–404
- "Available evidence from randomized controlled trials shows that replacement of saturated fat in the diet with linoleic acid effectively lowers serum cholesterol but does not support the hypothesis that this translates to a lower risk of death from coronary heart disease or all causes." Ramsden et al. 2016. BMJ. 353:i1246

Looking at a UK study, their conclusion was "Set against the proportion of total deaths attributable to the life-threatening diseases in the UK, vascular disease, diabetes, and cancer, the results of meta-analyses provide evidence of an overall survival advantage from the consumption of milk and dairy foods." Then there was this finding by D. Mozaffarian, Dean, Friedman School of Nutritional Science, Tuffs University, "I think these findings together with those from other studies do call for a change in the policy of recommending only low-fat dairy products. There is no prospective human evidence that people who eat low-fat dairy do better than people who eat whole-fat dairy."

This all then begs the question, "Do we need to alter milk fat composition?" Dairy contributes only 30 percent of saturated fat intake in the US. There are three challenges to altering milk fatty acid (FA) composition production by cows: rumen metabolism of FA, post-absorptive packaging and transport of specific FA, and limited conversion of effective fatty acids (EFA) (omega-6 and

omega-3 FA) to long-chain polyunsaturated fatty acids (LCPUFA). Unsaturated FA are toxic to rumen bacteria, so they convert it by hydrolysis and biohydrogenation. Ruminal bacteria change dietary unsaturated FA into Trans- and Saturated FA. This is done by biohydrogenation. Presence of rumenic acid (CLA) in milk fat is due to rumen biohydrogenation of PUFA. Milk and dairy products have beneficial effects on health, and despite concerted efforts, there is little evidence that anyone has meaningfully changed FA composition to an extent that would have any further impact. (Editor's Note: The figure below would tend to belie this last thought as a cow's ration when moved to more forage should produce more CLA as long as it is not too mature when eaten. It is a matter of what concentration of CLA is achieved and its human health impact. Conclusive scientific evidence is still needed.)



With this hardship of changing FA composition of milk, generally omega-3 levels in milk are low and not easily changed numerically, even if increased 100%, the level in milk would still be quite low. Stearic acid, a SFA, is the predominant FA available for absorption from milk. However, "A high daily intake of regular-fat cheese for 12 weeks did not alter LDL cholesterol or Metabolic Equivalents (MetS) risk factors differently than an equal intake of reduced fat cheese or an isocaloric amount of carbohydrate-rich foods" (Raziani et al. 2016). Adam also cited a *Hoard's Dairyman* comment: "After more than five decades of dirt being slung in the direction of whole milk, butter, cheese, and full-fat yogurt, recent research and nutritional advice have been swaying the direction towards full-fat dairy."

All milk, conventional or organic, should be promoted for its significant contribution to our nutrient supply and its benefits on human health.

Adam concluded by looking forward about milk fat

- Focus needs to move away from looking at large scale changes in SFA, MUFA, PUFA (bovine milk fat will always be a source of SFA in our diet).

- Focus should be on individual FA and the food source (matrix) that they are delivered in.
- Especially the impact of minor FAs in milk fat which we often did not previously identify.
- Milk has a variety of unique FAs - May be bioactive in unique ways (positive and negative).

Increased awareness of the concept of nutritional quality of food products in relation to environmental sustainability will further highlight an important role for dairy products in sustainable diets. Nutrient density must be included when assessing environmental impact. Milk is the densest of the beverages rated by the Nutritional Density Climate Impact Index (NDCI Index). This index is determined by dividing the nutrient density by GHG emissions (GHG – Greenhouse Gas). It is almost double that of its nearest rival beverage, orange juice.

Various consumer and technology trends will fuel and shape the future of dairy products and ingredients. Type of milk needed in 10 years will be very different as processors will primarily need milk components. Fluid milk sales have plummeted in recent years. We will continue to identify bioactive components in milk that have human health implications.

