Dairy Goat Field Day
In partnership with USDA-Risk Management Agency

Location: Fraga Farm, Sweet Home
Dates: Wednesday, June 6, 2012
Time: 10:00 a.m. – 4:00 p.m.
Cost: $50 per person or $75 for partners from the same farm sharing materials

This farm field day focuses on small-scale goat dairying and cheese making. The event will be hosted by Jan and Larry Nielsen who own and operate Fraga Farm, an organic goat dairy and cheese processor. Managing risk for animals, customers and farm business is part of their success. Topics included during the workshop are animal health, milking, sanitation, food safety, rules and regulations, cheese making and marketing.

Pre-registration is required. Resources materials and a meal are included in the workshop cost. Space is limited to 10 participants. This class is one of five stand-alone workshops in our summer livestock series.

Register on-line at http://extension.oregonstate.edu/benton/smallfarms/events or by visiting OSU Extension Service, 1849 NW 9th, Corvallis, OR 97330.

For more information contact Melissa Fery at (541) 766-6750 or Melissa.Fery@oregonstate.edu
**Abstract**: Dairy Goats: Sustainable Production is intended for those interested in starting a commercial goat dairy. It discusses the five major considerations to be addressed in planning for dairy goat production: labor, sales and marketing, processing, regulations, and budgeting and economics. It includes production information specific to dairy goats, including choosing breeds and selecting stock. A resource list for further information about dairy goat production follows the end notes.

This is a companion piece to ATTRA’s Goats: Sustainable Production Overview. The Overview should be read first, since it contains production information for goats in general, including grazing management, fencing, reproduction, nutrition, diseases and parasites, and resources.

**Contents**

Introduction ....................1  
Getting Started ................2  
Labor ............................2  
Marketing ....................3  
Processing ....................3  
Farm Profile:  
Split Creek Farm,  
South Carolina .............5  
Regulations ..................5  
Budgeting ....................7  
Production  
Notes ..............................10  
Selecting stock............10  
Farm Profile:  
Redwood Hill  
Farm, California .............14  
Feeding....................... 15  
Milking.......................18  
Health.........................21  
Conclusion ...................24  
Farm Profile:  
Blufftop Farm,  
Arkansas......................25  
Resources.....................26  
References....................30

By Linda Coffey, Margo Hale, and Paul Williams  
NCAT Agriculture Specialists  
© 2004 NCAT

**Introduction**

In 1994, world-wide production of goat milk was approximately 10.5 million tons. In the United States at that time, there were approximately one million dairy goats producing 600,000 tons of milk, about 300 known dairy goat businesses, and at least 35 known commercial goat-cheese makers. These cheese makers produced about 640 tons of U.S. goat cheeses, while at least another 650 tons of goat cheese were imported that year from France alone. (Haenlein, 1996)
Dairy goats are enjoyable animals, easy to handle and haul, and relatively inexpensive to purchase, feed, and house. Dairy goat production, especially pasture-based production, offers the opportunity for profitable and sustainable diversity on a small farm. For example, a vegetable farm can use goats to clean up residue and fertilize the land, while producing milk for the family or for raising kids, calves, pigs, or other livestock. Goats will browse and help keep pastures from being overrun with woody species.

In some locations, Grade A dairies may have a market for fluid milk. Goat milk can often be enjoyed by people who are allergic to cows’ milk, and infants of all species generally thrive on goat milk. Value-added products such as cheese and yogurt made from goat milk are finding a growing acceptance in the dairy market, with sales of goat cheese increasing more than 16% in 2000. (Specialty Cheese Market, 2001)

However, producing dairy animals and dairy products requires a great commitment of time and energy and consistent attention to detail. Proper nutrition and milking procedures, skillful kid raising, and good general health care are essential for success. In addition, costs must be kept under control. Most important of all is marketing; a viable business requires a healthy demand for the product or products produced and a price that allows a profit.

Because commercial production is so much more challenging than keeping a few dairy goats, this publication will first address the major issues of labor, marketing, processing, regulations, and budgeting. The production notes—including selecting stock, feeding, breeding, and milking—compose the second major section. Finally, budgets and a list of further resources are also provided.

### Getting Started

Things to be considered before entering a commercial dairy goat business include the availability of labor, the marketing outlook, processing options, regulations, budgeting, and economics.

**Labor**

Labor is a major concern. Do you enjoy goats enough to spend mornings and evenings, seven days a week, week after week, feeding, milking, and cleaning up? Do you have the support of your family in this? Many dairy producers have faced frustration and burnout after trying unsuccessfully to hire competent help. If your family is not willing to help with the business, you should probably consider a less demanding enterprise.

Estimates vary regarding the labor demands of a goat dairy. Dr. Robert Appleman believes that a 100-doe dairy selling fluid milk to a processor will require about 1.5 full-time workers. (Appleman, 1989) Appleman’s calculations:

- Milking: 25 does/person/hr (305 days)
- Set-up and clean-up: 40 min. daily
- Manure handling and bedding: 25 min. daily
- Feeding hay and grain: 25 min. daily
- Heat detection: 30 min./day for 6 months
- Breeding: 20 min. x 2 breedings
- Miscellaneous: .5 min. daily per doe

Some of the above figures are per doe, while others are per herd. Total labor per doe in

---

**Related ATTRA publications**

- Goats: Sustainable Production Overview
- Sustainable Goat Production: Meat Goats
- Small Ruminant Sustainability Checksheet
- Rotational Grazing
- Sustainable Pasture Management
- Integrated Parasite Management for Livestock
- Predator Control for Sustainable & Organic Livestock Production
- Value-added Dairy Options
- Assessing the Pasture Soil Resource
- Dung Beetle Benefits in the Pasture Ecosystem
- Grazing Networks for Livestock Producers
- Matching Livestock & Forage Resources in Controlled Grazing
- Multispecies Grazing
- Nutrient Cycling in Pastures
- Introduction to Paddock Design & Fencing–Water Systems for Controlled Grazing
Appleman’s budget is 34.7 hours per year, 70% of which is spent milking (Appleman, 1989).

In contrast, a Pennsylvania State University budget estimated labor as 22 hours per doe per year to run a 100-doe facility (Penn State, http://agalternatives.aers.psu.edu/livestock/dairygoat/budget1.htm), while another budget considered 13.6 hours per doe per year to be sufficient for a 100-doe herd. (Rutgers Cooperative Extension, http://aesop.rutgers.edu/~farmmgmt/ne-budgets/organic/DAIRY-GOAT-1500LB-MILK.HTML) With so much variation in estimates, you may want to visit a producer who has a dairy the size you intend to operate, work beside the farmer for a week or so if possible, and ask what that farmer thinks is realistic. Facilities and efficiency of milking, feeding, and cleaning can account for a lot of the difference, and that should be kept in mind as you plan your dairy farm. Also, note that these figures do NOT include any value-added processing or marketing time; if on-farm processing is part of your business, labor costs will be significantly higher.

**Marketing**

If labor is available, the next concern is marketing. What product or products do you hope to sell? Is there an unmet demand for that product in your area? If so, what price can you realistically expect to receive? Can you make a profit if you sell at that price?

In the case of fluid milk, a prospective producer must first locate a reliable buyer. Judy Kapture, long-time producer and columnist for the Dairy Goat Journal, issues a strong warning to the farmer planning to start a goat dairy. You are certainly wise to be cautious. I can tell far too many stories about people who used all their money to set up their farm as a goat dairy, and then never did sell any milk. Or their milk market fizzled out within a year... Get in touch with them (the buyer) to find out if they actually are planning to buy more milk. Learn the details — how much milk do they want from a farm, what do they pay for milk, is winter production a necessity, what do they charge for hauling, etc.

Then talk with some of the people who are shipping milk to them now. You want to find out if they feel the pay for the milk is good enough to make the goatkeeping effort worthwhile. (Remember that feed and other costs vary greatly and a “good milk price” in one area may be too low for another.) You may get some surprises when you ask this question... Be cautious about new startups. Sometimes they have a lot of enthusiasm but no idea how difficult it will be to market their milk or cheese or other product in the quantities they need... Are there patrons shipping milk to the buyer now? Talk to them, all of them. Are they getting paid? Is the buyer taking all the milk he promised he would?... How good is the market for what they are planning to sell? (Kapture, 2001)

In many areas of the United States, there are no processors. In some areas, a processor is available but already has enough milk producers on contract. Therefore, it is vital to be sure you have a market for your milk. If you are unable to sell to a processor, it may be feasible to sell to individuals raising baby animals, or to market the milk through your own livestock (raising calves, for example, and selling them for meat). In some areas it is possible to sell milk directly to individuals for human consumption, but in MANY states that is ILLEGAL. To find out what is legal in your state, contact the agency responsible for dairy regulations. The American Dairy Goat Association (ADGA) lists the contact information for state agencies on its Web site, www.adga.org. Go to “Starting a Grade A or Grade B dairy,” www.adga.org/StartDairy.htm.

