# *Alternative Feed Guide*

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KELMSCOTT RARE BREEDS FOUNDATION

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# Preface

Kelmscott Farm has published this manual to help livestock producers in New England identify ways to reduce feed costs. The use of alternative feedstuffs can help reduce the costs of livestock production, but may not be applicable to every production situation. We are not suggesting that every producer drastically change his or her feeding program. We are simply encouraging farmers to examine the viability of alternative feeds for their situation.

If you are interested in using alternative feedstuffs, this manual will help explain how to go about it. As there are many alternative feeds available, we do not attempt to list them all. All feed has variations in nutrient value. We suggest, therefore, that producers interested in implementing an alternative feed first test or obtain information on its nutrient value. Additionally, consultation with a veterinarian or cooperative extension agent is advised to determine the best way to implement a particular feed for your unique situation.

Including the use of alternative feeds in your feeding program can reduce costs while maintaining the nutritional requirements of your animals. We hope that you find this information useful.

# Introduction

As we all know, feed is one of the highest costs associated with livestock production. Dependence on sacked or prepared rations can result in production costs fluctuating with grain markets. Additionally, livestock production in New England accrues a higher cost because most of our grain is shipped here from the midwest, Pennsylvania, New York, and Canada. This high cost often affects the price of our product and the economic sustainability of farms in this region. We all know the difficulty, but what are some of the solutions? What we are suggesting is that farmers in this area look at adding alternative feedstuffs to their ration. On our farm, for example, we saw a need to reduce feed costs in our sheep herd. We analyzed options available and implemented *cull navy beans* into our gestating ewe feeding program. By doing this we have seen a reduction in feed costs of 30% over the year.

*So what are alternative feeds?* Alternative feeds are non-traditional feeds that are usually by-products, waste or unused portions of various products. These alternatives can usually be found at a very low cost and more often than not are concentrates. Often these feeds are found at canning factories, bakeries, grocery stores, breweries, feed mills and tend to be waste products of production. Because they are a "waste product" and need to be disposed of, these facilities look for ways to dispose of them without incurring environmental costs. The obvious result of alternative feeds use is cost reduction.

However, the implementation of alternative feeds should be entered into with some caution. It is important to consider the negative attributes of some alternative feeds such as toxicity, seasonality, storage, and location.

A great example of the need for such consideration is the beans that we use. On the surface they look great, have high protein, high total digestible nutrients (TDN), and are highly digestible by sheep, but there are some problems lurking in the nutrient value. They have a disproportionate calcium to phosphorus ratio. The appropriate Ca:P ratio in livestock feeds is 2:1. In the case of sheep, an altered ratio can cause urinary calculi in rams and potentially in ewes. Because we had the book value on the navy beans, we were able to avoid the complications of the effects of toxicity. In addition, many of these alternative products are not available year round or are in a form difficult to store or handle. Whey, for example, is a great feed additive. However, it is mostly found, in this area, as a liquid, difficult to handle and store. Also, the location of the product can present a problem. Transportation costs can add up if you have to drive 250 miles north to Aroostook County to get potato meal, for example. It is generally considered best if alternative feeds are obtained locally.

The goal of this guide is to provide information which will enable New England livestock producers to carefully weigh the advantages and potential problems of alternative feeds in choosing those that can effectively be used to reduce production costs.

# Livestock Nutrition Information

**Determining Nutritional Needs:**

As stated earlier, it is important to determine the nutrient value of alternative feeds. This can be done one of two ways. The first way is to sample the feed and send it to a facility that tests feeds for nutritive value, *see appendix for testing location and sample procedure.* The second way is to obtain the nutritive value from a reference. Different specie production manuals usually have a section on feed evaluation where one might find these book values.

When looking at nutritive values of feeds it is easy to become overwhelmed by the alphabet soup that indicates the different values. To alleviate confusion around these abbreviations we have provided a glossary in the appendix that defines most of the terms used through the rest of this guide and abbreviations that would be encountered on feed tests.

