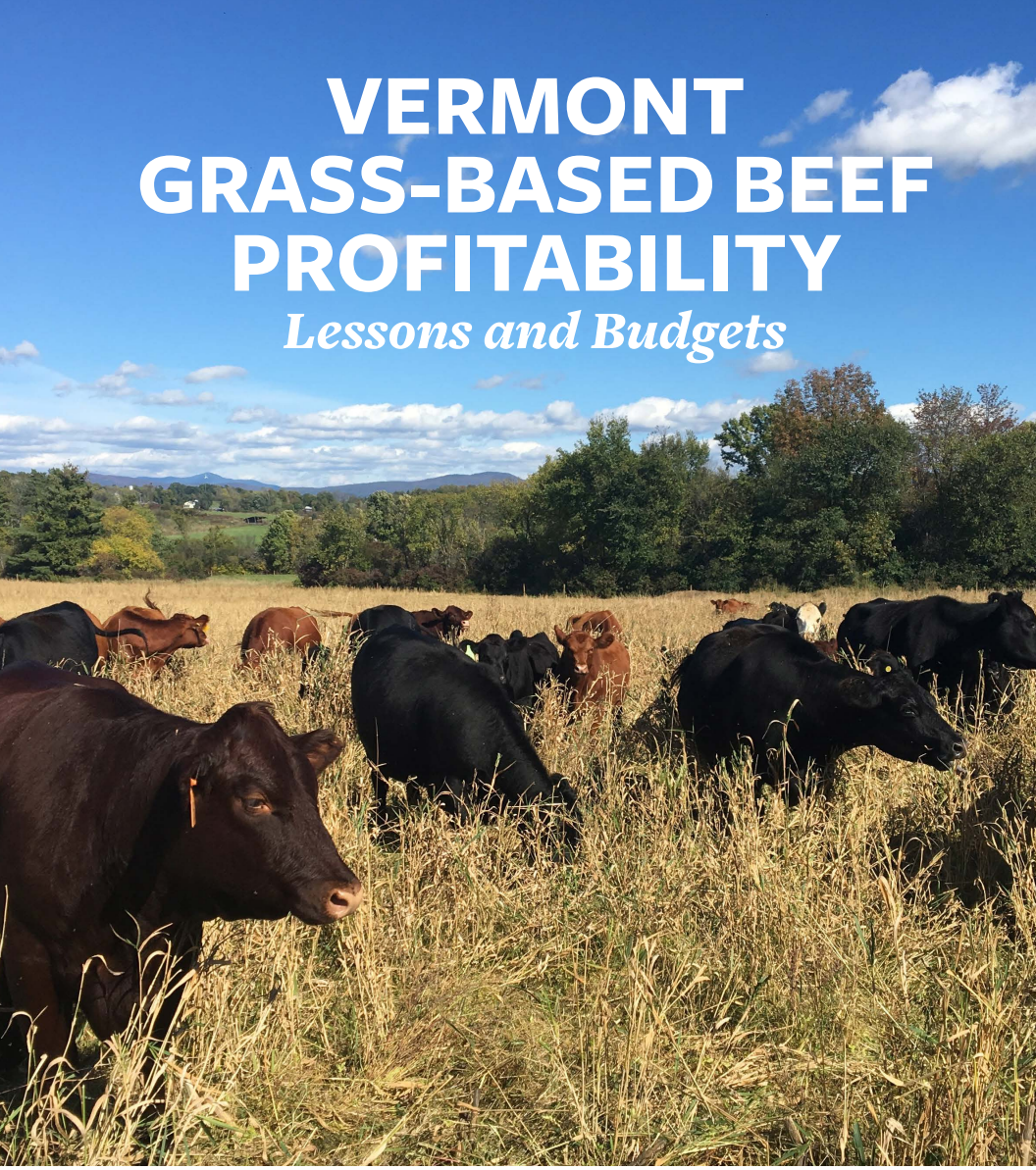
VERMONT GRASS-BASED BEEF PROFITABILITY

Lessons and Budgets



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INTERVALE CENTER

farm to plate
STRENGTHENING VERMONT'S FOOD SYSTEM

Acknowledgements

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Table of Contents

Project Summary

The concept for this project was developed in 2015 to better understand the perceived growth in the market for grass-fed meats and concern around the profitability of small-to-midsize grass-based beef farms. Grass-fed beef production is a good fit for Vermont's land base, and there is a desire among new and established producers to start or expand their beef enterprises. The goal was to identify best management practices and create economic models that can be used to improve the viability of grass-based beef businesses in Vermont. We hope that this project will help new and current beef producers develop deliberate and knowledgeable approaches to mitigate the production and financial risks associated with engaging in grass-based beef enterprise development.

Six beef producers were interviewed on their farms, and information gathered from them that was determined to be important for profitability and success was used to inform this report.

The project team also included information gathered from grass-based beef workshops and other reports to supplement what was directly provided by farmers. From the direct interviews and supplemental resources, financial templates for a cow-calf operation and a feeder operation were created--found at the end of the report--that the project team believes cover the typical variables for a Vermont producer.

While many of the results of this research are discouraging, it is important for producers to apply their own specific situation to the scenarios outlined in the report to determine whether grass-based beef enterprise development is right for them. In general, we found many differences and a few similarities between the six producers we interviewed. These are the central conclusions we can draw as a result of those interviews:

- Beef producers must align their production characteristics

with the markets they are serving. The market for grass-based beef in Vermont is competitive, so raising an animal without a target market can be financially harmful. There is no one right way to raise an animal for beef in Vermont, but producers that are successful know their markets and the attributes that those markets desire, and they tailor their production practices to achieve those qualities.

- Producers can improve the profitability of their operations through improved grazing practices that allow for increased stocking density. These practices include well timed rotations, extending the grazing season using stockpiled forage, and improving pasture productivity through good management and bale grazing. (Bale grazing involves setting out a large number of feed bales in the fall and regulating the cows' feed intake using electric fencing.)

- Producers benefit when they identify and access markets with higher price points and reduce overhead by accessing leased land.

- Financial and production tracking is crucial to developing a successful beef enterprise. Producers need to know their costs of production and the potential growth rates and finishing dates of their animals to align with markets.

- The animal's age at the time of finishing is important. Each additional day that an animal is kept on farm, even in the summer, has associated costs and implications for the profitability of a beef enterprise. The costs of holding under-finished animals through a second winter can have a severe impact on profitability.

- Financial modeling shows that operating small to medium scale grass-fed beef operations can lead to significant financial losses for producers, and each producer should have a comprehensive business plan before beginning or expanding production.

While the financial models show that the profitability of grass-fed beef can be challenging, it is possible to achieve success, as the producers we interviewed exemplify. The production model is a good fit for the agricultural land base of Vermont and has the potential to have positive impacts on the landscape and community; however, **producers must be meticulous on their genetics, grazing, slaughter timing, and age to keep their costs of production low. They must also keep their debt and infrastructure to a minimum.** Given this better understanding of the cost of production, this project will hopefully spur discussion and action around developing markets that are profitable for producers.

Financial and production tracking is crucial to developing a successful beef enterprise. Producers need to know their costs of production and the potential growth rates and finishing dates of their animals to align with markets.

Background

In order to understand beef production in more detail, the Intervale Center team and Sarah Flack, an independent grazing consultant, visited five beef producers in Vermont and New York. We also spoke to one producer from out of state over the phone. The farms looked at varied in size and production systems. Some were 100% grass fed, some were grass-based and fed a small amount of grain, and some fed hay and grain. Farms using the cow-calf model of production were visited as well as farms that just raise feeder beef animals. No farms were visited that only raise calves for sale as young stock.

When the project team visited farms, a series of questions were asked about animals, feed, land, grazing practices, housing, water, labor, health, slaughter and processing, sales and marketing, data tracking, price, and profitability. Live animals and the fields used

for grazing and haying were also examined.

Findings were then compiled into this summary of best management practices for grass-based beef production. At the end of the report, you will find budgets for a cow-calf operation and a feeder operation, a capital budget for starting a grass-based beef operation, and narratives for these budgets. Our hope is that this information will help those interested in starting new beef farms, or improving the financial viability of existing farms, to make well-informed decisions.

Market Assessment

For a farm to be profitable, they need to identify a consistent market that aligns with their production model, product quality, and price point.

The most important factor influencing the profitability of a beef operation is the markets that are available. In order to achieve profitability, a farmer must identify a consistent market that aligns with the farm's production model, product quality, and price point. All of the producers in our study had cultivated specific markets, usually over a number of years, and shifted their production practices to meet the needs of those markets. New producers or existing producers wishing to grow their businesses should work to fully assess their proposed markets before developing out their beef enterprises.

The producers visited as part of this project sold to a wide variety of market channels, including direct to consumer at farmers' markets, direct to consumers through beef boxes, quarter, half, and whole animals, direct wholesale to grocery stores or restaurants, and wholesale to an aggregator. Each of these markets holds its own challenges and benefits, and producers should assess how their own personal strengths and weaknesses align with the market they are trying to access. It is also very important to assess the depth of a prospective market and the level of existing competition. As the market gets more and more competitive, quality of product will become more important. The table below explains in more detail the considerations of different market channels. Producers should identify what market they have access to and whether or not they have the production skills and capacity to meet its needs.

As competition increases, buyers have more power, and price and consistency become more important.