Marketing to individuals will require much more time and effort and will be harder to initiate. For example, a milk truck going to a commercial dairy may pick up 200 gallons of milk every other day. If there is no milk truck, how much milk can you sell each week? If the answer doesn’t equal “all of it,” what will you do with the rest? The available market is a major factor in determining your scale of operation (herd size).

**Processing**

Some producers choose not to deal with a milk buyer and hope to increase their farm profits by processing the milk themselves. Diversifying the products you sell may offer more income and financial stability. Those products might include
fluid milk, milk-fed pork, goat cheese of one or more varieties, yogurt, fudge, goatskins, meat, or goat-milk soap or lotions.

Cheese is a good alternative to selling milk, particularly if you like direct marketing. It is legal to use raw milk in making cheese if the cheese is aged at least 60 days before sale. (Dairy Practices Council, 1994) Fresh cheese must be made with pasteurized milk. Cheesemaking classes will prove helpful, and much practice, experimentation, and sampling will be necessary before you are ready to market farmstead cheese. You must abide by regulations (talk to your inspector about what is involved). Cheese-making resources are discussed in *The Small Dairy Resource Book* (see Resources: Contacts), and Caprine Supply and Hoeger Supply Company (see Resources: Suppliers) offer several books about cheesemaking.

Edible products will require a Grade A dairy, commercial kitchen, and licenses (contact your state agency for more details), while soap making does not. Soap is non-perishable, easy to ship, and does not require much milk. These advantages make soap an appealing option for small farm enterprises.

Any further processing (beyond selling bulk fluid milk) will create extra demands on the farmers, since they must somehow tend not only to the dairying but also to the processing, packaging, marketing, delivery, and paperwork. (Dunaway, 2000) Also, while diversifying products may add stability (not all the eggs in one basket), each new product will require more equipment, labor, storage space, production knowledge and skill, and outlets and time for marketing. Unless there is a large labor force available, too much diversification will be unsustainable. Dr. Tatiana [sic] Stanton points out the following:

If you try to produce a whole line of products, it can make really big marketing demands on you if you are not going to sell them to the same buyer. For example, if you are a small producer and are going to sell fudge, soap, and cheese all to the same local food co-op or over the Web, that is one thing. You are going to have to do a lot more marketing if your cheese is going to cheese shops or restaurants, and your fudge and soap to gift shops. You may find in such a case that it is a terrible decision to expand your line. (Stanton, 2002)

Brit and Fleming Pfann, owners of Celebrity Dairy in North Carolina, have said, “Marketing takes a huge amount of time, and as we’ve gotten more involved in cheese-making and in selling the cheese, we’ve found that we have very little time to spend with the animals.” (Pfann, 2002) Other farmers have echoed that observation, and this is disappointing to those who enjoy the goats far more than processing or marketing. If you yourself do not want to be involved in marketing, then you will need a partner who is capable, reliable, and enthusiastic.

Your customers can be local individuals, restaurants, farmers’ market patrons, grocery stores, or even mail-order and Web customers. Harvey Considine cautions against pricing products too cheaply.

In a competitive market such as goat cheese, one must be constantly aware of what the competition is charging, but even then everyone must know their own costs of production. If you do not cover those costs you will not be long in business. Keep in mind that other factors than competition can justify price... My counsel always is to produce a high-quality product consistently and charge what you must to make your venture profitable. (Considine, 1999)

There are successful farmstead cheesemakers, and their stories may inspire you. Their experiences should help prospective producers think through the demands of the occupation and decide whether family support and available labor will be adequate to meet the challenges. Some thoughts shared by Brit and Fleming Pfann, of Celebrity Dairy in North Carolina, www.celebritydairy.com, illustrate the demands of farmstead cheese making:

- Sustained long hours of work (all year)
- Great breadth of skills (dairy animals, cheesemaking, marketing)
- Significant capital investment
- ...and may return a modest annual income.
Another North Carolina goat dairy is the Goat Lady Dairy; like Celebrity Dairy, it produces delicious farmstead cheese and has other enterprises to diversify the farm income. Goat Lady Dairy also offers a class in farmstead cheesemaking. To learn more about the dairy, visit www.goatladydairy.com/.

For more information about processing your own dairy products, see the ATTRA publication Value-added Dairy Options and explore the Resources section of that publication as well as this one.

Regulations

Grade A Requirements

The U.S. Food and Drug Administration drafted the Pasteurized Milk Ordinance (PMO), which states that only pasteurized milk can be sold as Grade A. Enforcement of this ordinance is under the jurisdiction of state departments of health or agriculture (Zeng and Escobar, 1995), and local requirements may vary. The American Dairy Goat Association Web site, www.adga.org/, includes contact information for the authority in each state, and it is important to contact your state inspector early in the process of setting up your commercial goat dairy. The Web address for the contact information is www.adga.org/StartDairy.htm. State inspectors will be able to make helpful suggestions and can assist you in planning and procuring USDA-approved equipment. Many producers have commented that their state inspectors helped them avoid expensive mistakes.

The Langston University publication Grade A Dairy Goat Farm Requirements — on the Web at www.lurexext.edu/goats/library/fact_sheets/d04.htm — discusses the requirements for a Grade A dairy. These include a milking barn or parlor with a floor made of concrete or other impervious material for easy cleaning, and walls and dust-tight ceilings that are smooth, painted or finished, and in good repair. Sufficient ventilation is needed to eliminate condensation, minimize odor, and provide comfort for the milker. Adequate lighting is required, as well as a storage cabinet for medications. Wooden milking stands are not acceptable. (Zeng and Escobar, 1995)

A separate milk room is required for cooling and storing goat milk, to minimize the risk of contamination from the milking barn. The structure must be in good repair and easy to clean. The floor should slope evenly to a drain, and wash-sinks, hot water, and on-site toilets are required. Milking lines and other equipment should be of stainless steel or other smooth, non-absorbent material. Milk storage tanks must have an efficient cooling system. Fresh, warm milk coming out of

Split Creek Farm, South Carolina

Evin J. Evans and Patricia Bell

Split Creek Farm, in Anderson, South Carolina, is a great example of a farm that started out small and grew to be a large operation. Evin Evans and Patricia Bell’s goal was to be self-sufficient, and that required gradual growth.

Split Creek Farm started with three goats and a few acres. Over the years Evans and Bell added to their herd and their pastures, fences, and barns. The herd, mostly Nubians, peaked at 750 goats; the farm’s goat population now averages approximately 275, with about half of those being milked.

Split Creek became a commercial Grade A Dairy in 1985 and started a small-scale cheese operation three years later. They increased their production as the demand for goat cheese grew, and by 1990 Split Creek had progressed from the original 4-gallon vat batches to the current 150-gallon vat batches. Split Creek currently sells raw milk, award-winning cheeses and fudge, soap, gift baskets, and folk art at a retail shop on the farm. Split Creek Farm’s primary concerns are herd health and the ultimate quality of the dairy products they sell. In keeping with their commitment to sell natural products, Evans and Bell do not use hormones to enhance breeding or milk production, and herbicides and pesticides are not used on their pastures.

Evans and Bell, with assistance from two full-time and two part-time employees, care for the goats and produce and sell the products. They have worked long and hard for what they have accomplished, and they are proud of the quality of their goats and their goat milk products. For more information on Split Creek Farm, their products, and the crew behind it all, visit www.splitcreek.com.
pipelines or milking buckets must be cooled to 45 degrees F within two hours. The water supply must comply with the Clean Water Act requirements, as enforced by the EPA, and a dairy waste management system must be in place. Grade A dairies are inspected at least twice a year, and milk samples are collected periodically.

**Scrapie Eradication Program**

Scrapie is a fatal, degenerative disease affecting the central nervous system of sheep (and goats, very rarely), one of the class of diseases known as transmissible spongiform encephalopathies (TSEs). Other examples of TSEs include BSE in cattle and Chronic Wasting Disease (CWD) in deer and elk. There is no evidence that scrapie can spread to humans, but BSE, a TSE similar to scrapie, has been implicated in variant Jacob-Cruchfeld disease, and therefore there is a concern about its potential to spread to humans. Negative public perceptions and the loss of export opportunities have encouraged the efforts to eradicate scrapie from the U.S. The incidence of scrapie in goats is extremely low, so it is highly unlikely that your herd will be affected. Nevertheless, goat producers (and sheep producers) are required to participate in the Scrapie Eradication Program. Details about this program are available by contacting your state veterinarian or by going to the National Scrapie Education Initiative Web site, www.animalagriculture.org/scrapie. You must first contact your state veterinarian to request a premises identification number. For additional information or for help in obtaining a premises ID number, call 866-USDA-TAG (toll-free). You will then receive free ear tags with your premises ID printed on them, and you must tag any breeding animals over the age of 18 months before they leave your farm. Dairy goat producers may use tattoos instead of ear tags, and the state veterinarian can assist by assigning a premises ID that consists of your state abbreviation and the ADGA tattoo sequence assigned to the farm. In addition, any breeding goat (or sheep) that crosses state lines (for shows or to be sold, for example) must be accompanied by an official Certificate of Veterinary Inspection (health certificate) issued by an accredited veterinarian. (National Institute for Animal Agriculture, www.animalagriculture.org/scrapie)

Registered goats may be transported across state lines using registration tattoos as identification, provided they are accompanied by their negative certificate registration or a health certificate listing the tattoo number.