Take home messages are:

- Milk fat synthesis is highly coordinated.
- In large part, presence of numerous FA in milk fat is due to rumen biohydrogenation of PUFA.
- Overall, pattern of milk FA can only be very modestly changed.
- It is important to consider effects on animal production/efficiency and product quality.
- Milk and dairy products are a source of dietary saturated FA
    - Earlier efforts that demonized milk fat were inaccurate and inappropriate
    - Will take time for this message to work its way through educators, medical community, and consumers (Editor's Note: Undo the false narratives about saturated fat in the diet.)
- Milk is an excellent source of oleic acid, a FA increasingly recognized for its potential beneficial effects.
- Milk fat provides minimal n-3 FA especially in the forms of most interest (EPA, DHA).
- Disservice to industry and consumers and of questionable ethics to imply significant changes in milk fat composition are important when they are quantitatively very small and unlikely to have human health implications.
- Milk and dairy products have beneficial effects on health and despite concerted efforts there is little evidence that anyone has meaningfully changed FA composition to an extent that would have any further impact.

What does today's science show? Milk and other dairy products promote health maintenance and disease prevention; increased consumer acceptance of full-fat dairy products. Focus should be on promoting the unique role of dairy products in supplying essential nutrients and identifying the role of bioactive components in dairy products. Consumers will continue to be increasingly aware of where their food comes from; getting better at recognizing the impact of food that they eat on their health and wellness as well as society and environment around them. Sustainable food security to feed the world's rapidly expanding population represents the major global challenge of the 21st century. Animal source foods, especially dairy products with milk fat, will play an important role in meeting this challenge.

FY 2018 Northeast Pasture Consortium Conference Proceedings

Concurrent Sessions on Prioritizing Pasture Research, Education, and Technical Assistance

With the end of the technical sessions, the private sector and the public sector met in separate rooms to formulate changes to our pasture research, education, and technical assistance priorities. These two breakout sessions were chaired by Cliff Hawbaker, Private Sector Co-Chair Elect and Jessica Williamson, Public Sector Co-Chair Elect of the Executive Committee. We were all amazed at how similar both sectors were in the priorities they named and how to proceed with them when Cliff and Jessica reported back at the afternoon *Reports* session. The combined report is below:

Reports Session

2018 Research, Education, and Technical Assistance Priorities Report

1. Explore new methods to transfer knowledge and information to increase adoption of research findings within the agriculture community; incorporate social science research into increased adoption and technology transfer.
   - **Including Farm Bureau to additionally influence regulations and legislations**
2. *Ecosystems Services and Disservices from Pasture Systems and Grazing Management:*
   - *Impacts to riparian areas*
   - *Impacts to water quality*
   - *Wildlife benefits to adaptive grazing management*
   - *Impacts of permanent stream and streambank exclusion from livestock grazing riparian area pastures*
3. *Research problems with orchardgrass persistence and breeding in hay fields and pastures; variety and species evaluation (outreach component)*
4. *Parasite issues for pastured small ruminants, especially given climate change and possibly a longer, warmer grazing season.*
5. *Further fatty acid research in meat and dairy products regarding human nutrition and health; support of human artificial gut model for milk digestion studies*
   - ***Including A2 milk casein research***
6. Addressing the Heavy Use Area/Pasture interface (vegetation management).
7. *Incorporating and maintaining more legume-base within pasture systems (quality, N-fixation, and other benefits.)*

Flipchart ideas from 2017 farmer research/education priority session:

- Methods for informing consumers with latest research findings; funding to support it and Northeast Pasture Consortium; Cooperative Extension may be a method for information, research, and technology transfer and distribution.
- *Monetizing Soil Health; ecological resources, carbon sequestration, relative to nutrient levels in soil; ecosystem services;* ***impact of improved production.***
- YouTube outreach; website resources and links.
- Knowledge needed to help farmers meet new Ag Practices/Regulations and funding to install practices.
- *Genetic influence on livestock product nutrient values, mineral and nutrient uptake; Breed selection recommendations for the Northeast states.*
- Consumer education materials from check-off org's (Beef and sheep); collaborate with them to get resources out.

- Educate regulators and legislators on farm practices (state and federal).
- Addition of social science presentations to NEPC agenda; and
- **Improved availability of FA testing for farmers to evaluate their products.**

Italicized priorities are ones with a research component.
Bold print items came directly from the private sector session.