Market Type	Price	Size of Market	Importance of Consistency	Time and Responsi-bilities
Direct to consumers through farmer's market	Higher	Small	Somewhat important	Lots of time selling directly to customers
Direct to consumers through boxes, quarters, wholes, halves	Higher	Small	Less important	Lots of time communicating and coordinating with customers
Direct wholesale	Medium	Medium	Very important	Lots of time communicating with stores and restaurants, delivering product
Wholesale or aggregator	Lower	Large	More Important	Lots of time communicating with buyer, ensuring carcass grade and quality

In addition to understanding the different markets that could exist for a producer, it is also important that producers understand the current state of beef markets in Vermont. In July of 2017 a report, "Grass Fed Beef Value Chain Research," by Rose Wilson and Allen Matthews was published (available at http://grazingguide.net/pdfs/GrassFedBeefValueChain20180118.pdf). Many of the findings of the report are important for current and prospective producers in the grass fed beef market to consider when starting or expanding a herd.

The study found that the majority of beef sourced locally by aggregators in Vermont is pastured and grain finished, not grass finished. The main reasons for this are inconsistencies in the following areas:

- An unconvincing value proposition for the average consumer considering the premium required for grass finished beef because of inconsistency of size and quality, and a general lack of standards;
- An immature grass finished supply chain;
- The market is moving away from cow-calf operations to efficiency driven systems where farms specialize in raising feeder calves to sell to a small number of specialized finishing farms;
- Institutional markets are moving away from meat based proteins to plant based proteins at the center of the plate, which therefore reduces their demand for these products;
- In general, consumers still want a tender beef product that tastes familiar to them. A local grain finished animal can serve as an alternative to conventional beef as well as an entry point with a more accessible price point for consumers. Meanwhile, the study found, those consumers who want the health benefits of a grass finished product do not normally care where the product is raised or processed. They only care to pay a premium for the way the product is fed.

The report highlights that nationally, grass fed and grass finished beef is an emerging market, and because of that, large packing houses are developing their own vertically integrated grass fed and grass finished product lines. As competition increases, buyers have more power, and price and consistency become more important. Buyers also prefer boxed beef instead of whole animals so they can eliminate carcass balancing. There also has been inconsistent quality of product, confusing marketing for grass fed beef, weak standards, and inability to compete on a national level on the cost of processing. The findings of the study do not demonstrate a large wholesale

demand for grass finished products in Vermont at the moment because of these challenges.

The study found that the preferred breeds are English, especially English crosses such as Hereford, Angus, and Devons. The average price that aggregators and distributors paid to farmers at the time of the study for hot, hanging weight local grain or grass finished beef was $2.74/ pound. The low price was $2.25/pound, and the high was $3.25/pound.

The producers we spoke to were getting between $2.87/pound and $5/pound for direct wholesale markets. Some of the producers we talked to were selling direct and getting much higher prices on average but had a limited market at the higher price point. Farmers must understand their cost of production to know if they can compete in a market with these prices. Consumer demand and competition from less expensive beef raised outside of Vermont will continue to drive these prices down for producers.

Farm Finances

Grass-fed beef production can be challenging financially. Whether a producer is raising cows and calves on their farm, or just finishing calves, start up capital should be a significant consideration. Beef production requires a large amount of capital to get started on top of the cost of acquiring farmland. Unless markets and throughput warrant this type of investment, it is difficult to attain positive cash flow, even with affordable debt capital from agricultural lenders.

Whether you're raising both cows and calves on your farm or just finishing calves, start up capital should be a significant consideration. Beef production requires large amounts of capital to get started on top of the cost of acquiring farmland.

After talking to producers and creating budgets for a model farm operation, it became clear that many producers are not performing at a level to show annual net earnings from raising grass fed beef on their farm, especially if they have to invest significantly in equipment or land. Most of the producers we spoke with are working an off farm job or have a partner working off the farm.

With the emergence of alternative forms of "patient capital," alongside owner contributions, there are other ways to finance the operation so as to defer repaying the investment in the first few years. This would theoretically allow for time to develop markets and delay repayment until the operation demonstrates greater repayment capacity. We did not include this scenario in the budget, but our model could be adapted to test for feasibility of a slow growth "patient capital" model. However, the presence of low- to no-cost capital for land, cows, and equipment does not solve the need for supplemental working capital to cover annual deficits. Until markets can pay a price high enough to cover the true costs of production, a small to mid-scale grass-based beef operation will struggle to return a net annual gain. This will need to be considered in light of an individual's financial picture and long term financial goals.

If the working capital issue is addressed and the operation is able to at least break even, there will be a presumed benefit to the balance sheet as owners/investors are paid back, and/or principal on loans are paid down through amortization. In our models, with a debt-based initial capitalization and financing plan, it would still result in a significant loss of equity over five years.

Record Keeping

Interviews revealed that many farmers are keeping good production data, such as live weight, hanging weight, cut outs, etc., but are less likely to keep good financial or sales information. This is important because using the financial models we

developed requires that operators are involved in overall record keeping and financial management using a computer and appropriate software in the farm office. Specifically, the models were created assuming that producers are:

- Using production software, such as Cattle Max, with associated mobile app to make real time herd management decisions. Some of the producers we interviewed just used Excel, but all were tracking their production numbers.
- Using Quickbooks or equivalent for timely bookkeeping, payroll, and regular reporting.

It is essential for operators to closely track and interpret data well in order to make sound decisions about their operation.

Land Assessment

Land assessment lies at the heart of determining the carrying capacity of a grass-based beef operation. Each farm has unique characteristics that will determine what type of business and scale of operation is the best fit. Asking a series of questions, and making sure they are the right questions, may be a good place to start, such as:

- How many acres of good quality pasture are there?
- How many acres are available for hay production, which could also be grazed after first or second cut to lengthen the grazing season?
- What kind of infrastructure is available at the farm?
- What is the right herd size for the farm?
- How would that change if the herd was either fed some grain vs 100% grass-fed?
- What if you graze all the land and buy the forages?
- What if you want to make all your own hay?
- How much less land would you need if you invest in a better grazing system and soil amendments to produce more high-quality pasture and forage on the current land base?

Step one is a thorough assessment of the land-base and farm resources. It is critical to make sure the land base and its capacity to provide pasture and stored forages matches animal numbers and level of production.

How to do a land base assessment

When doing a land base assessment, there are two primary questions you're trying to address: (1) How many acres of land are available to this operation? And (2) What is the productive quality of that land? Answering the following questions will give you the information you need to adequately address the two primary questions:

- How many total acres?
- How many acres of tillable cropland with good soils?

- How many acres of hay land and good quality pasture?
- How many acres of less productive pasture?
- How much of the land is seasonally wet or very rough/rocky?
- How much of the land that can be grazed is contiguous to allow easy herd movement between areas?
- Is there additional close by or contiguous land that could be rented to add more acres of pasture or forage harvest?
- Is there an on-farm source of bedding material?

How to do an infrastructure assessment

When doing an infrastructure assessment, the primary question you're trying to address is: What is the existing farm infrastructure? Answering the following questions will give you the information you need to understand what your existing farm infrastructure is:

- Where is there functional electric fencing?
- What about water lines to supply drinking water in pastures?
- Are there pastures or crop/hayfields that are difficult to access due to stream crossings, muddy areas, or highways?
- What winter housing and heavy use areas are there to feed and provide shelter to animals during winter weather, or keep animals off pastures during wet soil conditions?
- What housing is there for farmers or farm employees?
- What manure storage is there and is it sufficient given RAPs?
- Are there current or future water quality issues to address?

Overstocking the farm with too many cows usually results in pastures which suffer from overgrazing damage. Overgrazing damage occurs when animals are returned to the paddock before plants have had time to fully regrow or are left in the paddock for too long. Once overgrazing damage occurs, the land will produce less forage, the grazing season will be shorter, and the farm will require more purchased feed to support the same herd size.

The initial process of assessing the existing land base and infrastructure then leads into the financial planning process. Asking the right questions and staying open to considering a completely different opportunity for the farm are important.

Wetlands[1]

When assessing an existing farm, or a new farm, it is important to clearly identify areas of pasture or crop land which are seasonally wet, poorly drained, or may be actual wetlands. In some cases, it may be possible to improve existing ditching or drainage to prevent seasonal flooding or standing water. However, water quality regulations may prohibit installation of new tile and ditching. Be sure to check with local NRCS or soil conservation staff before starting to drain a wet area!

If a hay field or pasture has standing water in it at some periods each year, this will severely limit what can grow there. Standing water, unlike flowing water, will rapidly deplete oxygen available to plant roots. The majority of the improved forage species will not tolerate oxygen-depleted conditions, and they will be replaced by wetland species such as rushes and sedges. Sedges, rushes, and other species are well adapted to growing in fully saturated soils. These wetland areas will never become productive pasture areas so effort and investment should instead be made in improving pastures with soils that have a more productive potential.

Wetlands are an important part of our farm ecosystems, because during high-rainfall events they provide necessary buffers which can prevent flooding damage. These areas also provide habitat for many beneficial plant and animal species, such as amphibians and birds. So some of the wet areas on the farm may best be "managed" by fencing cattle out of them permanently, or allowing only very limited short- duration grazing at certain times of the year. If the area is so wet that no high-quality forage grows, fencing livestock out is probably the best choice. However, if the area is only seasonally wet,

1 *This excerpt is adapted from Sarah Flack's book The Art and Science of Grazing (Chelsea Green Publishing, 2016) and is reprinted with permission from the publisher.*

and contains some browse or other forages of value, then grazing may be an option. When grazing these types of areas it is important to time the grazing so that livestock are not damaging wet, saturated soils. In addition, very short-duration grazing, also called flash grazing, is usually best to prevent damage to water quality.