**Raw Milk Sales**


The sale of unpasteurized milk is the subject of regulation because of concerns over the transmission of diseases. In some states, such as Iowa, the sale of raw milk—even in small quantities—is strictly prohibited by state regulation and the state officials take a rather rigorous approach on the issue. In other states, officials have a more permissive attitude toward the sale of raw milk, allowing small-scale personal sales to occur even if not specifically allowed by law. In some states dairy farmers are allowed to make limited sales of raw milk directly to consumers as long as the sales meet the requirements established by law or regulation. The requirements usually relate to how the milk is sold, the quantity involved and compliance with state sanitation requirements for the dairy operation. (Hamilton, 1999)

Even if raw milk sales are legal in your state, you will want to consider carefully the risks of selling raw milk to customers. Many serious diseases can be transmitted to humans who drink raw milk, including brucellosis, tuberculosis, caseous lymphadenitis, leptospirosis, Q Fever, staphylococcal food poisoning, and others. (Smith, 1994) Even if you are sure your milk is pure, that the goats are healthy, that the milk has been handled with faultless cleanliness and carefully cooled, and even if you regularly drink the milk with no ill effects, once the milk...
leaves your farm it may be carelessly handled and become unsafe to drink. This is especially hazardous if the person drinking the milk has a weakened immune system or is very old or very young. Get the advice of your state department of health before you agree to sell raw milk to individuals.

**Budgeting**

Before beginning a commercial goat dairy, you must study the economic feasibility of the enterprise. There are many sample budgets available, but each must be customized to fit an individual farm. Investigate feed costs in your area as well as the selling price of milk. Costs of building or converting barns, fences, and watering systems are key considerations. Initial investment in livestock and in milking systems will be a large expense. Commercial dairy producers Stephen and Beverly Phillips of Port Madison Farm near Seattle, Washington, offer the following insights based on their experience.

“It takes capital to expand into a commercial-sized dairy,” Stephen says. “You must have the money to grow or keep the off-farm job or both. Sweat equity alone cannot do the job.

“A good plan, written down, is important to measure your progress. Otherwise, you get so close to the proverbial trees that you do not realize that you have made progress.

“When making improvements, it is important to plan for the size you may need in four or five years.

“And like most goat dairies, you need to beware of burnout.”

Beverly sums up her advice by emphasizing, “Don’t quit your day job too soon.” (Thompson, 1997)

Bee Tolman, operator of the Tolman Sheep Dairy Farm, offered further advice to prospective dairy farmers at the 2002 8th Great Lakes Dairy Sheep Symposium.

Do a complete business plan before you do anything else. Include all financial statements in detail. Don’t miss the details—they will be your undoing. And be conservative. I was advised by a goat dairy farmer (who has since folded) to add 30% to all budgeted costs. I didn’t. I now know that if I had, my plan would have been far more accurate. (Tolman, 2002)

As Ms. Tolman points out, it is wise to talk to farmers who are currently in the business to ensure that your plan and your budget are realistic.

Begin your calculations by taking the following steps.

- **Do market research.** Is there a market? What is the current price for your product, whether fluid milk for processing, bottled milk, milk-fed livestock, cheese, or soap? Is there a strong demand for your product?
- **Estimate production level.** How many does are you planning to milk? How productive will they be, on average? (Does in a large herd typically produce less than does in a hobby herd; ask several commercial producers what their herd average is, and be sure to select does for your herd that can produce enough milk to be profitable.) Be as realistic about production and marketing as you possibly can.
- **Investigate costs.** What does feed cost in your area? How much feed will you need in order to produce the amount of milk you plan to produce and sell? What about buildings, equipment, fencing, hay? You will need to come up with marketing and hauling costs, health costs, costs of utilities, supplies, breeding, and labor. Initial cost of breeding stock, cost of raising replacements, and an extra “cushion” for unexpected expenses must also be considered. Remember that under-capitalization can doom even a good business venture.
- **Consider labor NEEDED and available.** Plan for peak seasons such as kidding and breeding, as well as any labor needed for processing and marketing.
- **Compile a business plan.** Your lending agency will tell you what other figures are needed; your local Cooperative Extension agent may be helpful. See also the Resources section for help with business plans.

Table 1 illustrates how production levels and price influence your profits. These numbers are based on Roger Sahs’ goat dairy budget, which is included in this publication.

The Minnesota Extension Service published a
very interesting look at the economics of the dairy goat business in 1989. Robert D. Appleman, the author, explored costs and returns from a 10-doe hobby dairy and a 100-doe commercial dairy. His budget (Economics of the Dairy Goat Business — HG-80-3606) can be ordered by contacting order@dc.mes.umn.edu. He also did some fascinating calculations, such as looking at the impact of a change in cost of one input on the cost of producing 100 pounds of milk, the influence of marketing registered kids, or of marketing kid bucks, the labor required, and several other interesting scenarios. It is well worth reading the full article, and figuring today’s costs for your area instead of Minnesota’s 1989 costs. Even though the article is out of date, Appleman’s conclusions offer food for thought, and are summarized below.

1. The cost of producing 100 pounds of goat’s milk may vary from $22 to more than $37. To return a profit, then, a gallon of milk may have to sell for $3.20 or more.

2. The greatest contributor to the high cost of producing goat’s milk is labor. Every effort should be made to minimize this input. The greatest opportunity to accomplish this is to mechanize the milking process.

3. Marketing costs can be prohibitive.

4. Unless one has a good market for excess, it is not advisable to keep young stock beyond that needed to maintain the doe herd productivity.

5. If milk can be sold at a price of $12/cwt or more, milk-fed kids sold at 25 pounds for 80 cents per pound are not profitable.

6. There is an economy to size, especially when combined with considerable sale of breeding stock.

7. Emphasize high production per doe. Maintaining dry does (non-breeding does that will have a long dry-period) can quickly eliminate any profit potential.(Appleman, 1989)

Oklahoma State University Extension Specialist Roger Sahs works on goat farm budgets for dairy goat and meat goat enterprises (see attached budget—Table 2). He recommends that farm managers take the time to work out an enterprise budget.

...[an enterprise budget] would be an essential tool in evaluating whether such an alternative would be to the manager’s financial advantage. Farm management skills and knowledge are a very integral aspect of success with commercial

continued on page 10

<table>
<thead>
<tr>
<th>Milk Prod. (lbs.)</th>
<th>-10% $21.60</th>
<th>-5% $22.80</th>
<th>Expected Price/cwt. $24.00</th>
<th>+5% $25.20</th>
<th>+10% $26.40</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20% 1600</td>
<td>$42.48</td>
<td>$61.68</td>
<td>$80.88</td>
<td>$100.08</td>
<td>$119.28</td>
</tr>
<tr>
<td>-10% 1800</td>
<td>$85.68</td>
<td>$107.28</td>
<td>$128.88</td>
<td>$150.48</td>
<td>$172.08</td>
</tr>
<tr>
<td>Expected 2000</td>
<td>$128.88</td>
<td>$152.88</td>
<td>$176.88</td>
<td>$200.88</td>
<td>$224.88</td>
</tr>
<tr>
<td>+10% 2200</td>
<td>$172.08</td>
<td>$198.48</td>
<td>$224.88</td>
<td>$251.28</td>
<td>$277.68</td>
</tr>
<tr>
<td>+20% 2400</td>
<td>$215.28</td>
<td>$244.08</td>
<td>$272.88</td>
<td>$301.68</td>
<td>$330.48</td>
</tr>
</tbody>
</table>

Break-even milk production above total operating costs is 1263 pounds/head at the $24.00 price of milk.

Break-even milk price/cwt. above total operating costs is $15.16 using a production of 2000 pounds/head.

*Break-even price and production are calculated to cover total operating costs only while keeping revenues from kid and cull sales constant.

This table was developed using figures from the Dairy Goat Budget developed by the Department of Agricultural Economics, Oklahoma State University and included in the Economics section of this publication.(Sahs, 2003)
### Table 2.