When preparing to implement these feeds into a ration or when constructing a ration period, it is important to take into account variables that contribute to effective use of feeds. Variables that effect ration formulation include:

Physiological state
Age
Weight
Temperature
Work (horses)
Sex

All of these variables can be found in one listing. The NRC (National Research Council) publishes a nutrient requirement listing for most livestock species.

The information found in the NRC's nutrient requirement listings provides a base to work from. These tables break down nutrient requirements for the variables listed above and give producers an idea of how much to feed animals at various stages of growth and production. Additionally these tables can be found in most specie production manuals. For example the SID manual for sheep production lists the nutrient requirements for sheep. This information is also available from your local cooperative extension agent.

**Breakdown of Feedstuffs:**

Feeds are broken down into two different categories: roughages and concentrates. As stated earlier, a majority of alternative feeds are considered concentrates. Knowing this breakdown helps in ration preparation especially in ruminants. A tendency of producers when adding alternative feeds is adjusting the ration to focus on concentrate consumption. It is important to manage the ratio of roughages to concentrates. This ratio varies in ruminants from specie to specie.

Within the concentrate group, there are different components. Concentrates are broken down into five categories:

Proteins
Carbohydrates
Fats
Vitamins and Minerals
Non-Nutritive Feed Additives

Usually when formulating a ration, one focuses on %CP or %TDN. Often times when doing this, the vitamin and mineral components are left out. In the appendix is a list of vitamins and minerals and their relative function. In an earlier example it was shown that vitamin/mineral deficiency or toxicity can be a problem when mixing feeds.

# Balancing Livestock Feed Rations

## USING THE PEARSON SQUARE TO BALANCE FEED RATIONS

Feeding livestock involves both art and science. Before producers impart art to the feeding of their livestock, they oftentimes need science to determine a starting point for their rations. One tool which proves both helpful and easy to use is the Pearson square.

Producers may use the Pearson square to balance the feeding of two feedstuffs, whether they choose to do so on an "as-fed" basis or a "dry-matter" basis. The Pearson square simply enables us to ascertain how much to feed of two feeds when we have a certain value or goal we wish to obtain. The value or goal may vary with the producer's preference or with the stage of production of the animal; for instance, it could be crude protein (CP) or total

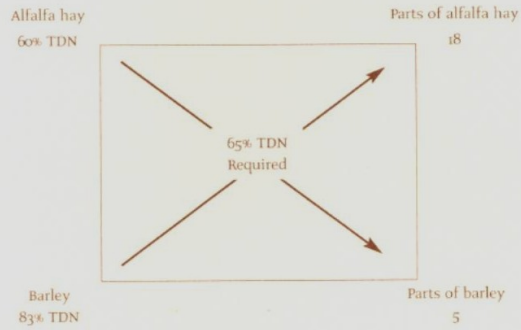
digestible nutrients (TDN). For example, let's apply the Pearson square to determine TDN for a 154-pound ewe who is nursing twins. We'll use numbers from the 1988 Sheep Production Handbook (SID) produced by the American Sheep Industry Association and the Production Research and Education Council.

Our 154-pound ewe requires four (4) pounds of total digestible nutrients each day, and we are feeding her alfalfa hay (fresh) which has a TDN value of 60% as well as barley, which has a TDN value of 83%. (These values are taken from the 1988 Sheep Production Handbook (SID, pp. 517 and 522).

To begin, we draw a square. We place the TDN value of our alfalfa hay (60%) at the top left corner of the square and the TDN value of our barley (83%) at the bottom left corner of the square. Next, we need to place our "goal" or our desired value in the middle of the square. In this case, our goal is to provide our ewe with 4 pounds of TDN each day. Since the value in the middle of the square is in pounds, while the values at the left-hand corners of the square are percentages, we must now make all of the values of the same variety. Let's change the goal in the middle of the square to a percentage.