Required Agricultural Practices (RAPs)

The Required Agricultural Practices (RAPs) became law in 2015 as part of a larger, state-wide effort to improve water quality in Lake Champlain and across Vermont's watersheds. They are administered by the VT Agency of Agriculture, Food, and Markets (VAAFM). Whether a farmer is just starting up or managing an existing beef operation, RAP compliance should be incorporated into a long-term planning process.

The first step in understanding how these regulations impact an operation is to determine where your farm falls on the RAPs farm size classifications. Different regulations apply to different farm size classifications (see: http://agriculture.vermont.gov/sites/ag/files/images/water_quality/FarmSizeClass.pdf). The new RAPs expand upon existing regulations that have been in place for Large Farm Operations (LFOs) since 1995 and Medium Farm Operations (MFOs) since 2006. Now all farms in the state are responsible for meeting water quality-related management standards, and a new category of Certified Small Farm Operations (CSFOs) has been established*.

Certified Small Farm Operation (CSFO):	*75-299 cattle or cow/calf pairs (or greater than 90,000 pounds combined live animal weight)*
Certified Medium Farm Operation (MFO):	*300-999 cattle or cow/calf pairs*
Certified Large Farm Operation (LFO):	*1000+ cattle or cow/calf pairs*

*Operations that fall below these thresholds are still required to comply with the RAPs but will not be certified or inspected by the state unless there is a violation.

Under the RAPs, certified operations are required to:

- Complete the appropriate RAP certification reporting annually, depending on size (reporting forms can be found online or mailed by VAAFM upon request)
- Obtain four hours of approved water quality training every five years (workshops and field days offered through UVM Extension are a great way to get these hours – contact VAAFM for more information)
- Be inspected by a representative from the VAAFM (every year for LFOs, every three years for MFOs, and every seven years for CSFOs)
- Comply with best management practice (BMP) requirements outlined in the RAPs

The primary BMP requirements impacting grass-based beef producers are:

- Waterways running through pastures need to be managed to protect water quality. This could mean fencing out animals completely and developing alternative watering infrastructure, or carefully managing stream access to prevent bank instability and erosion. Animal crossings and watering areas should also be managed to minimize erosion and manure runoff.
- Develop a Nutrient Management Plan (NMP) that follows the NRCS 590 practice standard. UVM Extension offers a winter class to help producers write their own NMP, or producers can hire a technical service provider to help them develop one. NRCS can offer financial assistance to cover the cost of developing the NMP. Maintaining a NMP requires taking regular soil samples of fields and keeping thorough and consistent records of manure and nutrient applications.
- Barnyards and Heavy Use Areas (HUAs) need to be managed in a way to prevent the runoff of manure. Any collected

manure (from barnyards, HUAs, etc.) should be applied to fields at the rate recommended by a business's NMP and in a way that prevents undo runoff to surface waters. Manure storage systems should be managed to prevent runoff and leachate. Bedded packs and covered stack areas have proven effective. If a farm field stacks manure, see the RAP guidance on required setbacks from streams and other sensitive features.

- Annual crop fields (corn, soybeans, etc.) require a 25 ft. buffer next to streams and a 10 ft. buffer next to ditches. Perennial hayfields do not need to be buffered. Any manure that is mechanically spread on fields will need to be setback from streams 25 ft. and ditches 10 ft.

Other topics that should be referenced in the RAP rule as applicable include: proper handling of animal mortalities, the winter manure spreading ban, siting of farm structures, and groundwater protections.

RAP Financial and Technical Resources:
In Vermont, farmers with questions or concerns should not hesitate to contact their local UVM Extension office or NRCS field office. These staff are non-regulatory and can help farmers identify and address water quality concerns on their farms. Additionally, there are several financial assistance programs available to help cover the costs of water quality-related improvements. See appendix for additional resources.

Grazing

Grazing practices need to align with the production goals of the producer. This report is not meant to be an educational tool for grazing. There are many grazing resources out there, such as books and classes, and we have linked to a few in the grazing section of the appendix. The appendix also includes more detail on good grazing practices and how to use livestock grazing to improve pasture productivity and quality.

What to think about if you want to be a certified organic producer

If you are a producer interested in becoming certified organic, it is important to consider the following:

- Herd health needs to be managed without prohibited synthetic medications, such as dewormers, so a prevention plan will be essential. Young stock are most susceptible to internal parasites, which can be picked up by animals grazing pastures that are grazed shorter than two to four inches in height. An animal, once dewormed with a synthetic dewormer, can never be sold for organic beef.
- Many health care materials are allowed for use, including vaccines, several pain medications, some types of electrolytes, and other medications. However, all medications, even natural ones, must be pre-approved by the certifier prior to use.
- Organic standards require that all animals get at least 30% of their dry matter intake from pasture during the grazing season once they are six months old.
- All pasture, grain, and stored forages fed (purchased or made on farm) must be certified organic. Any minerals must be from sources pre-approved by the certifier.
- Herd records must be kept, and animals must each be identified individually. The slaughterhouse will also need to be certified organic in order to label the beef as organic.
- Non-organic animals cannot be transitioned to organic and sold as organic beef. Only calves born from mother cows which were managed organically for the last 1/3 of their gestation can be certified organic.

Most of the producers we interviewed practiced Management Intensive Grazing and moved their animals based on pasture availability/regrowth, infrastructure constraints, and availability of labor to move the cows. Most moved their cows every day with only one going beyond a three day frequency, which is when

the cows can start damaging the pasture through consuming regrowth or grazing plants down too short. Most farmers favor fixed, high-tensile perimeter fencing with permanent water lines and temporary interior partitions.

Feed[1]

Beef cattle require protein, energy, fiber, minerals, vitamins, and water. To get enough of these, they need the right amount of daily dry matter intake from forages, in addition to access to clean drinking water and some sort of mineral supplement. The exact balance and amounts of nutrients an animal needs depends on its age, size, stage of gestation, rate of growth, amount of milk it may be producing, and its environment.

Forages, either pasture or stored feeds such as hay, contain different amounts of nutrients and also vary widely in how digestible they are. Forages which are highly digestible make it easy for livestock to meet their nutritional needs. Forages with lower digestibility make it difficult for animals to be able to eat enough total dry matter to get all the nutrition they need from their forages. So either not feeding enough forage, or feeding forage with low digestibility can result in undernourished livestock.

Forage quality depends on the type of plant, the time of year, and the stage of plant maturity. As plants mature and grasses produce flowers and seeds and more stemmy material, they produce more non-digestible fiber, and contain less energy and protein. Testing stored forages and pastures is the best way to be sure they are able to meet the nutrient needs of the herd. Forage samples must be based on a representative sample of the feed. For a round bale sample, a bale corer must be used and samples should be taken from multiple bales. For pasture, a hand grab sample from an area about to be grazed must be taken carefully, to be sure that only

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the types and portions of plants that cattle will actually graze will be sampled.

Once you know what the nutritional needs of each group of cattle are, and what the nutrient content of the pasture and stored forages are, you will have much better information to understand if your grazing plan, and your winter feeding plan, is on track to succeed.

Monitoring livestock performance and wellbeing is also an essential part of assuring their nutritional needs are being met. Monitoring may include taking live weights of growing animals, tracking hanging weights or grades, body condition scoring animals, watching for rumen fill, observing manure (manure scoring), and general observation of health and behavior.

Housing and Water Systems

As part of the interviews, farms were asked about the systems they were using for housing and for providing water to their animals. We found that housing needs depend greatly on whether or not a farmer is overwintering animals.

The producers we spoke to have a mix of winter housing options. Most did not have purpose-built winter housing but are using a mix of repurposed dairy infrastructure and sacrificial paddocks/ loafing areas. For instance, one farm was tying up their calves in the barn for the winter and keeping the breeding stock outside on a cement pad. They are hoping to build a pole barn for a bedded pack system in the next few years. Another farmer created an arrangement to house his animals on another nearby farm for the winter for a daily price per animal. The farmer calculated that this would be more affordable than keeping them on his own farm and buying hay to feed them.

There is a lot of existing dairy infrastructure on farms in Vermont that have the acreage for beef production, but this infrastructure

is not always an asset to the grass-based beef producer. Some producers out-winter their animals on pastures with access to wind breaks, but this could potentially negatively impact pastures, especially in clay soils.

The economics of building new beef infrastructure, such as a pole barn or hoop barn for a bedded pack system, do not always make sense. The ideal housing is a bedded pack system that has some kind of cover for the animal. A covered, bedded-pack system has positive impacts on water quality, the health of the animals, and improved winter growth rates, but can be cost prohibitive. If a farmer is considering building housing on their farm, it is important to calculate what the financial impacts will be and if the added income afforded by the new facility will support its costs.

If a farmer is considering building housing on their farm, it is important to calculate what the financial impacts will be and if that added income will support the cost of the facility.

Water systems were varied on the farms we visited. Jim Gerrish, grass-fed beef producer, educator, and consultant, teaches that it is most cost effective to bring water to your cows in the pasture instead of having a central water system. The benefits of reduced labor cost, increased manure distribution, and increased pasture productivity all offset the costs of installation. Additionally, accessing NRCS cost sharing can make installing high-quality fencing and water systems quite affordable for producers.

Slaughter and Processing

We asked the interviewed farmers questions about their slaughter and processing practices to better understand at what grade carcasses finished, how beef was sold, where farmers were having animals slaughtered, and whether or not they were satisfied with their experience.

The farms interviewed sold their beef in a variety of cuts, including as whole animals, half and quarter animals, primals, subprimals, retail cuts, and/or boxed beef. Buyers of the beef included mid-sized distributors, wholesale accounts like restaurants and grocery stores, and direct consumer purchases.