**Dairy Goats 100 Head Unit**  
Class #2 Grade Herd, Per Doe Basis

<table>
<thead>
<tr>
<th>Operating Inputs</th>
<th>Units</th>
<th>Price</th>
<th>Quantity</th>
<th>Value</th>
<th>Your Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed Feed</td>
<td>CWT.</td>
<td>9.050</td>
<td>7.200</td>
<td>65.16</td>
<td></td>
</tr>
<tr>
<td>Alfalfa Hay</td>
<td>Tons</td>
<td>100.00</td>
<td>0.900</td>
<td>90.00</td>
<td></td>
</tr>
<tr>
<td>Vet Medicine</td>
<td>HD</td>
<td>10.000</td>
<td>1.000</td>
<td>10.00</td>
<td></td>
</tr>
<tr>
<td>Supplies</td>
<td>HD</td>
<td>12.000</td>
<td>1.000</td>
<td>12.00</td>
<td></td>
</tr>
<tr>
<td>Utilities</td>
<td>HD</td>
<td>18.000</td>
<td>1.000</td>
<td>18.00</td>
<td></td>
</tr>
<tr>
<td>Doe Repl. Feed</td>
<td>HD</td>
<td>32.800</td>
<td>1.000</td>
<td>32.80</td>
<td></td>
</tr>
<tr>
<td>Kid Feed</td>
<td>HD</td>
<td>22.000</td>
<td>1.000</td>
<td>22.00</td>
<td></td>
</tr>
<tr>
<td>Breeding Fees</td>
<td>HD</td>
<td>10.000</td>
<td>1.000</td>
<td>10.00</td>
<td></td>
</tr>
<tr>
<td>Misc. Expense</td>
<td>HD</td>
<td>6.000</td>
<td>1.000</td>
<td>6.00</td>
<td></td>
</tr>
<tr>
<td>Marketing Expense</td>
<td>HD</td>
<td>2.000</td>
<td>1.750</td>
<td>3.50</td>
<td></td>
</tr>
<tr>
<td>Machinery Labor</td>
<td>HR</td>
<td>7.500</td>
<td>0.847</td>
<td>6.35</td>
<td></td>
</tr>
<tr>
<td>Equipment Labor</td>
<td>HR</td>
<td>7.500</td>
<td>1.630</td>
<td>12.23</td>
<td></td>
</tr>
<tr>
<td>Livestock Labor</td>
<td>HR</td>
<td>7.500</td>
<td>7.692</td>
<td>57.69</td>
<td></td>
</tr>
<tr>
<td>Machinery Fuel, Lube, Repairs</td>
<td>DOL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment Fuel, Lube, Repairs</td>
<td>DOL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Operating Costs**  
363.62

<table>
<thead>
<tr>
<th>Fixed Costs</th>
<th>Amount</th>
<th>Value</th>
<th>Your Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machinery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest At</td>
<td>6.75%</td>
<td>11.80</td>
<td>0.80</td>
</tr>
<tr>
<td>Depr, Taxes, Insurance</td>
<td></td>
<td>2.38</td>
<td></td>
</tr>
<tr>
<td>Equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest At</td>
<td>6.75%</td>
<td>209.71</td>
<td>14.16</td>
</tr>
<tr>
<td>Depr, Taxes, Insurance</td>
<td></td>
<td>26.31</td>
<td></td>
</tr>
<tr>
<td>Livestock</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doe Goat</td>
<td>105.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buck Goat</td>
<td>5.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repl Doe-Goat</td>
<td>37.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest At</td>
<td>6.75%</td>
<td>147.75</td>
<td>9.97</td>
</tr>
<tr>
<td>Depr, Taxes, Insurance</td>
<td></td>
<td>18.90</td>
<td></td>
</tr>
</tbody>
</table>

**Total Fixed Costs**  
72.52

<table>
<thead>
<tr>
<th>Production</th>
<th>Units</th>
<th>Price</th>
<th>Quantity</th>
<th>Value</th>
<th>Your Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goat Milk</td>
<td>CWT.</td>
<td>24.00</td>
<td>20.00</td>
<td>480.00</td>
<td></td>
</tr>
<tr>
<td>Male Kids</td>
<td>HD.</td>
<td>20.00</td>
<td>0.90</td>
<td>18.00</td>
<td></td>
</tr>
<tr>
<td>Female Kids</td>
<td>HD.</td>
<td>50.00</td>
<td>0.65</td>
<td>32.50</td>
<td></td>
</tr>
<tr>
<td>Cull Doe Goats</td>
<td>HD.</td>
<td>50.00</td>
<td>0.20</td>
<td>10.00</td>
<td></td>
</tr>
</tbody>
</table>

**Total Receipts**  
540.50

**Returns Above Total Operating Cost**  
176.88

**Returns Above All Specified Costs**  
104.36

5% Doe Death Loss, 200% Kid Crop  
10% Kid Death Loss, 25% Doe Repl Rate  
(Sahs, 2003)

Developed and processed by Department of Agricultural Economics, Oklahoma State University
Dairies. The ability to bear losses from business risk, a large capital base, and well trained labor are also important considerations. (Sahs, 2003)

Spend time working on budgets before committing the capital to a commercial enterprise. Show your budget to a commercial producer to check whether your figures on costs, receipts, and expected production are realistic; then consider whether your expected return is sufficient compensation for your efforts. Doing your homework before taking the plunge will save you much heartache and expense. Several other sample budgets are included in this publication in the Resources section.

Production Notes

Selecting stock

Once you have figured out what products you will sell, have the business plan and budget figured out, and are sure there is enough qualified labor and available capital to sustain the business, you are in position to select goats for the dairy. All the preliminary work will help you to prioritize and budget the purchases of stock and equipment, and to have an idea of what type of goats you need. For instance, commercial producers of fluid milk will want animals that produce a lot of milk; depending on the milk buyer’s priorities, butterfat and protein percentages may also be important. A cheese maker will be more interested in total protein yield. Those who plan to sell breeding stock will want to consider production records, conformation, and pedigree (including records of related animals). Those who are marketing milk through kids may prefer a dual-purpose animal, such as the Nubian, that will bear meatier kids. A person purchasing a family milker will want to milk the doe to see how easily she milks out, taste the milk for flavor, and observe her disposition. An animal that is perfect for one use may not be the best choice for another.

All buyers will need to find healthy goats that produce the quantity and quality of milk needed for their business. That is the essential part. However, many producers will first choose a breed that is personally appealing, then find breeders and visit farms to select goats for the dairy. Therefore, we will first discuss breeds, then address finding a breeder, evaluating health, and production records.

Choosing a breed

Breed choice will depend on how you will use the milk, the availability of the breed in or near your area, and personal preference. Since there are differences in milk composition (% butterfat, % protein) and the quantity produced, some breeds will (on average) be more suitable for some farms than others. However, individuals WITHIN breeds vary more than individuals BETWEEN breeds. For instance, while on average, Saanens produce more milk than Nubians (see Table 3), some Nubians will produce more milk than some Saanens (as illustrated in the “range” column of the table). Though Nubians may produce less milk than Saanens, the composition of Nubian milk makes it more suitable for cheesemaking. Therefore, it is important to select individuals that possess the characteristics you need. Production records are the best way to know this. (Production records will be discussed later in this publication.)

Selecting a breed that is fairly common in your area may make it easier to acquire (and to sell) breeding stock, provided the other producers have goals and management systems similar to yours.
Personal preference plays a major role in selecting a breed. Dairy farmers must spend hours with their animals, so get animals that you enjoy seeing, that will function on your farm, and that have dispositions that suit you. This is an individual choice, best made after observing individuals of various breeds and working with them, if possible. General descriptions of the breeds are given below. Further information about the breeds and contacts for the breed clubs are available from the ADGA Web site, www.adga.org. Descriptions and pictures of the breeds may be found on the Oklahoma State University Web site at www.ansi.okstate.edu/breeds/goats/.

In the United States, there are six full-size dairy breeds available. They are Saanen, Alpine, Toggenburg, and Oberhasli—the Swiss breeds—and Nubian and LaMancha.

Some producers raise crosses of these breeds; these crosses are referred to as “experimentals.” The Swiss breeds have similar body and ear shapes and similar milk composition.

Saanens tend to be larger than the other Swiss breeds, and are generally heavy milkers with slightly lower butterfat percentages. They are white goats with erect ears and are known for being gentle and productive milkers with long lactations. Saanens are sometimes called “the Holsteins of goats.” Saanens may sunburn and must have some shade available during hot weather.

Toggenburgs are recognized by their color pattern, since they are always brown with white legs, white stripes down the side of the face, and other white markings. They are medium sized, sturdy, and hardy. On average, their milk is lower in butterfat and in protein percentages than the other breeds.

Alpines come in a whole range of colors and color patterns and are slightly smaller than Saanens. Like the Saanens and Toggenburgs, the Alpines originated in the cool climate of the Swiss Alps. Alpines are popular in commercial herds, and there are more Alpines on production test than any other breed (as of 2002).

The Oberhasli is a Swiss dairy goat of medium size. Its color is chamoisee (bay, with deep-red bay preferred, accented with black markings). Oberhaslis are not as numerous in the United States as the other breeds, and fewer Oberhaslis are enrolled in DHI production testing. Therefore, it may be difficult to locate stock, especially production-tested stock.