To do this, we refer again to the SID book. On page 517, we find that our 154-pound ewe nursing twins requires 6.2 pounds of dry matter daily. If we divide the 4 pounds of required daily TDN by the 6.2 pounds of required dry matter daily, we find the daily percentage of TDN to be 65%. Now we can place the value of 65% in the center of our square.

Our next step is to work diagonally and subtract numbers. We subtract the alfalfa hay TDN value of 60% (top left) from the desired TDN of 65% (center of the square). The resulting number of 5 is placed in the bottom right corner of the square. We also subtract the 65% desired TDN (center of the square) from the 83% TDN of the barley (bottom left), which gives us a number of 18. These numbers provide us with the "parts" of each feed component necessary to achieve our goal. We should also note that whichever feed component is at the top of the square on the left will also be at the top of the square on the right, and that whichever feed component is at the bottom of the square on the left will be at the bottom of the square on the right.




To complete our exercise, we must finally convert our "parts" from the right side of the square to percentages. To accomplish this, we first add the two "parts" together. 18 parts of alfalfa added to 5 parts of barley gives us a total of 23 parts. To convert the "parts" to percentages, we divide each "part" by the total of 23.

| | |
|---|---|
| 18/23=78% | 5/23=22% |
| Alfalfa | Barley |

This brings us to our desired result. We now know, after having used the Pearson square, how to meet the nutritional needs of our lactating ewe. 78% of our ration needs to be comprised of alfalfa

hay, while the other 22% needs to be comprised of barley. Having completed the scientific portion of our ration, it is now up to the producer to impart his or her "art" when feeding his or her sheep!

## Conclusions

We have taken a look at what alternative feeds are, some of their positive and negative attributes, how to determine nutritional needs, how feedstuffs are broken down and how to balance alternative feeds with existing livestock feed rations. The reality is that there is not an abundant choice in alternative feed resources in New England. However, we believe with proper research and implementation, alternative feeds can be effectively used to enhance existing rations as protein or energy supplements and help bring down feed costs.

We hope that you have found this guide informative and that it will be useful to you in your own search for local feed alternatives.

# *Appendices*

# Glossary of Terms

**Ad libitum** - Allowing animals to eat what they want when they want

**ADF (Acid detergent fiber)** - Contains cellulose and lignin

**As Fed** - Feed normally fed to animals. Range 0-100% DM

**Ash**- materials left over from the sample and measured as minerals

**Crude Fiber**- The lignin, cellulose, and other structural carbohydrates in feedstuffs

**Crude Protein** -A measure of total protein in feeds determined by multiplying the Nitrogen content by 6.25

**Digestible Energy (DE)** - Portion of energy that can be digested and absorbed

**Digestible Protein** - Protein that can be digested and absorbed

**Dry Matter (DM)** - The materials left over after drying a feed sample

**Net Energy (NE)** - The amount of energy feed after essentially all losses
have been accounted for (feces, urine, digestive gases, and heat increment)

**Neutral Detergent Fiber (NDF)** - Contains cellulose, lignin, and hemicellulose

**Nitrogen-Free extract (NFE)** - The portion of feed composed of starches and sugars

**Non-Protein Nitrogen (NPN)** - Nitrogen in feeds such as urea and amino acids

**Pasture** - Green forage crops selectively grazed by an animal

**Ration** - Feed mixture that is fed to animals during a 24 hour period

**Roughage** - A feedstuff that contains more than 18% crude fiber on a dry matter basis

**Silage** - Green forage crops or whole corn plants that are chopped into small pieces and packed into a silo for preservation