Farmers should have a target live weight at slaughter that aligns with the needs of their market. Many of the producers we spoke to process animals year-round. They have some variation in the size of animals with this process but are careful with their selection in order to maintain a relatively consistent product throughout the year. We did not speak to any producers who only slaughtered seasonally. It is likely even more challenging for cash flow and access to markets as the producer doesn't have consistent product all year round.

Two of the producers interviewed target a live weight of about 1,200 pounds, which translates to about a 650-700 pound hanging weight. One of these producers also has some animals that he holds through a second winter. These animals are larger and hang at about 700 pounds. Other producers spoken to target an approximately 550 pound hanging weight.

Everyone interviewed brought their animals to a different slaughterhouse, and they were each satisfied with their experience. It is important for a producer to understand the business cycles of a slaughterhouse. They are all very busy in the fall, and farmers need to have a consistent cycle of animals to increase their chances of getting in to a slaughter in the fall. It is important to be clear with the facility and communicate effectively with them.

Genetics and Animals

Production Model

In this study, producers who utilized cow/calf and finishing models were interviewed to better understand why they chose those production models. We were interested in whether producers choose to be cow/calf or finishing operations for a reason, what breeds farmers are using, how they manage their genetics, what traits they are interested in, and what characteristics they look for in finished animals. Farms that raise their own calves as well as farms that purchase feeder animals were visited, but no visits were made to farms that only raised calves for sale as young stock.

Farmers considering raising beef should be thoughtful about whether to keep breeding stock on the farm or to buy in calves to finish. Breeding animals for young stock and raising calves for

the market require two different skill sets on the farm, and not every producer is well positioned to do both. If one chooses to buy in feeders, animals must be from a reliable source and must be well suited in their genetic traits for the farmer's land base and market. A producer certainly does give up some control over the product when they do not raise the calves on their farm, but not keeping breeding stock on the farm can save money and time. One producer interviewed decided to focus on raising animals for finishing only because it allowed him to focus on sales and marketing, two things he identified as strengths.

Genetics

Whether a producer is breeding animals on their farm or buying in calves, animal genetics is an important consideration for any beef producer and should be dictated by the market for which the beef is intended.

For direct to consumer sales at farmers' markets or through boxes, quarters, halves, and wholes, breed is somewhat less important. Local consumers are okay with some variability in their product and may not be paying as close attention to consistency as a chef or buyer for an aggregator or wholesale market would. That being said, it is very important to understand that the finishing potential of an animal is directly tied to its genetics.

In general, we saw a wide variety of production systems and genetics on the farms that we visited, even though they all raised animals that were crosses of at least two breeds. Some farms had an additional line of purebreds that were raised to be sold as breeding stock as an added income stream. In order to sell breeding stock, it is important to understand that market as separate from the beef market. We saw mainly English breeds as well as Wagyu. A purebred animal likely results in less variability in production but may also have less hybrid vigor. Ultimately, as Jim Gerrish says, "superior management and average genetics

are better than superior genetics and average management." Our findings support this statement.

Frame Size

There is some debate with producers around brood cow animal size on the farm. We spoke to some producers who are still raising fairly large brood cows at around 1,400 to 1,500 pounds. Other producers, who have worked with beef producers in other parts of the country, have decided to move toward a smaller framed animal that will finish more quickly. The size of one's brood cows will determine how long it will take to finish an animal, which will ultimately affect the cost of production because a larger framed animal will always take longer to get to a choice grade. The producers we interviewed were targeting hanging weights anywhere from 550 pounds to 850 pounds in a timeframe anywhere from 15 months to 30 months. The most common weight and age was about 550 pounds in about 20 months.

The following chart is adapted from a talk given by Jim Gerrish comparing the impact of differently sized animals on the production and income capacity of a farm. It demonstrates that having more small framed animals will produce more total weaned weight and therefore more total income for the farm. This chart assumes similar expenses for each example.

Comparison of the Economics of Animal Size

Brood cow weight	1,000 lbs	1,500 lbs
Animals on farm	100	67
Conception rate	90%	80%
Calves weaned	90	53
Weaned weight	500	630
Total weaned weight	45,000	33,000
Price per pound	$2	$1.80
Total income	$90,000	$59,400

Credit: Jim Gerrish, American Grazinglands

Finishing

Producing a truly finished animal is one of the main challenges for many new beef producers in Vermont, and the inconsistent quality in the market can in part be attributed to this challenge. Inconsistent quality is not inconsequential, as it can give local grass-based beef a bad reputation.

Given this challenge, producers should have a target average daily gain that they hope to achieve. The farmers interviewed hope to hit at least 2 pounds per day of gain. One producer interviewed hopes to achieve 3.5 pounds per day in the spring, 2-2.5 pounds per day in the summer, and 1.75 pounds per day in the winter. These findings are in line with industry standards that suggest a producer should try to achieve 1.75 pounds average daily gain to build muscle in animals and at least 2 pounds average daily gain for marbling during finishing. From our visits, it seems most producers are live grading their animals for finish or meat quality, but the carcasses are not being graded at the slaughterhouse.

Understanding the live grading process and level of finish are areas where there is room for improvement for producers in Vermont as the market demands a higher quality product. The Producer's Guide To Pasture-Based Beef Finishing referenced in the resource section of this guide is a wonderful resource for understanding the complexities of finishing beef animals on grass, including grading and rates of gain.

Breeding

Producers who kept breeding stock were asked about their breeding practices to better understand the timing of breeding and calving for producers, what traits are most important to them in their mothers, and if the producers preferred bulls or artificial insemination.

Almost all of the producers we visited are using bulls for their semen. On occasion, when a producer is really focused on

improving the genetics of their herd, they will buy semen for artificial insemination (AI). Producers agreed that using AI was really the best way to improve the genetics of their herd. Whether or not to keep a bull on the farm or do AI is an important decision for a producer. Although AI gives you a lot of options for genetics, a farmer needs to have the correct facilities and additional labor capacity.

Breeding selection criteria is very important for a producer to identify if they are breeding animals on their farm. We heard a variety of criteria from producers. According to our research, the most common traits producers look for in their breeding stock are:

- Calving ease
- Docility and ease of handling
- Fertility
- Weaning weight
- Growth potential
- Marbling
- Grade
- Body condition
- Good feet and udders

One example of breeding selection specific to a 100% grass-fed farm is the focus on fertility. For grazing farms with limited grazing seasons, having cows calve early and within a short calving window is very important. One of the farms we visited culls any cows that are still open after 45 days with the bull.

Calving time is another consideration if you are breeding on your farm. Calving timing needs to align with when a farmer needs to bring their animals to market. For many beef farms, calves are born in the spring and then ideally slaughtered the next fall when they are about 18 or 19 months old. In this model, the calves only have to spend one winter on the farm. Overwintering animals can be a large expense for a producer, as many have to buy in hay and need an adequate facility to house animals. Many of the

producers interviewed are focused on trying to calve as early as possible in order to achieve this model. The earlier you calve in the spring, the longer the animals are on pasture that year. However, calving later in the spring on pasture can work if you maintain a certain feed regimen in which the animals gain weight more quickly.

Even though spring calving has always been possible, we found a few reoccurring issues with spring calving. If an 18 month old animal is not finished by October or November as the producer plans, then the farmer must keep the animal for a second winter when they are relatively large and therefore consuming a lot of calories on the farm. This is an issue many producers face when most of their animals are being slaughtered at 24 months. Another problem with spring calving and fall slaughter is that the fall is the busiest time of year for the slaughterhouses. They are overcrowded, and it tends to be challenging to get a spot.

Many of the farms we visited are considering fall calving instead of spring calving. Some are doing both so they have more animals available all year round. For fall calving, an animal that is slaughtered at 24 months will be held for two winters, but the first winter they will be young and primarily getting their calories from nursing. They will therefore be less expensive overall to keep on the farm.

Steps to Profitability

The beef producers we interviewed as part of this study expressed the opinion that in order to be competitive with beef in the current system, a farmer needs to have some kind of unique advantage. Whether that is the ecological service that the beef provides in order to support another more profitable enterprise, access to free or low-cost high quality land, long grazing days, or a specialized market, successful Vermont grass-fed beef farmers have capitalized on advantages particular to the individual farm rather than advantages broadly characteristic of grass-based production within the state. While these individual successes should not be diminished or overlooked, this is not how a successful grass-fed beef market and support system is built.

While the results of this research reveal challenges in profitably producing grass-fed beef in Vermont, there are steps that producers can take in order to be profitable and reach their goals. The first is selling at a higher price point. Selling at a higher price point is not just dependent on producers finding a market with higher prices, but is also a place where consumer buying choices and public policy can have an impact. For example, efforts to encourage consumers to buy half and quarter animals from farmers when possible would help support the profitability of the Vermont grass-fed beef market.

Other strategies farmers could use to increase profitability are leasing land and reducing overhead costs. In addition, improving grazing management and thus increasing stocking density can increase profitability. The more animal units the farm can support with the same overhead costs, the lower the cost of production per pound. Farmers can increase how many animals their farm can support through stockpiling forages and improving their pasture productivity. Another strategy is to reduce the number of days animals spend on the farm. This will directly reduce the cost of production through reduced variable costs. Reducing the number of days feeding stored feed is essential for a producer to enhance profitability.

This report is geared toward producers, and therefore it focuses mainly on adjustments that the individual producer can make in order to increase the viability of their beef program. But it is very important to note that there are structural issues that also need to be addressed in order for grass-fed beef in Vermont to be competitive and financially viable. We cannot talk about grass fed beef production in Vermont without recognizing the role of agribusiness in the market and how that drives prices down. It is likely that distributors impact this market more than consumer habits. Distributors capitalize on the work that local farms have done in creating local demand and make false statements about attributes of their products. They have more resources and better access to markets and they typically don't use that opportunity to source from local producers.