Nubians are known for their floppy ears and for producing milk that is highest in butterfat. They do not produce as much milk as the other breeds, and are considered a dual-purpose goat since they tend to be meatier than other breeds. Nubians are sometimes referred to as the “Jerseys of the goat world” and are the most common breed in the United States. Some producers think they are not well suited to a commercial dairy because of their active and energetic disposition. Others appreciate the Nubian’s contribution to the bulk tank, especially if the milk is intended for cheese, yogurt, or ice cream.

LaManchas were developed in the United States, and these goats are also easily identified by their distinctive ears. LaManchas have very tiny ears, and sometimes appear to have no outer ear at all. LaManchas are smaller than the other dairy breeds, but they are very good producers of sweet, creamy milk. Breeders of LaManchas claim that these goats are docile and sweet-tempered. They can be any color.
Visiting a breeder

Visiting other producers can help you select a breed or breeds. Locating a good breeder is key to getting your business off to a good start. To find breeders in your area, you can check with your local Extension service. The American Dairy Goat Association (ADGA, www.adga.org) publishes a directory of breeders every year, including contact information and a list of breeds raised by each member. It is well-organized and is free to members ($35.00 annual dues).

You may want to visit three or four breeders before making a purchase; this gives you the opportunity to compare how the animals are raised, fed, and housed, and to assess the overall health of the herd. Ask lots of questions (see the section below for some suggested questions).

You should try to find a breeder who

- Is willing to provide health certificates
- Is part of the Dairy Herd Improvement Association (DHIA)
- Allows free access to all production and breeding records
- Manages a farm that has well-cared for animals and land

Evaluating health

ALL buyers of dairy goats should insist on healthy goats. There are three main ways to gather information about the health of a dairy goat.

1. visual appraisal
2. interview the owner or herd veterinarian
3. request that certain tests be performed, such as
   a. mastitis test (by milk culture or California Mastitis Test)
   b. blood tests to check for CAE, TB, brucellosis, etc
   c. fecal tests to screen for internal parasites

Ideally, all three methods (visual, interview, and testing) should be used.

First, examine the whole herd, looking for

- Shiny coats
- Lively manner
- Easy movement (no limping,
- no swollen joints or misshapen udders)
- No abscesses
- Proper body condition (not fat or excessively thin)
- Firm, pelleted manure
- Well-shaped udders and teats (symmetrical udders)

A herd that meets all these visual criteria gives evidence of being healthy and well-managed.

Second, interview the herd owner or veterinarian.

- What diseases have been problems in this herd?
- What criteria do you use for selection or culling?
- What diseases are tested for routinely?
- What is the vaccination and parasite management protocol?
- Are replacement kids raised using pasteurized milk, to reduce the incidence of milk-borne diseases such as CAE, Johne’s, mycoplasma, and others?
- How long do does stay productive in this herd?
- How long is the average lactation in this herd?
- What is the average production level of this herd? (Ask to see records.)

Third, ask that tests be run on the does you are considering. These tests will increase the
cost of the animal, and you should be prepared to absorb at least some of that cost. Some tests may not be necessary; if the veterinarian certifies that there are no suspected cases of Johne’s, for instance, and you observe that all animals appear healthy, you may choose to forgo the Johne’s test. Check with your veterinarian about which diseases are occurring in your area, and get his or her recommendations on which diseases are worth testing for.

Buying healthy stock initially will save you much money, time, and disappointment in the long run. Diseases shorten the productive life of the animal and reduce the chances of a profitable farm; therefore, it is wise to spend effort and money in the beginning to secure healthy animals. See the Health section of this publication and of the ATTRA publication Goats: Sustainable Production Overview for more information about some diseases to be aware of.

Production records

Having verified that the stock is healthy, the next concern is their productivity. Keeping your needs (that is, the needs of your dairy products customers) in mind, investigate the productive potential of each animal. Production records from the Dairy Herd Improvement Association (DHIA) of the individual and of its relatives offer the best insulation that you are purchasing a productive animal. Type classification, also known as linear appraisal (an objective score given by a trained judge, who provides a professional appraisal of an animal’s conformation), may be available and offers another tool for selecting animals with desirable traits. Pedigree records are also very useful, since they give information about the genetic makeup of the animal. For a complete description of these tools and how to use them, as well as a wealth of information about what to look for in a good dairy goat, see Dairy Goat Judging Techniques, by Harvey Considine. This book can be ordered from www.dairygoatjournal.com/bookstore.html for $16.95.

When examining production records, keep in mind that production is naturally much lower during the first lactation. Examine the records to see overall production in pounds, length of lactation, and butterfat and protein percentages (if those are important to your operation). Bear in mind that your own management will be a major factor in the doe’s production on your farm; production records only verify that a goat has the genetic potential to produce milk. To learn more about production records, type evaluation (linear appraisal), and the DHI program, visit the American Dairy Goat Association (ADGA) Web site, www.adga.org.

DHI records are useful when purchasing goats, but are even more useful as a management

---

Table 3.

<table>
<thead>
<tr>
<th>BREED</th>
<th>Number of Does</th>
<th>AGE at START of LACTATION</th>
<th>MILK lbs</th>
<th>RANGE</th>
<th>BUTTERFAT %</th>
<th>PROTEIN %</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALPINE</td>
<td>699</td>
<td>3y2m</td>
<td>2254</td>
<td>840-5300</td>
<td>3.5</td>
<td>78</td>
</tr>
<tr>
<td>LAMANCHA</td>
<td>216</td>
<td>3y3m</td>
<td>2097</td>
<td>1050-3510</td>
<td>3.9</td>
<td>81</td>
</tr>
<tr>
<td>NUBIAN</td>
<td>445</td>
<td>2y11m</td>
<td>1746</td>
<td>640-3670</td>
<td>4.8</td>
<td>84</td>
</tr>
<tr>
<td>OBERHASLI</td>
<td>68</td>
<td>2y11m</td>
<td>2062</td>
<td>990-3629</td>
<td>3.7</td>
<td>76</td>
</tr>
<tr>
<td>SAANEN</td>
<td>432</td>
<td>2y6m</td>
<td>2468</td>
<td>970-5630</td>
<td>3.4</td>
<td>84</td>
</tr>
<tr>
<td>TOGGENBURG</td>
<td>184</td>
<td>3y5m</td>
<td>2015</td>
<td>860-4480</td>
<td>3.2</td>
<td>64</td>
</tr>
</tbody>
</table>

Based on 2002 ADGA DHIR Individual Doe Records

Averages compiled by the ADGA Production Testing Committee
tool after purchase. In some areas, the cost is as low as $2.00/month/goat. From the information you can:

- Measure real productivity
- Track persistency through the lactation
- Evaluate the effect of a feed change
- Select your best producers and cull the lowest ones
- Identify potential mastitis problems
- Improve the profitability of your herd

Producers who are on DHI test say that it costs nothing, because it returns such valuable information that it more than pays for itself. Eliminating unproductive individuals will improve the sustainability of your farm; records are the best tool in this effort. For more information about production testing and to locate a DHI in your area, talk to local producers, contact your local Extension agent, or visit the Animal Improvement Programs Laboratory (AIPL) Web site at www.aipl.arsusda.gov/. (The AIPL site

Redwood Hill Farm, California

Jennifer Bice

Redwood Hill Farm Grade A Goat Dairy is located in Sebastopol, Sonoma County, California. Sebastopol is near the coast, about 50 miles north of San Francisco. Redwood Hill Farm is a “farmstead operation” because in addition to producing a unique line of artisanal goat-milk cheeses and goat-milk yogurt in five flavors, the farm manages its own herd of 400 dairy goats (Alpine, LaMancha, Nubian and Saanen).

The farm was started in the 1960s by Kenneth and Cynthia Bice and their 10 children. Active in 4-H with many different animal species, the family quickly made dairy goats their favorites. Jennifer Bice and her husband, Steven Schack, took over the family farm in 1978 and expanded the business and product line. Steven died in 1999, and Jennifer knew that continuing the business would be the best way to honor his memory.

With a herd of 400 registered dairy goats, a Grade A dairy, and a processing plant, Redwood Hill Farm employs 12 people, as well as 5 work exchange students from other countries. These students stay for 12 to 18 months. They come from agricultural college programs in their own countries to live, work, and learn in the United States. While the students don’t always have direct dairy goat experience, they learn quickly and are highly motivated. Currently Redwood Hill Farm has students from Bulgaria, Hungary, Turkey, Honduras, and France.

Redwood Hill Farm is now building a larger processing plant to meet the demand for its goat milk products. From award-winning animals (including ADGA National Champions in four breeds) to gold medal awards for their cheese and yogurt at product competitions, Redwood Hill Farm strives to be the best. That, along with providing a good life for its employees and the dairy goats themselves, is a big part of the Redwood Hill Farm mission.