The Reports session continued with Dr. David Knaebel, Beltsville, MD, National Program Leader for Soil Biology and Soil Health giving us the **USDA -Agricultural Research Service report**. ARS does 5-year research projects. The projects must be relevant and solve a problem. There is a new website to introduce and coordinate Soil Biology: https://www.ars.usda.gov/anrds/soil-biology/soil-biology-home/. Soil biology falls under the Natural Resources and Sustainable Agriculture Systems Program Area. National Programs of interest in this Program Area to the Northeast Pasture Consortium are: Water Availability and Watershed Management (NP #211), Soil and Air (NP #212), Grass, Forage, and Rangeland Agroecosystems (NP #215), and Sustainable Agricultural Systems Research (NP #216). The Soil & Air National Program is co-led by Marlen Eve and Dave. The three components of the NP 212 2016-2020 Action Plan allow the sharing of resources and research to achieve goals are: component 1 – management and stewardship of soil resources, component 2 – managing nutrients in agroecosystems, and component 3 – reducing environmental risks in agriculture operations.

The Rangeland, Pasture, and Forages National Program (NP# 215) has four program components in its 2013-2018 Action Plan. The component of most interest to the Northeast Pasture Consortium is 2. Improved Pasture Technologies and Management for Enhanced Livestock Production, Conservation, and Ecological Services. Another program component of interest for those harvesting forages is 3. Improved Harvested Forages for Enhanced Livestock production.

There are many other Program Areas that have National Programs of interest to the Northeast Pasture Consortium, such as Nutrition, Food Safety/Quality with its Human Nutrition (NP #107), Animal Production with its Food Animal Production (NP #101) and Animal Health (NP #103) with its Component 6: Parasitic Diseases.

One of the ARS Facilities Conducting Functional Foods Research Available for partnering opportunities that the Consortium is already aware of is the Dairy and Functional Foods Research Unit at the ARS Eastern Regional Research Center, Wyndmoor, PA. It conducts relevant research focusing on developing technologies for healthful dairy-based foods and characterizing health-promoting components from food-processing wastes.

It is interesting how far ranging the Consortium is in its involvement with many scientific disciplines. Your interest in watershed management as expressed in your research priorities and the first session of this Conference is another great indicator of the wide-ranging interest you have along with the partnership with Dairy and Functional Foods Research Unit. Your interest in soil health was expressed in yesterday's soil health sessions.

Please contact me to do collaborative work with me or any of my compatriots.

The **USDA-National Institute of Food and Agriculture (NIFA) report** was given by Executive Director, Jim Cropper. James Dobrowolski, NIFA National Program Leader for water and rangeland

and grassland ecosystem programs, was enroute to meet with officials of the Society for Range Management as their annual meeting starts Sunday, January 28. Dr. Dobrowolski assembled the Power-Point presentation *NIFA's Competitive Programs Relevant to Rangeland and Grassland Ecosystems FY2018* and sent to Jim to present. These competitive programs are essential to the Northeast Pasture Consortium to keep us funded at a level that we can meet yearly to determine if the research and education priorities that we have set are being achieved, or if we need to redirect them to meet some other need(s), or some new priority has emerged that needs attention. We have directly applied to grant programs or have been a participant in grants written by our members. The PowerPoint presentation was tailored to address competitive programs in the President's Budget related to forage, grasslands and rangelands and the criteria used to judge grant applications for meeting funding requirements. Jim Cropper then narrowed his focus to those competitive grant programs most applicable to the Northeast Pasture Consortium. A big program is Agriculture and Food Research Initiative Foundational and Applied Science (AFRI) program. It contains several sub-programs, such as the Bioenergy, Natural Resources and Environment (BNRE) that supports research on healthy agroecosystems and their underlying natural resources that are essential to the sustained long-term production of agricultural goods and services. Agro-ecosystems may include crop production systems, animal, livestock, or integrated crop-livestock, production systems including harvested forages and feeds, pastures, range, and forest lands that are actively managed to provide economic, societal, and environmental benefits for individuals, communities, and society at large—$15M over 3-5 years ($500K each). Increased investments in the Foundational and Applied Science Program allow enhanced and focused investments in promising new areas in agricultural sciences. NIFA proposes $10M for investments in the plant and animal breeding program areas that support classical breeding efforts to improve crop and animal productivity, efficiency, quality, performance, local adaptation of cultivars and breeds, and development of public cultivars. It appears that to solve the orchardgrass die-off problem in the Middle Atlantic states that this program is one that we or one of our partners could apply to get a grant to find new cultivars of orchardgrass that are tolerant of summer heat after defoliation by a grazing or machine harvest event.