There are structural issues that need to be addressed in order for grass-fed beef in Vermont to be competitive and financially viable.

There are numerous policy and market based changes that could assist beef producers. State and federal policies could affect price by developing labeling and standards around truly grass-fed (pasture based) production and improving Country of Origin Labeling laws to transparently reflect the origins of the animal to the consumer. There should be a push for clearer standards and definitions from aggregators about what they are looking for in the product. Quality testing of beef products would be valuable for producers. More research on the health benefits from grass fed beef could be used in marketing. Finally, we need systems to address the structural barriers facing farmers like the cost of land and infrastructure to level the playing field with the large vertically integrated producers.

In general, in order for grass-fed beef to work in Vermont, a combination of professional development for producers to increase their skills and policy and market development is

needed. For example, there are many benefits that grass-fed beef producers are providing that are not accounted for in the market, such as keeping their land open and productive, sequestering carbon, and improving the ecosystems where they produce. If this is the sustainable agriculture we want thriving in our state, how do we work to capture this value?

Sample Budgets with Narratives

Budget Assumptions

The sample budgets are based on data collected from the farms we visited and information garnered from service providers. They are not accurate benchmarks collected through standardized quantitative methods. The budgets were developed to provide a snapshot of the potential for profitability on a model farm and to provide a template for producers to use with their own numbers.

The farm in our sample budgets is a collection of assumptions. With each assumption, there are trade-offs that were required to simplify the complexity of a beef operation. For example, the assumption that all of the start-up expenses would be paid for with a single loan is highly unlikely, but we chose to represent the capitalization of the business in this way for simplicity.

Land and Capital

Our sample farm is based on a real property located in Central Vermont. The property is a former dairy farm that has most recently been used for organic hay production for a nearby dairy. The infrastructure includes a three bedroom house, an equipment shed, and a partial barn structure with milking parlor. The freestall dairy barn was torn down, but the concrete pad remains, which will be used as a winter loafing area for the beef herd.

We began the modeling process with a land assessment based on the process detailed earlier in the document.

Land assessment:

- 110 acres tillable with 30 acres of additional pasture. Most of this land has good soils with very few excessively rough or wet areas.
- The land is on both sides of a road, but it is contiguous so it could all be grazed without the need to trailer cattle between areas.

- There may be other land nearby that could be rented, but this will not be considered in this initial land-base assessment.

Assuming the total acreage is 140, and all the hay for winter feed is purchased, a total of 110 to 115 animal units can be supported on this land base. Depending on the business model chosen, this could be a herd of:

- 130 young steers bought in each fall which would be overwintered and finished in their second year on the farm, OR
- A 44 cow-calf herd that could be supported on homegrown stored forages and pasture. This would include one bull and 44 cows and assumes calves are only kept on the farm for one winter and finished in their second year on the farm.

Infrastructure assessment:

- There is no livestock housing, barn, or heavy use area. There is no existing functional fencing or a pasture water system.

A capital budget and timeline for construction will be needed for this farm and should include:

- Brood cows
- Pickup truck
- Trailer
- Brush mower
- Bale grabber or spear
- Tractor
- Bale and mineral feeders
- Corral with headgates and scales
- Fence energizer
- Temporary fencing
- Permanent perimeter fencing
- Freezer
- Piped water to pastures
- Heavy use area (covered or uncovered with adjacent shelter)
- Manure storage location or plan for winter manure
- Office software and hardware

- If haying:
  - Mower / Conditioner
  - Baler
  - Bale wrapper
  - Hay rake and/or tedder

In our model scenario, we assume a small owner contribution combined with a substantial amount of debt financing to provide funding for this operation. The initial capital outlay requires both long term and intermediate term debt financing in year one. The purchase price for the farm is $395,000. Financing is assumed to occur through the Farm Service Agency's Down Payment Program, which allows beginning farmers to borrow up to 95% of the purchase price. The assumption is that the farmer would put 5% down and then access joint financing through FSA and another agricultural lender. The agricultural lender would finance $197,500 at 6% for 20 years, and FSA would finance the remaining $177,750 for 30 years at 2.85%.

The capital budget has a total of $216,175 in expenses. Fencing and water lines are included in this budget, as well as the cost of professional high-quality installation that would be eligible for NRCS cost share. If haying owned land, intermediate capital needs would increase to $242,675. The livestock, machinery, and equipment would be financed with a single operating loan from FSA or a traditional lender. The assumptions are an intermediate term for seven years fixed at 7% interest from a commercial lender or FSA with no money down.

The balance sheet projections assume an initial net worth of $76,229 after the first year of capital outlay. Additional working capital will be needed for years two through five to fund the annual operating deficits in a range beginning at $152,236 in year one and decreasing to $96,943 in year five. Source of said capital is unknown. Assuming it is available, the overall equity position of the owner/operator will increase over this five year period from both internal herd growth and amortization of loans as principal

is paid down. Increase by year five will be $138,610 for an ending net worth of $214,839. This assumes a 10% annual depreciation rate on equipment and infrastructure.

Grazing

The farm has 140 acres of open pasture/hayland. For our sample budgets, we assumed a 45 day rotation with an average of 1,100 pounds of dry matter(DM) per acre. Feed consumption is assumed at a rate of 30 pounds of DM per 1,000 pounds animal unit per day, for a total annual stocking capacity of 114 animal units.

1. *140acres*1100#s dry matter per acre=154,000#s total dry matter*
2. *154,000#s total dry matter / 45day pasture rotation=3422#s available dry matter per day*
3. *3422#s available dry matter per day/30#s dry matter consumed per 1000#animal unit=114 animal units*

Standardization of animal units allows for stocking and feed numbers to be standardized for animals with different frame sizes and in different phases of growth. This assumes that there would be some mechanized clipping of pastures during high growth periods and acknowledges that the carrying capacity of the farm could be significantly higher during certain periods of the season. The relatively low productivity of the pastures represents an opportunity for increased profitability but requires a higher level of management.

Winter Feed

Our sample operation is based on the assumption that all feed is purchased to avoid the capital costs of purchasing haying equipment and for simplicity of forage and budget calculations. Animal numbers were calculated based on a 1,200 pound average mature brood cow, one 1,400 pound bull, and calves averaging 600 pounds through the winter feeding period. Calving is assumed to occur spanning the month of

April with calves taking an average of 20 months to reach a 1,050 pound live weight. This assumes an Average Daily Gain of 1.75 pounds, which is optimistic for a 100% grass-fed operation. Winter feed is budgeted at $55/bale for high quality, wrapped, second cut bales with transportation cost included.

Cow-calf budget

Our cow-calf budget assumes a stocking rate of 44 mature cows that are all purchased and bred in year one. Mortality is reflected in the calving rate for simplicity and is assumed to be at 10% in year one declining to 5% in year five. This is potentially optimistic, but culling and brood cow retention is also calculated at the same rate, which would lead to a relatively young and healthy herd. A bull would be purchased every other year at an annualized cost of $2,500.

Calving on the model farm would occur in April with cows being raised to an average of 20 months to a finished live weight of 1,050 pounds and a hot hanging weight (HHW) of 630 pounds or 60% of live weight. Retail cutout is assumed to be 44% of live weight. We assumed that the producers would have the potential to market 10 animals through retail markets at $7/pound with the rest being sold wholesale at $2.60/pound HHW.

Labor is included in the budget at a loaded rate of $16/hr. Average weekly labor was calculated at 20 hours/week with an additional 6 hours/week for management and 16 hours/week in the summer for farmers' markets.

Cow-Calf Working Budget

The following is a sample budget only; an interactive excel template is available at http://www.vtfarmtoplate.com/resources/cow-calf-working-budget for you to enter your own information.

Bulls	1
Brood cows	44
Brood cow average live weight	1200
Calving rate	95%
Calves	42
Yearlings	42
Number of culls/replacements (brood)	5
Days on pasture	200
Average HHW-Pounds	630 (1050# animal with 60% dressing weight)
Number of animals sold wholesale	27
Number of animals sold retail	10
Animal units (1000#)	108

	Number	Total	Annual per AU	Notes
Income				
Agricultural Program Payments				
Wholesale Beef Sales	16,884.0 pounds	$43,898		$2.60 per pound
Retail Beef Sales	4,619.8 pounds	$32,339		$7.00 per pound; Final meat yield 44% of live weight
Cull Beef Income	5,544.0 pounds	$2,772		$0.50 per pound
Total Income		**$79,009**	**$730.45**	

	Number	Total	Annual per AU	Notes
Variable Expenses				
Advertising & Promotion		$1,500	$13.87	Farmers' Market/ Web
Auto & Truck		$2,000	$18.49	
Bedding		$700	$6.47	Bulk load sawdust for run-in shed
Breeding		$2,500	$23.11	Bull purchase biennially
Conservation Expense				
Custom Hire		$500	$4.62	
Custom Hire - Manure Spreading		$1,200	$11.09	
Due and Subscriptions		$900	$8.32	Trade Association, Education, Professional Development
Feed Purchased - Grain				
Feed Purchased - Hay	784.9 bales	$43,168	$399.10	30#s per AU - wrapped round bale 500#DM $55
Fencing		$500	$4.62	
Fuel and Oil		$2,500	$23.11	$208.33/mo
Labor Hired (incl. FICA, Workers Comp, etc)	1,704 hours	$27,264	$252.06	$16/hour. 20 hours on-farm labor, 6 hrs/week of mkting general, 16 hrs/week of farmers' mkt for 22 weeks
Labels	4,619.8	$924	$8.54	$0.20 per label
Livestock Purchase				
Minerals		$1,716	$15.86	
Misc. Expense				