This story was written for the introduction to the Commercial Dairy Diary feature in the Dairy Goat Journal, September/October 2003. For a copy of this article/issue or other issues, please go to www.dairygoatjournal.com or call 1-800-551-5691. For more on Redwood Hill Farm, see their Web site at www.redwoodhill.com.
contains production, type, and pedigree records compiled by ADGA and DHI, as well as other information.) The American Dairy Goat Association (www.adga.org) also provides information about production testing and type evaluation.

Finally, when selecting stock, keep in mind that the most important part of the herd is the buck. As the sire of your next generation, the buck is “half of your herd,” and choosing an excellent buck is the quickest way to improve the herd. Again, production records (on the dam, daughters, and on any other relatives) are the best way to assess the usefulness of the buck. Linear appraisal will also be helpful, if available. The sire you select should come from good bloodlines and be healthy and fertile. Your veterinarian can perform a breeding soundness evaluation before purchase. If that option is not available, at least check the scrotal circumference of the prospective sire (it should be at least 20 cm.), to get an indication of sperm-producing potential. It is not a guarantee of fertility, however. Please refer to Goats: Sustainable Production Overview for more details on selecting a buck and evaluating breeding stock.

Choosing healthy stock with good genetics is an important step in setting up a sustainable farm. However, in order to live up to their potential, the animals must be well managed and correctly fed. In order to make a profit with dairy goats, this must be accomplished economically.

**Feeding**

To review the information contained in the Overview, goats are ruminants, and their health and productivity depend on the rumen function. Microorganisms in the rumen digest fiber, carbohydrates, and protein and supply the animal with nutrients. Without those microorganisms, the goat will die. Therefore, it is of paramount importance that the animal is fed appropriately to keep the ruminal organisms healthy.

The rumen microorganisms are “healthiest” when goats are eating good-quality forages, such as vegetative pasture. To get the best milk production from your goats, you must provide excellent quality forages. A pasture that contains many kinds of plants, including browse plants such as blackberries, multiflora roses, willows, or Russian olive, is ideal. Cool-season annuals such as ryegrass will provide a lush, high protein forage in the early spring before many other grasses are tall enough to graze. In the winter, a good mixed-grass hay (cut at an early stage of maturity) is ideal. Goats will eat a wide variety of plants, including weeds. They are selective eaters that will seek the most nutritious plants while grazing, browsing, or eating hay. They are also wasteful eaters, and therefore it is wise to help them use their feed more efficiently by controlling their grazing and by feeding them only a little more hay than they will clean up. There is a trade-off here; if you allow goats to be very selective, they will waste more feed, but they will produce more milk. If you are too strict with their forage allowance, you will save money on feed but lose income from milk. Experience and experimentation with your own herd and farm will help you find that happy medium. For more information about pastures and rotational grazing, see the ATTRA publications Sustainable Pasture Management, Rotational Grazing, Introduction to Paddock Design, and Matching Livestock Needs and Forage Resources. Also check with your local Extension and NRCS agents for information about what forage plants do well in your area. Information about the grazing habits of goats is provided in the ATTRA publication Goats: Sustainable Production Overview. Some studies about pastures for dairy goats are discussed below.

Steve Hart and B. R. Min at Langston University are doing research on grazing-based dairy goat production systems (see Resources: Contacts). Dr. Hart points out that the “goal of pasture management is to supply high quality pasture starting at the beginning of lactation and maintain high quality forage in sufficient quantities throughout lactation.” This is very difficult and requires the establishment of several types of forage. At Langston (in Oklahoma), they grazed cool season annuals such as wheat, rye, or oats, perennials such as orchardgrass, Berseem clover interseeded with wheat, and warm season grasses
it showed up. Because I could measure milk production on a daily basis, the sensitivity was much more noticeable with the goats than if I had been running steers… There was also a noticeable correlation between paddock moves, length of stay, and milk production. During the first three days in a fresh paddock, milk production would rise then fall during the next three days from 5 to 10 percent. Another move to a fresh paddock would cause a 2 to 11 percent rise, then as the stay lengthened, milk production would start dropping again even though there was still a large amount of forage left in the paddock. This leads me to believe that I need more and smaller paddocks, more moves, and more goats to fully utilize the forage available while keeping pasture production up. (Baker, 1998)

As mentioned previously, Drs. Hart and Min at Langston University have been conducting research on grazing dairy goats. As part of this work, goats were fed four different rations: A — Control: Kept in the barn, fed alfalfa hay and a high level of grain (2/3 lb. of grain for every pound of milk over 3.3 lbs.). B — Grazed and fed 2/3 lb. of grain for every pound of milk over 3.3 lbs. C — Grazed and fed 1/3 lb. of grain for every pound of milk over 3.3 lbs. D — Grazed, no supplemental grain.

Researchers found that body condition of the does greatly influenced milk production, with thinner does being less productive during the lactation. Internal parasite problems also had a negative effect on production. Milk production responded to grain, increasing by 1.7 pounds for every added pound of supplemental feed. However, in the second year of the study, when...
the does were kidded in better body condition, does fed no supplemental grain produced 7.74 lb. milk/day, while those in the barn produced 8.91 lb/day, and the does fed a small amount of grain (1/3 lb. for each pound of milk over 3.3 lb/day) produced 9.17 lb/day.

Considering the cost of grain and alfalfa hay, it seems likely that the goats on pasture were much more economical to feed and produced comparable quantities of milk. This has implications for those considering organic dairies and for others who want to reduce feed costs. Hart notes that butterfat percentages were lower in the second year for goats that were not supplemented. He also notes that having high-quality forage available in adequate amounts is the key to feeding dairy goats on pasture. The full description of this research is available on-line at www2.luresext.edu/goats/library/field/hart02.html.

As stated earlier, rumen microorganisms are “healthiest” and milk production is highest when goats are eating high-quality forage. However, it is difficult (if not impossible) to provide good-quality pasture year round. Also, dairy goats have a high requirement for nutrients because they are producing milk at a high level. Therefore, supplementation with concentrates will usually be necessary.

Care is needed when feeding concentrates (grain) to balance the energy needs of the goat and to protect the ruminal organisms. With this in mind, there are some general rules for feeding dairy goats.

1. Graze goats on the highest-quality forage available, and be sure there is a plentiful supply of good pasture or good-quality hay.
2. Lactating dairy goats need about 5 pounds of feed per day (dry matter basis) per 100 pounds of goat, with at least half of this being forage. Some goats will eat even more during peak lactation (up to 6% of body weight on a dry matter basis).
3. Goats require 12 to 14% protein in their diets (the higher amount is for growing kids or high-producing does).
4. Limit the feeding of grains so that the pH of the rumen stays in a favorable range.
5. Increase grain levels very slowly (.2 lb every 3 or 4 days, to a maximum of no more than 50% of the diet).(Hart, 2004)

6. Feed cracked rather than ground grains to encourage rumination and thus salivation, which helps to buffer rumen acids and maintain favorable rumen pH.
7. If you must feed high-concentrate diets (for example, to an extremely high-producing doe during peak lactation), divide grain into several small feedings and offer sodium bicarbonate to help buffer the rumen.
8. If diets are not high enough in roughage, it may be necessary to feed a buffer (such as sodium bicarbonate) at 4% of the concentrate ration in order to maintain butterfat production.(Smith, 1994)
9. It is always important to monitor the feed consumption of your herd. If they are not cleaning up their grain, grain should be reduced and better quality forage offered.

Because of the lactation curve, individual requirements change over the course of the year.

Guidelines for supplementing lactating does

- Start the doe on grain a month before kidding and have her consuming about 1.5 lbs of grain by the time she kids. This allows the rumen organisms to slowly adapt.
- After kidding, increase grain slowly to about 3 lbs/day by 4 weeks post-kidding.
- After peak lactation, feed according to milk production. Feed 1/2 lb of grain for every pound of milk over 3 lbs milk/day, along with good quality forage. For example, a goat producing 8 pounds a day would get all the good forage she could eat plus 2 ½ pounds of grain, split into two feedings (5 lb. milk over 3 lb. x ½ lb feed/lb milk).
- Never feed more than 4 pounds of grain to a doe per day. (Hart, 2004, and Smith, 1994)
Producers generally adjust the amount of supplementary feed, rather than change the ration composition. Care must be taken to avoid sudden changes in diet, and careful observation is needed to monitor body condition and milk production so that supplementary feed may be increased or decreased when necessary. Over-feeding is wasteful and counter-productive, as it may result in does that are too fat, have birthing problems, and do not milk well. On the other hand, under-feeding in late gestation will place the doe at risk for metabolic diseases (pregnancy toxemia) and may also reduce production through the lactation period. The safest bet seems to be to allow the pregnant doe plenty of good-quality forage — and be sure the doe is indeed eating plenty of it. Allow 4 pounds of forage (dry matter basis) per 100 pounds live weight of the doe.