A key ingredient to getting a grant approved is to fulfill the "Integrated" prerequisite for proposals: Requiring Stakeholder involvement as an incentive to link science with farm management. NIFA wants the science to be adopted at the farm level. Quote: "Practitioners who look for 'actionable' knowledge seldom refer to academic research." The academic research must be packaged so that it is understandable and can be readily adopted or adapted by the farmer or rancher. Integrated research, education, and extension bring the three functions of the agricultural knowledge system (research, education, and extension) around a problem area or issue needing answers on how to solve them.

What does optimal integration look like? Research, extension, and education components complement one another and are truly necessary for the ultimate success of the project. The problem is solved once applied on the land. As the Consortium has been doing for over 20 years now, research should fill knowledge gaps that are critical to the development of practices and programs that will address the problem. Our stakeholders identify knowledge gaps so that researchers can best use their time to solve issues of most importance that results in quick adoption. Education is used to package the research into a readily understandable practice to apply. Education should strengthen institutional capacity and curricula and train the next generation of scientists, educators, practitioners, and citizens—innovation especially important for youth, perhaps a U-tube video. Extension should lead to measurable documented changes in learning, actions, or conditions in an identified audience or stakeholder group. A good example of this is the grass-fed and -finished research that was fostered by the Consortium, then developed into an educational program and then put on the land by many small beef producers through-

out the Northeast through Extension activities by interested nongovernmental organizations as well as university Extension. This Extension activity still needs to be ongoing as early adoption of grass-fed beef is a work in progress and needs to be more rigorously practiced producing a consistent and salable product. Behavior change has these elements:

- Awareness. The individual is simply aware the innovation exists.
- Interest. The individual wants more information.
- Evaluation. The individual mentally examines the innovation using the information gathered, trying to determine whether it will really impact their work and how it will make their effort easier or better.
- Trial. The individual tests the innovation to see if reality matches expectations, usually with small-scale, experimental efforts.
- Adoption. The individual likes the innovation and adopts it wholeheartedly. It is applied to all areas of relevant use and the individual often becomes a strong advocate.

Challenges and opportunities for NIFA's Rangeland and Grassland Programming:

- Challenge: Maintain balance between fostering transdisciplinary research and maintaining robust disciplinary research.
  - Opportunity: Include a convergence option in AFRI Foundational BENRE Program.
- Challenge: Provide opportunities to interact formally and informally.
  - Opportunity: Focus annual project director meetings and special symposia on convergence, encourage teams of researchers.
- Challenge: Identify rangeland and grassland as potential areas for convergence cultivation and evaluation.
  - Opportunity: Fully develop data management tools to help elucidate where rangeland and grassland activities across government converge to have the greatest impacts on societal challenges.

The **USDA-Natural Resources Conservation Service report** was given by Susan Parry, NRCS State Grassland Specialist, Harrisburg, PA. Kevin Ogles, our scheduled speaker, had a family illness to attend to this week. Susan said that NRCS is involved in the reorganization of USDA. This may aid in having an NRCS more technical assistance driven again. Specifically, on pasture issues, NRCS grazinglands specialists have been updating the pasture condition score worksheet and the scoring process to make it more user friendly. They are developing training courses on pasture condition scoring and the development and use of forage suitability groups (soil information driven to assess the potential of growing forages and selecting the best suited forages based on soil properties and intended use in the climatic area that they are found in). They are also working on having more pasture information in the National Range and Pasture Handbook. The Pastureland National Resource Inventory (NRI)is still on-going. They hope to publish the initial findings on plant species composition and pasture conditions on pastureland across the Nation in two years. The Rangeland NRI was published recently. It takes 10-12 years of data collection before there is sufficient data to get reliable estimates. The inventory procedure is quite intense, so the data collection is time-consuming and therefore limits how many sites can be visited during early to midsummer. Time frame for collecting the data must be somewhat narrow so as not to have significant changes in pasture conditions just due to the passage of time during the growing season.