	Number	Total	Annual per AU	Notes
Phone/Internet		$1,500	$13.87	$125/mo
Processing		$5,527	$51.10	$55 slaughter, $0.79lb processing
Professional Services		$1,000	$9.25	
Repairs/ maintenance - Equipment		$2,500	$23.11	
Repairs/ Maintenance - Infrastructure		$3,000	$27.74	
Seeds		$700	$6.47	reseeding, frost seeding
Soil Amendments - Fertilizer				
Supplies		$1,000	$9.25	
Utilities		$1,800	$16.64	$150/mo - barn utilities and cooler
Veterinary & Medicine Expense		$1,000	$9.25	include vaccinations and tail blood preg
Total Variable Expenses		**$103,399**	**$955.94**	
Fixed Expenses				
Insurance		$2,300	$21.26	
Property Tax		$5,300	$49.00	
Total Fixed Expenses		**$7,600**	**$70.26**	
Total Expenses		**$110,999**	**$1,026.21**	
Net Income		**$(31,990)**	**$(295.75)**	

	Number	Total	Annual per AU	Notes
Mortgage Total/ Land Cost		$25,801	$238.53	
Loan for Start-up/ Capital Expense		$39,152	$361.97	
Net after Capital Expense		**$(96,943)**	**$(896.25)**	
Net after Capital without Paid Labor		$(69,679)	$(644.19)	
Cost of Production Per Pound without Debt: $4.22				

Cow-Calf Capital Budget

Land Mortagage: 375,250.00

Year 1:

Item	# of Units	Cost per Unit	Total Cost
Livestock			
44 Bred Cows	44	$1,500	$66,000
Equipment			
Truck 3/4 Ton P/U	1	$25,000	$25,000
Trailer 20'	1	$15,000	$15,000
Mower 6'	1	$2,000	$2,000
Bale Grabber	1	$2,000	$2,000
Trator w/ Loader 65 HP	1	$35,000	$35,000
Facilities			
Round Bale Feeders	5	$175	$875
Mineral Feeder	1	$200	$200
Corral/Chute/HeadGate	1	$8,000	$8,000
Animal ID and Rx Tools	1	$100	$100
Energizer	1	$1,400	$1,400
Poly Wire Fence Reels	4	$75	$300
Step in Fence Posts	100	$2	$200
Perimeter Fencing	16,000 feet	$2	$32,000
Water Line	3,000 feet	$1	$3,000
Water Tubs	1	$150	$150
Winter Shed/Shelter	1	$10,000	$10,000
On-Site Freezer	1	$8,500	$8,500
Winter Waterer	2	$1,500	$3,000
Office			
Quickbooks Software	1	$200	$200
CPU/Printer	1	$750	$750
Website/Logo	1	$2,500	$2,500
			$216,175.00

Cow-Calf Projections

	Year 1	Year 2	Year 3	Year 4	Year 5
Bulls	1	1	1	1	1
Brood cows	44	44	44	44	44
Calving rate	90%	92%	95%	95%	95%
Calves	40	40	42	42	42
Yearlings	0	35	40	42	42
Number of culls/ replacements (brood)	5	5	5	5	5
Days on pasture	200	200	200	200	200
Average HHW-lbs	630	630	630	630	630
Number of animals sold wholesale	0	20	25	27	27
Number of animals sold retail	0	10	10	10	10
Animal units (1000#s)	74	102	107	109	109
Income					
Agricultural Program Payments	$-	$-	$-	$-	$-
Wholesale Beef Sales	$-	$32,760	$40,950	$43,898	$43,898
Retail Beef Sales	$-	$32,339	$32,339	$32,339	$32,339
Cull Beef Income	$2,772	$2,772	$2,772	$2,772	$2,772
Total Income	**$2,772**	**$67,871**	**$76,061**	**$79,009**	**$79,009**
Variable Expenses					
Advertising and Promotion	$1,500	$1,500	$1,500	$1,500	$1,500
Auto & Truck	$2,000	$2,000	$2,000	$2,000	$2,000
Bedding	$700	$700	$700	$700	$700
Breeding	$2,500	$2,500	$2,500	$2,500	$2,500

	Year 1	Year 2	Year 3	Year 4	Year 5
Conservation Expense	$-	$-	$-	$-	$-
Custom Hire	$500	$500	$500	$500	$500
Custom Hire - Manure Spreading	$1,200	$1,200	$1,200	$1,200	$1,200
Due and Subscriptions	$900	$900	$900	$900	$900
Feed Purchased - Grain	$-	$-	$-	$-	$-
Feed Purchased - Hay	$29,512	$40,946	$42,580	$43,168	$43,168
Fencing	$500	$500	$500	$500	$500
Fuel and Oil	$2,500	$2,500	$2,500	$2,500	$2,500
Labor Hired (incl. FICA, Worker's Comp, etc)	$27,264	$27,264	$27,264	$27,264	$27,264
Labels	$-	$924	$924	$924	$924
Livestock Purchase	$-	$-	$-	$-	$-
Minerals	$880	$1,580	$1,680	$1.716	$1,716
Misc Expense	$-	$-	$-	$-	$-
Phone/Internet	$1,500	$1,500	$1,500	$1,500	$1,500
Processing	$-	$5,527	$5,527	$5,527	$5,527
Professional Services	$1,000	$1,000	$1,000	$1,000	$1,000
Repairs/ Maintenance - Equipment	$2,500	$2,500	$2,500	$2,500	$2,500
Repairs/ Maintenance - Infrastructure	$3,000	$3,000	$3,000	$3,000	$3,000
Seeds	$700	$700	$700	$700	$700
Soil Amendments - Fertilizer	$-	$-	$-	$-	$-
Supplies	$1,000	$1,000	$1,000	$1,000	$1,000

	Year 1	Year 2	Year 3	Year 4	Year 5
Utilities	$1,800	$1,800	$1,800	$1,800	$1,800
Veterinary & Medicine Expenses	$1,000	$1,000	$1,000	$1,000	$1,000
Total Variable Expenses	**$82,456**	**$101,041**	**$102,775**	**$103,399**	**$103,399**
Fixed Expenses					
Insurance	$2,300	$2,300	$2,300	$2,300	$2,300
Property Tax	$5,300	$5,300	$5,300	$5,300	$5,300
Total Fixed Expenses	**$7,600**	**$7,600**	**$7,600**	**$7,600**	**$7,600**
Total Expenses	**$90,056**	**$108,641**	**$110,375**	**$110,999**	**$110,999**
Net Income	**$(87,284)**	**$(40,771)**	**$(34,314)**	**$(31,990)**	**$(31,990)**
Mortagage Total/ Land Cost	$25,801	$25,801	$25,801	$25,801	$25,801
Loan for Start-up/ Capital Expense	$39,152	$39,152	$39,152	$39,152	$39,152
Net after Capital Expense	$(152,236)	$(105,723)	$(99,267)	$(96,943)	$(96,943)
Net after Capital without Paid Labor	$(124,972)	$(78,459)	(72,003)	$(69,679)	$(69,679)

Feeder Budget

Our feeder budget was based on similar assumptions to the cow-calf budget above. We assumed that calves would be purchased at a live weight of 550 pounds for $1.30/pound in the late fall. They would remain on the farm through the entire next grazing season and be sold to a wholesale buyer at $2.60/pound hanging weight. This led to a decrease, compared to the cow-calf budget, in variable expenses such as marketing, labor, and processing. The major increase in expense was for the purchase of the animals.

Feeder Working Budget

The following is a sample budget only; an interactive excel template is available at http://www.vtfarmtoplate.com/resources/feeder-working-budget for you to enter your own information.

Weaned Feeders	130 (Purchased Oct 550# Weaned)
Average Weight at Purchase	550
Days on Pasture	200
Calf Purchase Price Per # Live	$1.30
Average HHW-Pounds	630 (1050 pound animal with 60% dressing weight)
Animal Units (1000#s)	117

	Number	Total	Annual per AU	Notes
Income				
Agricultural Program Payments				
Wholesale Beef Sales	81,900 pounds	$212,940		$2.60 per pound; Final meat yield 40% of live weight
Retail Beef Sales	0	0		$7.00 per pound
Cull Beef Income	0	0		$0.50 per pound
Total Income		**$212,940**	**$1,820.00**	
Variable Expenses				
Advertising & Promotion				Farmers Market/ Web
Auto & Truck		$2,000	$17.09	
Bedding		$700	$5.98	Bulk load sawdust for run-in shed
Breeding				
Conservation Expense				
Custom Hire		$500	$4.27	

	Number	Total	Annual per AU	Notes
Custom Hire - Manure Spreading		$1,200	$10.26	
Dues and Subscriptions		$900	$7.69	Trade Association, Education, Professional Development
Feed Purchased - Grain				
Feed Purchased - Hay	900.9 (500# round bales)	$49,550	$423.50	30#s per AU- wrapped round bale 500#DM $55
Fencing		$500	$4.27	
Fuel and Oil		$2,500	$21.37	$208.33/mo
Labor Hired (Incl. FICA, Worker's Comp, etc)	1,040 hours	$16,640	$142.22	$16/hour 20 hours/week on-farm labor
Labels				$0.20 per label
Livestock Purchase	71,500	$92,950	$749.44	$1.30 per
Minerals		$2,600	$22.22	
Misc Expense				
Phone/Internet		$1,500	$12.82	$125/month
Processing				Purchaser assumes cost
Professional Services		$1,000	$8.55	
Repairs/ Maintenance - Equipment		$2,500	$21.37	
Repairs/ Maintenance - Infrastructure		$3,000	$25.64	
Seeds		$700	$5.98	Reseeding, frost seeding