Does that consume a lot of forage during late pregnancy will continue to eat ample forage after kidding, will be less susceptible to digestive disorders, and will yield more milk at the same concentrate level. One French study looked at the effects of the ration during late pregnancy and early lactation. One group of Alpine goats was fed a well-balanced diet, including alfalfa hay (as much as they wanted) and a limited amount of grain during late pregnancy, with a slow increase in grain during early lactation. Another group was fed a restricted amount of hay, a large quantity of grain during late pregnancy, and a quickly increasing amount of grain after kidding. Each of the goats fed ample amounts of hay produced about 148 pounds more milk on average during the first 12 weeks of lactation than the goats fed a restricted amount of hay, a large quantity of grain during late pregnancy, and a fast increase in the amount of grain fed after kidding. (Morand-Fehr, 1978)

Hart’s research at Langston University (see Resources: Contacts) has also been exploring the effect of level of grain supplementation on milk production. See the Langston Web site at www.luresext.edu/goats/index.htm for more information.

While the focus of this section is on feeding lactating does, you should remember that the care and feeding of kids and replacement animals is equally important. Kids kept for replacements should be fed lots of good quality forage so that they can reach 75% of their mature body weight in about 8 months. Breeding does to freshen as yearlings will increase their lifetime production. To increase your understanding of the kid’s digestive system and how to feed young animals, refer to www.gov.on.ca/OMAFRA/english/livestock/goat/facts/goatnutrition.htm#top, and www.sheepandgoat.com/articles/artificial-feeding.html. Another resource with information on kid rearing is the Dairy Goat Production Guide, by Harris and Springer, University of Florida. This guide includes a good general overview of raising dairy goats and is available on-line at http://edis.ifas.ufl.edu/DS134.

\[\text{Here is a sample ration for lactating dairy goats that provides 15\% protein and should be fed with good alfalfa hay.}\]

- Corn: 100 lbs.
- Oats: 100 lbs.
- Soybean meal, crumbles or pellets: 50 lbs.
- Dairy mineral: 13 lbs.
- Cane molasses: 15 lbs.
- Salt: 3 lbs.
- Total weight: 271 lbs.

(Considine, 1996)

**Milking**

Goat milk production is usually seasonal in the U.S., with most dairy goats being bred in the fall and kidding in the spring. However, year round production is required by some markets, and it is possible by staggering kidding. This is done by breeding does out of season, which requires extra management. Milk production will be less in the does producing out of season com-
pared to does freshening in the spring. Therefore, producers will need to get a premium milk price to offset the lower production in the off season.

Goats usually lactate for eight to ten months and produce about 750 quarts of milk during that time. (Considine, 1996) This is approximately 1500 pounds (“a pint’s a pound,” roughly, so a quart is two pounds) and is not sufficient production to sustain a viable commercial operation, according to tatiana Stanton of Cornell University. (Stanton, 2003) She estimates a commercial fluid milk operation needs more than 2000 pounds of milk production per head in order to be profitable. Again, this reinforces the value of production records so that the profitable animals can be identified, while unproductive (and therefore unprofitable) goats can be culled.

Milking must be done on a routine schedule. Most farmers milk twice a day at 12 hour intervals. Milking can also be done three times a day. There will be an increase in milk yield, but often the increased yield is not worth the extra time and labor involved in milking three times a day. There has also been research on milking goats once a day. Milking once a day decreases milk yields, especially in early lactation. Milk from goats milked once a day contained higher percentages of total solids, yet total solid yield was less than does milked twice a day. (Salama, 2003)

You should milk young, healthy animals first, and oldest animals last. This decreases the spread of infections and disease. Calm, low-stress handling of the does at milking time will aid in reaching optimum milk production. You should strip the teats before milking to observe any abnormalities in the milk. Some of the abnormalities that may be seen are clots or little butter-like chunks in the milk or stringy milk. Both are evidence of mastitis. Each doe will take two minutes to milk out. (Mowlen, 1992) During milking time it is a good idea to inspect the does for any signs of injury or disease.

Hand milking is efficient for herds of up to a dozen or so goats. Many hand-milkers use a seamless, stainless steel pail with a hood or cover to keep out debris. Many producers find that milking is a good time to feed the doe grain. This keeps the doe occupied and standing still during milking. Using a milking stand provides several benefits. It keeps the doe tied and standing still and also puts the doe at a comfortable height for the milker. See the hand-milking sketch for an example of a milking stand (Illustration 1).

A platform can also be used when hand milking or when using a milking machine. The platform should be 15 to 18 inches high and constructed so each animal has adequate space to be tied. Allow 3½ feet in length for each doe and 18 inches in width. Does will mount the platform by steps or a ramp. It is vital that the ramp/steps be made so that the goats will not slip. Slipping just once can make does reluctant to go up to the platform.

For herds larger than 15 or 20 goats, it is often more economical and practical to machine milk. Milking machines for small-scale operations are available from Caprine Supply and Hoegger Supply Company, among others. Farms with more than 50 goats will require a large and efficient milking parlor, designed for convenience and in compliance with regulations. When herd size justifies a parlor, there are several designs to choose from. Milking can be done from the front, back, or side of the doe, and milk can go directly into the bulk tank or first go into recorder jars that let you monitor individual production.

Proper sanitation, proper vacuum levels, and proper milking machine maintenance will also reduce the risk of mastitis. Monitor your equipment to make sure that it is functioning properly. Fluctuation of the vacuum in the milking machine can cause backwash, which allows intramammary transmission of bacteria. Also, a doe with teats that are the wrong shape or size can cause vacuum problems. To minimize this risk, milk young, healthy udders first, and then milk abnormal does last.

Whatever the parlor design, it is crucial that your parlor is set up so animals move in and out quickly. If the parlor is set up inefficiently, milking time will increase dramatically. Visit several farms to see possible layouts and talk to current producers about the advantages and disadvantages of their designs. Because parlors will be used twice daily for many years and require a major financial investment, it is important that they be carefully planned.

Regardless of the milking set-up and method, you must maintain sanitary practices, from cleaning the teats before milking to handling the milk. Teat sanitation is probably the most critical step in milking. Milking time, milk quality, and risk of mastitis (see Health section) all depend on how teats are cleaned.

There are several different methods of cleaning the teats before milking. You can spray the
teats with water using a low-pressure nozzle. The water should be warm and may contain a sanitizer. The teats must then be dried, usually using paper towels. The problem with spraying is that too much water gets on the udder, and dirty water ends up on the teats and in the teatcups. This leads to contaminated milk and an increase in mastitis. For these reasons, spraying with a low-pressure nozzle is not recommended unless the teats are very dirty (which should not occur if sanitation is adequate). There are premoistened towels (similar to baby wipes) that are available to clean the teats. These towels are easy to use and work well on teats that are not very dirty. The drawback to these towels is that they are expensive.

Predipping is another way to clean teats before milking. Most experts consider it the best sanitizing procedure to reduce mastitis. (Levesque, 2004) The whole teat should be covered with disinfectant (some producers use the same disinfectant for pre- and post-dipping, and others choose a less expensive predip) that is then left on the teat for 15 to 30 seconds. The teat is then wiped dry.

Illustration 1

This is important for teat stimulation and to make sure all of the disinfectant is removed before milking. The teats can be dried with individual paper towels (never use the same towel on more than one doe) or cloth towels (individual as well). Cloth towels dry and stimulate better than paper towels and in the long run are cheaper. (Levesque, 2004) If using cloth towels, you must properly sanitize them between milkings, by using hot water and bleach and drying them in a clothes dryer.

Whatever method is used for cleaning the teats, it must be done thoroughly and consistently. You must also realize that no disinfectant will be efficient on very dirty teats. Some teats may have to be washed and then disinfected. Once you have the teat clean, disinfected, and dry, do not touch it again before milking or you will put bacteria back on it. After milking, the teats must be dipped in disinfectant called teat dip (usually iodine). The teat canal is relaxed and dilated after milking, which makes it more vulnerable to bacteria. That is why disinfecting after milking is crucial in preventing mastitis.

Sanitary practices must also be used when handling the milk. After milking, strain the milk with a disposable filter, and then cool the milk immediately. Ice-water baths work well for small scale operations. A bulk tank cooler is necessary for larger operations, and it must chill the milk to 45 degrees F within two hours.

All milking equipment must be thoroughly cleaned and sanitized after using. Milk residue must be removed, and all milk contact surfaces must be cleaned thoroughly to remove bacteria. Milk residue should be immediately rinsed out with warm (100-115° F) water. The utensils should be cleaned with soap and a scrub brush, immediately rinsed, and hung on a rack so that they are dry prior to the next milking. Utensils must be sanitized with a chlorine solution immediately prior to milking.