FY 2018 Northeast Pasture Consortium Conference Proceedings

The **Special Report – Allen Matthews, Director and Instructor of Sustainable Agriculture, Chatham University, Pittsburgh, PA.** ***Grass Fed Beef Value Chain Marketing*** was given by Jennifer Colby. Dr. Matthews had a conflict in his schedule that arose unexpectedly beyond his control. Jennifer gave the highlights of the publication produced by Dr. Matthews. The market place summary is below:

Size and Scale

- Of the seven aggregators, 6 are small to mid-size, each finishing an average of 833 animals per year, with Vermont animals representing 15% of the total volume. The large-scale aggregator finishes up to 36,000 animals per year, and sources less than 1% of its feeders from Vermont.

- The 6 small to mid-size aggregators have an average of 27 farms in their portfolio, with 24% of these being from Vermont. The large-scale aggregator has 200+ farms in its portfolio with one feeder farm and no finishing farms Vermont.

- In 2016 Sodexo purchased 15.4% of its food budget on products that met the Vermont First definition. Within the beef category, Sodexo spent $1.051 million dollars on beef in 2016; $202,000, 19% of the total meat spend was on local pastured, grain-finished beef.

Product & Market

While three of these aggregators are solely grass-fed, grass-finished suppliers, most of the beef sourced locally is pastured, grain-finished animals. Reasons given for this include:

- Inconsistent Quality, Size & Lack of Standards for a local grass-finished product versus the quality and accepted standards available from imported grass-finished product (AU, NZ).
- Yet unconvincing value proposition for the average consumer, the premium required for a local, grass-finished product exceeds their price sensitivity threshold, and these consumers still want a "tender" and familiar tasting beef experience. While a local, pastured grain-finished animal may not be perceived as sustainable and healthy as a pastured, grass-finished animal, it is an "entry point" and more accessible product for consumers seeking an alternative to conventional beef. Feeding grain reduces Northeast producers' cost of goods sold by both speeding up the product life cycle and replacing high cost of nutrients in high quality winter hay with lower cost nutrients from grain inputs[1/], thus producing a viable, sustainable, and accessible price point to consumers and producers. Simultaneously, the grain makes the finished product more familiar and thus appealing to the end user. The pasturing and localness appeal to consumers' emotional attachment to sustainability, well-being, and animal welfare, for which consumers are willing to absorb a moderate premium over conventional beef. On the flip side, consumers seeking grass-fed, grass-finished beef specifically, for personal health benefits (higher levels of omega-3 fatty acids and CLA anticancer properties, lower levels of saturated fats) only care to pay a premium for the product's feed, not an additional premium for where it was sourced or how it was raised.
- Immature Supply Chain - the local/regional supply chain for pastured, grain-finished animals is established. Buyers can source local pastured, grain-finished product as boxed beef without having to balance whole carcasses themselves, this is not yet an option for local grass-fed, grass-finished product.

[1/] Pound per pound, the hay is less expensive. It is the nutrient density of the grain that makes it cost-effective. It also provides more energy that is somewhat lacking in the hay.

Over time, it is expected that the average consumers now choosing between conventional and local, pastured, grain-finished will evolve along the continuum and begin to choose between purchasing local, pastured, grain-finished and local grass-fed, grass-finished as an even better choice for both sustainability and personal health. It is uncertain whether those choosing grass-fed for its health properties now will evolve to associate additional value for how and where the product was raised.

- Preferred breeds are English, especially English crosses. Examples include Hereford, Angus, Devon, and Hereford crosses.

- The market is moving away from cow-calf operations to efficiency driven systems in which many often smaller farms specialize in raising feeder calves to supply a smaller number of large finishing farms.

- The market is moving away from whole and half carcasses to boxed beef.

- The trend in institutional markets is moving away from meat-based proteins as the center of the plate, turning towards plant-based proteins instead.

Pricing

- The average price aggregators and distributors paid to farmers for hot, hanging weight, grain, or grass-finished, local beef is $2.74/#; variation in price ranged from a low of $2.25/# to a high of $3.25/#, representing up to $687 in net income variation per carcass to the farmer.