	Number	Total	Annual per AU	Notes
Soil Amendments - Fertilizer				
Supplies		$1,000	$8.55	
Utilities		$1,800	$15.38	$150/mo for barn utilities and cooler
Veterinary & Medicine Expenses		$500	$4.27	
Total Variable Expenses		**$182,040**	**$1,555.89**	
Fixed Expenses				
Insurance		$2,300	$19.66	
Property Tax		$5,300	$45.30	
Total Fixed Expenses		**$7,600**	**$64.96**	
Total Expenses		**$189,640**	**$1,620.85**	
Net Income		**$23,301**	**$199.15**	
Mortage Total/ Land Cost		$25,801	$220.52	
Loan for Start-up/ Capital Expense		$39,152	$334.63	
Net after Capital Expense		$(41,652)	$(365.00)	
Net after Capital without Paid Labor		$(25,012)	$(213.78)	
Cost of Production Per Pound Without Debt:			**$2.32**	

Analysis

Both of our model budgets show that beef production is risky and potentially deeply unprofitable. The cow-calf operation not only requires a significant amount of capital for start-up and land purchase, but it never actually goes cash positive. The feeder operation is slightly more profitable but relies on the sourcing of suitable feeders and having a willing wholesale buyer. Even with adjustments to the wholesale and retail purchase price in the cow-calf budget to $3.50/pound and $10/pound, the enterprise does not quite break even before debt service. If the stocking rate could be improved to allow for a doubling of the herd size, the enterprise would still run a net deficit of $4,871.

Producers are encouraged to enter their actual numbers in the working budgets to perform their own financial analysis.

To access the interactive versions of these budgets (excel files), please visit http://www.vtfarmtoplate.com/resources/cow-calf-working-budget and http://www.vtfarmtoplate.com/resources/feeder-working-budget.

Appendices

Resources

Overall Production

- Producer's Guide To Pasture-Based Beef Finishing, http://agebb.missouri.edu/mfgc/BeefFinishingProducer%27sGuide.pdf

Dry Matter Digestibility

- Nutrient Requirements of Beef Cattle (7th Revised Edition, 2000), http://www.nap.edu/catalog.php?record_id=9791)
- National Organic Program Dry Matter Demand Tables For Classes of Beef Cattle, https://www.ams.usda.gov/sites/default/files/media/NOP-5017-3-DryMatterDemandTablesforClassesofBeefCattle.pdf
- Understanding Dry Matter Intake, http://www.beefmagazine.com/mag/beef_understanding_dry_matter

Forage Sampling

- Forage Quality Testing: Why, How, and Where, https://extension.psu.edu/forage-quality-testing-why-how-and-where
- "Hay Analysis Guide for Beef Cattle", https://fyi.uwex.edu/wbic/files/2011/11/Hay-feed-analysis-draft-4.pdf
- "Sampling Hay, silage, and total mixed rations for analysis", https://forage.msu.edu/wp-content/uploads/2014/07/WI-A2309-ForageSampling-Undersander-etal-20051.pdf

- "Collecting Forage Samples for Analysis", http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-2553/PSS-2589web.pdf

Grazing

- "What is Good Grazing Management", http://www.sarahflackconsulting.com/articles/what-is-good-grazing-management/

Body Condition Scoring

- Body Condition Scoring of Beef Cows, http://pubs.ext.vt.edu/400/400-795/400-795.html

- Body Condition Scoring of Beef Cows, https://fyi.uwex.edu/wbic/files/2015/08/BCS-short-08-28-15.pdf

Manure Scoring

- Manure Scoring Determines Supplementation Needs, https://www.noble.org/news/publications/ag-news-and-views/2013/october/manure-scoring-determines-supplementation-needs/

- What Is Your Cattle's Manure Telling You?, https://www.progressivecattle.com/topics/feed-nutrition/7320-what-is-your-cattle-s-manure-telling-you

Bale Grazing

- The Basics and Benefits of Bale Grazing, https://www.gov.mb.ca/agriculture/livestock/production/beef/pubs/baa05s04j.pdf

Other Resources

- Final RAP Rule, http://agriculture.vermont.gov/sites/ag/files/pdf/water_quality/RAP/Final/Required-Agricultural-Practices-Regulations-11172016-CLEAN.pdf
- RAP Guidance for Certified Small Farm Operations (CSFOs), http://agriculture.vermont.gov/sfo
- RAP Guidance on Nutrient Management Planning, http://agriculture.vermont.gov/water-quality/farmer-assistance/nmp-ltp
- RAP Financial and Technical Assistance, http://agriculture.vermont.gov/sites/ag/files/TechnicalandFinancialAssistance.pdf

What Is Good Grazing Management?

Sarah Flack

The Benefits Of Good Pasture Management

When done correctly, livestock grazing can create many benefits for the environment, plants, soils, animals and farm income. Pasture plant quality and soil health can improve, animal welfare can benefit, feed costs can go down, animal performance can increase and farm finances can become more sustainable.

Good grazing management can change pasture plant species without tillage and reseeding, by just using animal impact from grazing. This can convert weedy brushy pastures, where animals have to search to find good quality forage, into highly productive pastures, which feed more animals higher quality forage.

These improved pastures provide low cost, high quality feed, which is particularly helpful for farmers facing rising feed and fuel costs. With high quality pasture in the ration, farms can decrease the amount of purchased grain and forages. Other cost savings can come from having cows harvest their own feed instead of paying for fuel needed for mechanical harvest, storage and feeding.

As pastures improve, plant density and diversity increases and soils are protected from erosion and compaction. Soil health is also improved by increased plant root growth and improved nutrient cycling.

In addition to these many benefits to plants, soils and livestock, there are changes in the meat and milk of pastured animals. Ruminants whose diet includes more forage and less grain produce meat and milk, which contain different amounts and types of nutrients than grain-fed livestock. The nutrients that can be in higher amounts include beta-carotene, vitamins A, E and D, omega-3 fatty acids, conjugated linoleic acid and others.

In addition to research supporting the higher nutritional value of these foods, consumers are also attracted to some of the other benefits of grass farming, including improved animal welfare and the many environmental benefits.

With all these benefits, it is no surprise that there is growing interest from both farmers and consumers in grass farming. However, for beginner farmers or farmers new to grass-based livestock farming, the number of suggestions on the "best way" to improve soil fertility, forage quality and pasture production can be overwhelming. This is particularly challenging to farmers who have not yet learned the basic core principles of good grazing management.

Without a solid understanding of the basic guidelines of how to set up and manage a pasture system, it is easy to get side tracked by the latest new idea and end up with a system that doesn't meet the quality of life needs of the farmers, the financial needs of the farm, or the production and welfare needs of the livestock.

Types Of Grazing Systems

An effectively designed and managed grass-based livestock operation requires understanding the basic principles of grazing management. It requires understanding what pasture plants need, what livestock need and how to put it together with the right infrastructure. This knowledge makes it possible for the farmer to choose which type of grazing system best fits their own farm and family goals, and customize it so that it really works.

The methods of pasture management include systems managed intensively, simple rotational systems, and large continuously grazed pasture systems. By intensive we are not talking about how short the pasture is grazed down; it refers to the management itself. The more successful management intensive systems provide livestock with new areas of high quality pasture frequently, but then give those areas of pasture time to regrow before the next grazing.

When compared to the more intensively managed systems, continuous grazing requires less daily management in moving the cattle, fencing, and water tubs. However, continuous systems are less efficient, so they require more acreage of pasture, more clipping, and may require occasional pasture reseeding and renovation over time due to overgrazing damage. Continuous grazing systems, particularly systems where cattle continuously graze the same pasture for most of the grazing season, usually provide less high quality feed. These types of management may result in lower growth rates, and milk yields, but requires less day-to-day management.

By shifting from a continuous system to a simple rotational system, it is possible to make some improvements to pasture quality and quantity. However pasture productivity will still be lower in a rotational system compared to an intensively managed system. A key difference between a simple rotational system and a higher quality system is that the better grazing systems pay close attention to how fast plants are growing. This requires that the recovery period after each grazing be increased as growth rates slow to make sure plants are always fully recovered before the next grazing. **This key principal of variable recovery periods is essential to create the highest quality pastures.**

Pasture plants need time to rest after each grazing in order to photosynthesize and replenish the energy stored in the base of the plant and in roots. Continuously grazing animals in the same pasture, or returning them to a pasture before it is fully regrown, does not give plants time to recover and results in overgrazing damage. Continuous grazing also gives cattle time to graze the plants down very short, which can damage the plants. The resulting weak plants may stop growing or die. These weakened overgrazed plants will not compete well with weed species, will not hold soil well, and result in bare soil and erosion. Some grasses and clovers will survive by staying very short, never growing tall enough for livestock to graze easily. At the same time in that pasture, livestock will reject areas

that will soon grow up into tall patches of grass, weeds, brush, or small trees. In continuously grazed pastures, there may also be a buildup of dead plant material or thatch on the soil surface and cow pies that have not decomposed quickly. These are all symptoms of grazing damage.

Over the years, many terms have been used to describe the better-managed grazing systems. Andre Voisin used "Rational Grazing" in his writing in the 1950s. More recently grazing consultant Jim Gerrish and others use the term Management Intensive Grazing (MiG). I like this one as the emphasis is on the importance of the Management! Work by Allan Savory created Holistic Planned Grazing. Holistic Grazing is part of a comprehensive Holistic Management planning system, which includes financial planning, biological monitoring and establishing goals. Prescribed grazing is a term used in many NRCS publications. Mob Grazing is used commonly now, and refers to use of high stocking density with long recovery periods. However, farmers using holistic planned grazing or MiG may also use high stock densities and long recovery periods.