**Total Digestible Nutrients (TDN)** - All the nutrients that can possibly be absorbed by a feed

**Major Macro minerals: Ca, P, Na, K, Mg, S, Cl**

**Trace Micro minerals: Cu, Fe, Mn, Zn, Co, I, Mo**

**Fat Soluble Vitamins: A, D, E, K**

**Water Soluble Vitamins: B complex, and C**

## Some Important Vitamins in Animal Nutrition

| Fat Soluble | Function(Partial) |
|---|---|
| A | Maintains vision and cellular metabolism |
| D | Calcium/phosphorus absorption and metabolism |
| E | Antioxidant, reproductive function in some species, aides in selenium absorption |
| K | Aides in blood clotting |

| Water Soluble B-Complex | |
|---|---|
| $B_1$ - Thiamine | As a group, act as co-enzymes in chemical reactions to release energy, help maintain skin health, help maintain nervous tissue, and help with red blood cell production. |
| $B_2$ - Riboflavin | |
| Pantothenic Acid | |
| Niacin | |
| $B_6$ - Pyroxidine | |
| $B_{12}$ - Cyanocobalamin | |
| Biotin | |
| Folic Acid | |

## Some Important Minerals in Animal Nutrition

| Mineral | Function |
|---|---|
| Calcium(Ca) | Bone/tooth formation, muscle contraction |
| Phosphorus (P) | Bone/tooth formation, enzyme component |
| Magnesium (Mg) | Enzyme activator, component of skeletal tissue |
| Sodium (Na) | Muscle contractions, maintenance of body fluid levels, electrolyte |
| Potassium (K) | Electrolyte, enzyme activator |
| Chlorine (Cl) | Electrolyte, acid/base balance |
| Sulfur (S) | Synthesis of amino acids in ruminants |
| Iron (Fe) | Component of hemoglobin |

# RESOURCES

## *Contacts*

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Brunswick, ME 04011
Tel: (207) 725-3586

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USDA Beef Extension
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Jason Harris
Blue Seal Feeds, Inc.
Territory Sales Manager
Shapleigh, ME 04076
Tel: (207) 432-0273

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Waldo, ME 04915
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# WEBSITES

www.agri.gov.ab.ca/calculator

www.zginfonet.com/wheatenergy.html/tools/index.html*livestock

www.colostate.edu/Dept/CoopExt

www.inform.umd.edu/EdRes/Topic/AgrEnv/ndd/feedingProceduresForMarketingAlternativeFeeds.html

www.agweb.okstate.edu/agbase/agprogen00-18.html

www.wvu.edu/~agexten/forglvst/alterdrot.html

www.ianrnews.unl.edu/static/0104130.shtml

www.ext.nodak.edu/extpubs/ansci/livestock/as1182.html

www.ianr.unl.edu/PUBS/fieldcrops/mp51.html*dbfbc

www.noble.org/ag/Livestock/WhatYouPayFor.html

www.ag.ndsu.nodak.edu/copying/altfeeds.html

www.usda.gov

www.ext.colostate.edu/pubs/livestock/01618.html

# FEED SOURCES

## *Bakery Waste:*

**Megguier Hill Corp.**
66 Milliken Street
Portland ME 04103
Tel: (207) 797-7997

## *Barley:*

Course and Fine
**Larry Clowes**
529 Lewiston Road
West Garder, ME 04345

## *Beans:*

**B & M Beans**
John Totman
Portland, ME 04101
Tel: (207)772-8341

**Kennebec Bean Company**
Peggy Loubier
Vassalboro, ME 04989

## *Brewers Grain, Wet:*

**Sea Dog Brewing Company**
26 Front Street
Banfor, ME 04401

**Andrew's Brewing**
Andy Hazen
Lincolnville, ME 04849
Tel: (207) 763-3305

## *Peanuts:*

**Perry's Nuthouse**
17 Searsport Avenue
Belfast, ME 04915
Tel (207) 338-1630

## *Potato Meal:*

**Tator Meal, Inc.**
PO Box 413
Presque Isle, ME 04769
Tel: (207) 762-0011

**McCain's**
Easton, ME 04740
Tel: (207) 488-2561

## *Whey:*

Sweet and Sour
**State of Maine Cheese Co.**
Cathe Morrill
461 Commercial (Rte. 1)
Rockland, ME 04841
Tel: (207) 236-8895