- The average price aggregators and distributors received from retail buyers for hot, hanging weight, grain or grass-finished, local beef is $3.76/#; variation in price ranged from a low of $2.86/# to a high of $5.06/#, representing up to $1,511 in net income variation per carcass to the aggregator/distributor.

- The average price retail buyers received from consumers per pound of finished product per carcass is $11.46/#, which equates to $7.11/# hanging weight. Variation in pricing ranged from a low of $5.84/# hanging weight equivalent to a high of $10.32/# hanging weight equivalent; representing up to $3,079 in net income variation per carcass to the buyers.

- Price paid by aggregators and distributors to farmers represents 73% of the price received from buyers, yielding a 27% gross margin on Cost of Goods Sold.

- Price paid by buyers to aggregators and distributors represents 51% of the price received from consumers, yielding a 49% gross margin on Cost of Goods Sold.

Production Yields for New England & New York

- Finish yields
    - ➢ The average finish live weight is 1,200 # with an average carcass yield of 57%
    - ➢ The average yield of retail cuts is 426 #, 62% of carcass weight
    - ➢ The average age at slaughter is 24 months
    - ➢ Only the most proficient producers are producing a 2-pound per day rate of gain

- Feeder yields*
    - ➢ The average feeder live weight when transitioned to finishing is 800 #
    - ➢ The average feeder age when transitioned to finishing is 16 months

*Feeders refers to weaned calves grazing pasture and of sufficient weight and maturity to be placed on high-energy rations for finishing.

Processing

- Processing costs in New England can run up to $800 per head.

- Processing costs for the four large national processors (Tyson, JBS, Cargill and National) can cost as little as $100 per head

- Larger regional branded grass-fed, grass-finished, and "natural" beef programs using national or regional packinghouses can secure volume-based pricing bringing their processing fees down between $100-400/head.

Opportunities

- Develop the supply chain for local grass-fed, grass-finished beef
    - ➢ Support and assist aggregators and distributors in efforts to begin local grass-finished carcass balancing and boxed beef availability at scale (Fleisher's for example, would like an aggregator to balance 5 carcasses per week). With load balancing, retailers have leverage to grow the market.
    - ➢ Develop an agreed upon set of standards for a local grass-fed, grass-finished product.
    - ➢ Support and assist local/regional processors in establishing volume-based pricing for aggregators. With volume-based pricing, processors are ensured a steady supply of work, and aggregators can optimize their cost of processing, providing a more competitive price for their finished product.
    - ➢ Support R&D for technological advances that improve product quality and supply chain financial viability. For example, "Wet-aged" cryo-packed sub-primal beef has been standardized for processing in commercial markets. This technique allows the beef to age-chilled in a case for 35 to 45 days. This aging process improves tenderness and taste without as much weight loss as "dry-aged" beef, which usually hangs for 14 days with a 5% weight loss per week.

- Support efforts to increase sourcing of local, grass-fed, grain-finished animals
    - ➢ Pineland Farms Natural Meats expressed a desire for more Vermont producers. Feeder farms are 100% grass based, and animals raised in Vermont could then be shipped to either grain or grass-finishing farms.
    - ➢ Pineland Farms Natural Meats also expressed interest in establishing grain finished finishing farms in Vermont.
    - ➢ To help catalyze the Vermont beef industry, Sodexo will work with Black River Meats to identify opportunities to increase the percentage of Vermont raised animals in the Black River Meats Northeast Raised product line.

- Transform the move away from meat as the center of the plate to a local beef advantage
    - ➢ If institutions adopted a "Less Meat, Better Meat" philosophy, maintaining their current meat budget but directing it towards local pastured, grain-finished, or grass-fed, grass-finished product they will support a local beef industry while achieving their local purchasing and sustainability initiatives.
    - ➢ If Sodexo Vermont's entire beef budget were entirely redirected to locally sourced beef it would create an influx of $850,000 into the local beef supply chain.