But keep in mind that what is more important than the name, is to know what key principals all successful grazing systems share. Successful grazing management pays close attention to the needs of the plants, the livestock, and soils. So whatever the name, these systems will favor the better pasture plant species, reduce weed problems, improve soil health, and increase the quantity of pasture dry matter produced while improving the nutritional quality of the feed.

Grazing guidelines:

- Allow plants enough time to fully regrow and recover after each grazing
- Graze livestock in each area for a relatively short time (short period of occupation) to prevent "re-grazing".

Continuous Grazing	Rotational Grazing	Systems with variable recovery periods
Cattle are in the same paddock for the whole grazing season.	Cattle are rotated around several pastures, often on a set rotation. Recovery periods are not varied as plant growth rates slow.	Cattle are moved to a new paddock only when it has fully regrown. They are moved at least every 3 days. Recovery periods are variable based on plant regrowth time requirements.
Cattle graze selectively, making it difficult to balance the ration. Pastures will generally provide enough feed in spring, but later in the summer pasture will be too short, or too over-mature to provide enough dairy quality feed.	Cattle may have adequate dry matter intake and pasture quality in the spring, but as plant growth rates slow the pastures will be too short or plants will over-mature and provide less high quality feed.	Cattle will have adequate DMI and pasture quality throughout the grazing season.
Pasture quality and quantity will significantly decline as the season progresses.	As cattle rotate back into pastures that are not fully regrown the quantity and quality of feed will decline.	Cattle only rotate back into pastures that are fully recovered so pasture quality and quantity is good. Additional acres are added into the grazing rotation as growth rates slow.
Pasture quality will decrease each year due to overgrazing damage, increased weeds, and rejected forage. Clipping and eventually renovation and reseeding may be needed.	Pasture quality will gradually decrease due to overgrazing damage, weeds, and rejected forage. Clipping can help prevent weeds from spreading, but eventually renovation and reseeding may be needed.	Pasture quality will improve over time. The more intensive the management, the faster the pasture will improve.

Setting up the grazing system part one: The Plants

To provide the highest quality feed, farmers give animals a fresh pasture after each milking or twice each day. Some farms may move the herd more frequently than twice a day using strip grazing or other methods. This will allow for a higher stocking density and will more quickly improve pasture quality. Strip grazing is a strategy frequently used in mob grazing, and it is done by moving fence forward frequently, giving the cattle a new strip of fresh pasture each time.

If farm labor doesn't allow for that much time moving cattle or fences, it is possible to use larger paddocks and move livestock less frequently. The important guideline to follow is that livestock return to the pasture only when it has fully recovered. Here in the northeast, this may be as soon as 18 days in early summer when plants are growing rapidly, but it may be 40 days or longer later in the summer. The length of the regrowth period will vary significantly depending on soil moisture, soil fertility, plant species, past management and temperature. Ideally, farmers move animals frequently, and each paddock is not grazed for more than three consecutive days. Using smaller paddocks and moving the herd more often will provide more consistent high quality feed and higher overall pasture productivity.

It is important as pasture growth slows, the speed of the rotation must also slow down. This is usually done by adding more acreage to the rotation. If the number of grazing acres is not increased, plants will not get enough rest, and animal dry matter intake will drop resulting in poor animal and pasture performance. Timing the first cut of hay early enough to allow some areas to grow back tall enough for grazing later in the season is the easiest way to add in more good quality pasture when plant growth slows in the summer. Paddocks should not be grazed in the same order. They should instead only be grazed when they are ready! This is another key difference between a simple "rotational" system and better-managed systems where the emphasis is on plant recovery periods.

So what to do when the pasture quality isn't as good as we want it to be? A common approach to "fixing" pastures which have become weedy or not productive enough is pasture renovation. Renovation of a pasture is when it is completely tilled up and reseeded, which is a labor intensive and costly project to take on. This is why it is important that less expensive options for restoring or improving the field have not been overlooked. Keep in mind that if a pasture is plowed and reseeded but the grazing management system is not changed, the reseeding will only provide a temporary solution to poor pasture quality.

As we have already discussed, improving the grazing management is the first way to try to improve pasture. Additional improvement ideas include assessing soil health by both visual observation, measures of soil compaction and soil testing.

This may indicate that adding fertility, improving aeration or drainage is necessary. If minor improvement in plant species is needed, frost seeding can be done. This is a low cost method of broadcasting seed on frozen ground. The thawing and freezing action of the soil allows the seed to be incorporated into the soil. Frost seeding works very well with legumes, but is not generally as effective for most grass species.

Once non-tillage options have already been tried, and the decision that reseeding is necessary is made, it is important to make sure time and money spent is carefully planned. This should start with a thorough evaluation of the soils including how wet or droughty they are, soil type and soil testing. This provides information needed to be able to choose the right mix of plant species. For example, some pasture plants thrive in wet soils, while others will not survive. Other factors that are important to think about in choosing what to plant include the local climate, the type of grazing livestock, existing weed pressure, and the length of time the stand is needed. There are a lot of differences regionally, so when reseeding a pasture in northern Vermont, you are likely to choose a different mix of

pasture species than in a pasture in Pennsylvania.

What does a high quality dense pasture look like? It should include a diverse mix of several different grass species as well as several legume and forb species. Forbs may include chicory, dandelion and plantain. This will allow a nice mix of vertical grass leaves and stems with the more horizontal legumes and broad leaf forbs. This creates density, which makes it easier for livestock to get a full mouthful in each bite. It also creates more leaf area to photosynthesize and help the plant grow vigorously. When you stand in a high quality dense pasture and look down, you should see only plants with no bare soil visible between them.

Grass Productivity by Andre Voisin is one of several older publications I enjoy re-reading, as it reminds me that much of what we know about grazing has been around for quite a while. He used the term "rational" to describe good grazing systems. I enjoy his book because of both his technical information, and his obvious passion for the subject, which he expresses here along with a good description of what a well-managed pasture landscape should look like.

"What loveliness! What shades of colour all blending to form an even more magnificent picture where rational grazing is applied. The different paddocks, at different stages of re-growth, are not all of the same hue. Moreover, in a well-managed system the paddocks are not grazed in the same order as they stand, and so the colour tones, like reflections on the sea, do not gradually and uniformly diminish in intensity. Between two dark greens one glimpses a paddock lighter in colour, like the depth of a wave. A part where the grass has already begun to flower takes on an undulating, wavy aspect. What enchantment a pasture grazed in this way offers they eye!

Setting up a grazing system part two: The livestock

Pasture height, digestibility and plant density controls dry

matter intake of grazing livestock. The best way to make sure the herd or flock is eating enough dry matter from pasture is to pay close attention to the quality and size of the bite of pasture they receive. If the pasture is too short, then they cannot get enough pasture in each bite to meet their dry matter needs, even if given a larger area to graze. If the pasture they are eating is too over-mature, and contains too many fibrous stems and not enough leaves, then it may not be digestible enough. This low digestibility can also limit their ability to consume enough pasture dry matter.

Cows and other ruminants can only take a certain number of bites each day and only graze for part of each day because they must also spend time resting and ruminating. This is one reason to provide a new pasture, which is fully recovered and dense, several times a day or at least every three days. When livestock go into a pasture that is fully regrown, they can rapidly fill their rumens with high quality feed. Managing for a dense pasture sward of the correct height results in better animal performance and a more profitable farm.

When ruminants graze, they wrap their tongues around pasture plants and snip them off with their lower teeth and upper dental pad. They generally first eat tender leaves and the tops of plants. If they are grazing the same pasture for several days or a week, the nutritional quality of what they eat each day will change due to this selective grazing behavior. So on day one they will get very high quality feed which takes them less effort to eat. Several days later in the same pasture the cattle are working harder and getting lower quality feed. Using a higher stocking density (smaller paddocks) and moving them to new pastures more often will result in more predictable pasture nutrient intake, which can make ration balancing and milk production easier to manage.

Don't push them to graze it down too short. Leaving more plant residue provides better quality feed for the livestock. It is also better for the plants to leave more plant residue behind, and not push the animals to stay in the pasture too long and graze

the plants down too short. Livestock will reject some pasture around manure. This natural instinct helps them avoid areas containing parasites. The best way to manage these rejected areas is to improve the biological activity of the soil and population of insects such as dung beetles, so that manure is more rapidly incorporated into the soil. Using a higher stocking density so that the leftover plant residue is trampled will encourage this decomposition activity.

For farms who can't use a high stocking density to get a thorough trampling effect, clipping pastures immediately after grazing may help manage rejected forage and standing residue, particularly in the first few years of grazing. Clipping with a mower can be a useful tool for both weed control and mowing "straw like" over-mature grass stems so that regrowth at the next grazing is higher quality. When clipping it is important not to set the mower too low, and also important to clip as soon as cattle finish grazing the area so you are not mowing new regrowth. Some farms also use a "follower group" of cattle that have lower nutritional needs to "clip" the pasture. However, when using this method, care must be taken not to do overgrazing damage.

Summary

Now that we have looked at things from the perspective of the plants and from the perspective of the livestock, we can see how each of their requirements complement each other. The plants do best with short periods of grazing and long regrowth periods. The livestock do best with short periods of grazing in each area and do best when the plants have had enough time to regrow. Good grazing management is a win-win system for the plants and livestock. And along the way there are many environmental benefits such as improved soil health. In addition, farm profitability can improve; the nutritional content of the meat and milk changes, and consumer demand for grass fed products can be met.

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