Business Meeting

The business meeting of the NEPC was abbreviated this year to present a very thorough conference program and prioritize the research and education needs going forward. It was presided over by Jennifer Colby and Cliff Hawbaker. Jim Cropper pointed out that the Northeast Pasture Consortium is a project of the Northeast Regional Association of Agricultural Experiment Station Directors (NERA). We are designated as a Multistate Research Coordinating Committee and Information Exchange Group. We are in our second year of another 5-year extension. We have been advancing the science of pasture-based livestock farming now for 22 years by collaborating with scientists at the member universities and USDA-Agricultural Research Service, Extension forage and livestock specialists, USDA-Natural Resources Conservation Service grazing lands specialists, pasture-based farmers, and agribusiness people involved in agronomic and animal husbandry issues or processing the products produced on pasture.

Cliff Hawbaker reported that the Private Sector had nominated two people to be on the Executive Committee. Mr. Gary Burley had agreed to fill the unfinished term vacated in 2017 by Richard Swartzentruber. There was one remaining year to that term. Mr. Kevin Jablonski was nominated to become the new member-at-large for 2018-2019. Cliff moved that the nominations be closed, and Susan Parry seconded. Both Gary and Kevin were approved unanimously by the members present. Jennifer opened the nomination of a new member-at-large for the Public Sector. Daimon Meeh was nominated and he provisionally agreed but said he would have to get his supervisor's approval. Susan Parry moved that the nominations be closed, and Jim Cropper seconded. Both were rather sure that Daimon's supervisor would approve. Daimon was approved unanimously by the members present to be the Public Sector member-at-large for 2018-2019.

In other business, Susan Parry recommended that the Consortium member list be updated so that the new by-laws could be sent out to the membership for comment and approval. She also recommended that we recruit more farmer representatives from each of the 12 states in the Northeast Region. Ideally, each state should have 3 representatives.

Diane Schivera, who had stayed on the Executive Committee for an extra year as a Private Sector member, remarked that she had enjoyed her time on the Executive Committee. She thought it was a great group to work with.

Jessica Williamson asked for some comments from the membership about this year's conference program. Cliff Hawbaker advised that we have actual testimony from farmers on practices that they had installed that we developed and championed. Get their evaluation on how well the practices work on the farm. Perhaps they could give advice on how to better implement a practice. Cliff also suggested

that we consider a farmer panel to discuss a topic of interest. Jessica suggested that the Executive Committee do a survey of the membership on program changes that they would like to see. Jennifer Colby suggested doing an overview of the day's events for farmers to add context to why the sessions were important to pasture-based farmers.

David Knaebel recommended the Consortium membership check out the National Association of Conservation Districts (NACD) Soil Health Champions Network. NACD created the Soil Health Champions Network in 2015 to promote soil health education and outreach among American farmers, ranchers, and forestland owners. Today, the Network is comprised of more than 200 landowners and operators who are implementing conservation practices on their land and championing the benefits of soil health within their communities.
URL: http://www.nacdnet.org/get-involved/soil-health-champions-network/.

Clyde Bailey announced to the membership that the Appalachian Grazing Conference will be held on March 7-9, 2019 in West Virginia. Exact location has not been chosen yet. He invited us to come and hold our Conference there as well prior to theirs.

Mr. Cropper thanked three Executive Committee members for their great service to the Consortium the past 4 years, and in the case, of Diane Schivera, 5 years. Mr. Angus Johnson is a very ardent supporter of the Northeast Pasture Consortium and continues as the Chair of the Stakeholder Action Committee. Ms. Susan Parry was passionate for providing a blueprint for the Consortium to become even better organized to make a difference in pasture-based agriculture in the Northeast Region and beyond. Diane Schivera got a special thank you for sticking around an extra year and giving us her special insight on things while battling Lyme disease.

He then welcomed Gary Burley and Kevin Jablonski to the Executive Committee as Private Sector members and told Daimon Meeh that he would send him an email outlining what the Executive Committee does so his supervisor can make an informed decision about Daimon's participation on the Committee. He said he would send Gary and Kevin the same information to them as well to get them prepared for serving on the Committee.

With that Mr. Cropper asked for a motion to close the business meeting and conference. Fay Benson moved to adjourn. Karen Hoffman seconded the motion. Motion carried, and meeting/conference was adjourned. Jim Cropper thanked everyone remaining for staying on and staying engaged. The participation and attention were great throughout the conference and business meeting.