Strict sanitation is necessary to prevent diseases and is critical for food safety. It requires time and money, but it is time and money well spent. It is cheaper to prevent disease and contamination than to treat it. A good reference for producers considering a commercial dairy is the Small Ruminant Guidelines from the Dairy Practices Council. These Guidelines include a wealth of technical information about the details of setting up a milking parlor, producing quality milk and farmstead cheese, proper handling of wastewater, and much more. The Guidelines are sold separately or as a set; the set costs about $70.00 plus shipping and handling and is assembled in a binder for easy storage and reference. For more about this resource, see www.dairypc.org, or call 732-203-1194. For a commercial dairy operation this is an invaluable tool.

Does are bred to freshen once a year and are usually allowed a two to three month nonlactating (dry) period before the next parturition. This allows the mammary system time to repair and regenerate for the next lactation. The greater a doe’s production, the longer the dry period should be, because she has used more nutrients than an average-producing doe. She will need more time to replenish losses and store reserves. Does that are not given a normal dry period usually produce only 65 to 75% as much milk in the subsequent lactation as does given a dry period. (Harris and Springer, 1996) It is important for does to be dried off in good body condition and have a minimum of an eight week dry period. When drying off a doe you should reduce the quantity and quality of her diet. Grain should be reduced or removed, and she should be given a lower quality of hay. Changing the doe’s routine will assist in reducing milk flow. You must continue to monitor drying-off does, because it is common for mastitis to develop during this time.

Health

The Overview contains information about health issues that are important for all goats, including internal parasites, Caprine arthritis
encephalitis, abortion, footrot, caseous lymphadenitis, contagious eczema, and fly control. This publication provides discussion about three additional diseases of particular interest to dairy goat producers: mastitis, Johne’s disease, and ketosis.

**Mastitis**

Mastitis is an inflammation of the mammary gland. It is usually caused by the bacterium *staphylococcus* or *streptococcus*, but it can also be caused by other bacteria, such as *mycoplasma*, *e. coli*, and *pseudomonas*, or by improper milking machine operation. Symptoms include pain, heat, redness, swelling, and a hard udder. Mastitis causes a reduction in production and in profitability. Does will not always show physical symptoms of mastitis. A decrease in milk production and an increase of somatic cell counts are good indicators of mastitis. Somatic cell counts rise in late lactation, so a rise in SCC is not always an indicator of infection. Milk samples can be cultured to determine the organism causing mastitis (*strep.*, *staph.*, or *mycoplasma*). *Mycoplasma* is cultured differently from *staph.* and *strep.*, so you must request the milk test for *mycoplasma*; it will not show up on the *staph/strep* test. *Streptococcus* infections are responsive to antibiotics and are fairly easy to eradicate. *Staphylococcus* infections do not respond well to antibiotic treatment. *Mycoplasma* is less common than *staph.* and *strep.*, but it is highly contagious and is usually the culprit in herds experiencing outbreaks of clinical mastitis that resist therapy. *Mycoplasma* can be transmitted to the kid through the milk. Raising kids on pasteurized milk will reduce the incidence of *mycoplasma* in the herd. Once a doe is infected with *mycoplasma*, she will be a lifelong carrier and will shed the organism in her milk and feces. There is no effective treatment for mycoplasmal mastitis, but it can be controlled. You must identify infected animals by culturing milk samples and then segregate or cull infected animals. The California Mastitis Test (CMT) is another tool for detecting mastitis. The CMT is cheap and easy, but is not very sensitive for goats. The CMT is more useful for ruling out mastitis than for diagnosing it in goats.(Smith, 1994)

Other causes of mastitis may include injury, malnutrition, or a contaminated or malfunctioning milking system. The first line of defense against mastitis is healthy teat skin. The cause of teat injury must be quickly identified and eliminated. Mastitis is also linked to diets deficient in vitamins A and E, selenium, and copper. Fluctuations in the milking vacuum, improperly designed and improperly functioning milking equipment can also lead to mastitis.

**Johne’s Disease**

Johne’s Disease is a contagious, chronic, usually fatal bacterial infection of the intestinal tract. This disease primarily occurs in ruminants.

---

**To implement a mastitis control program**

1. Examine udders twice daily at milking for abnormal secretions of milk (e.g., lumps or stringy milk) and hot, swollen udders. Treat early if mastitis is detected.
2. Wash (with a minimum of water) and dry teats before milking. Remove the milking machine promptly when milk flow has ceased.
3. Use a recommended teat dip following each milking to decrease entry into the udder of mastitis-causing organisms.
4. Dry treat (infuse teat with antibiotics) at drying off to kill bacteria in the udder.
5. If milking by machine, have equipment checked periodically to be sure that it is functioning properly.
6. Employ strict sanitation practices so that mastitis is not spread from one goat to another, including using individual towels for cleaning the teats and disinfecting the milking machine after milking a goat with mastitis.
7. Treat all cases of mastitis promptly and properly with antibiotics. Record all treatments and note the withdrawal times for milk and slaughter. If retreatment is necessary, use a different antibiotic, as bacteria vary in their resistance to different antibiotics. In problem cases, have your veterinarian culture a milk sample to determine the most effective treatment.(Pennington, no date)
with different serotypes of the bacteria infecting cattle and goats. Johne’s can be difficult to detect because an animal can be infected for months and not show signs. Clinical cases of Johne’s rarely occur before one year of age and are most commonly seen in two- and three-year old goats. (Smith, 1994) By the time a clinical case is detected in a herd, there will usually be several sub-clinical carriers of the disease (animals not showing signs). Carriers of the disease shed the bacteria, which can survive in the environment for more than a year.

Weight loss while maintaining a good appetite is the best indicator of Johne’s Disease in goats. Cattle have diarrhea when infected, but this is not usually a clinical sign in infected goats. There is no known treatment for Johne’s, but there are several tests that can be used to detect the disease. Many diagnostic labs offer ELISA and AGID tests to detect and confirm cases of Johne’s. Fecal testing and tissue sampling can also be used to detect the disease. Johne’s is not considered a major problem for goat producers, but it is a disease that can cause problems if introduced into a herd.

Ketosis

Ketosis is a term for a metabolic condition whereby the animal cannot or will not consume enough energy to meet its needs. Goats are at risk for ketosis during late pregnancy (pregnancy toxemia) and during early lactation (lactational ketosis).

Pregnancy toxemia can be caused by either underfeeding or overfeeding in early pregnancy. For instance, a doe that is carrying more than one kid and is not fed enough energy will be ketotic. An over-fed doe will have less capacity to eat because the full uterus plus internal fat stores take up too much space, thus limiting the amount of feed the doe can hold. Also, feeding too much grain (or corn silage) in late pregnancy will cause the doe to develop acidosis; this puts the doe off feed and may contribute to pregnancy toxemia.

Similarly, rapidly increased energy demands during early lactation cause high-producing dairy goats to lose weight and condition, as they can not eat enough to meet their needs. A gradual increase in the amount of grain offered (.2 lb every 3 days) (Smith, 1994) will meet enough of the energy needs to protect against ketosis, but will not trigger acidosis.

Treatment of ketosis involves improving the diet by offering better quality roughage and slowly increasing concentrates. Propylene glycol is also given to increase blood sugar levels, but overdoses can be fatal; Mary Smith of Cornell University recommends 60 ml given two or three times daily. (Smith, 1994) In cases where the disease has progressed and the doe is unable to eat or to get up, consult your veterinarian. If the doe is within one week of her due date, inducing the doe to kid or performing a C-section may save either the kids or the doe.

Treatment of mild acidosis (when the doe is off feed because of over-eating grain) involves offering the best quality hay and withholding grain to allow the rumen to recover. Plenty of water, oral antacids, and oral tetracycline may help. Severe acidosis may kill the doe; the goat will be off feed, the rumen ceases to function, and the animal may groan, grind teeth, have constipation followed by diarrhea, and go down. This is a very serious condition; consult your veterinarian immediately if you suspect the goat has over-eaten grain.

Again, prevention is best; increase concentrates very slowly, and do not feed finely ground
grain (cracked is preferable). Protect the rumen organisms by feeding several small feedings rather than one large feeding, and offer forage first. (Smith, 1994) Steve Hart recommends that you start a doe on grain a month before kidding and gradually work up to 1.5 pounds of grain (in two feedings) by kidding time; then gradually increase (.2 lb. change every 3 or 4 days) until you are feeding .5 pounds of grain for every pound of milk over 3 lbs./day, always providing good quality forage or hay. Never feed more than 4 pounds of grain per day, and use cracked corn rather than ground to reduce the incidence of acidosis. (Hart, 2004)

See ATTRA’s Goats: Sustainable Production Overview for information about other significant health problems, including CAE, CL, internal parasites, abortion, soremouth, and footrot. Further information about disease prevention and treatment can be found by consulting your veterinarian and by exploring the resources listed at the end of this publication.

Remember that for all diseases, prevention is better than treatment. Paying attention to your animals and to selection, nutrition, and sanitation will increase the health and productivity of your herd.

**Conclusion**

The decision to start a dairy goat operation is not easy. You probably will not become rich, but if you like goats, have the markets and an understanding of them, and have the time to build a business, this can be a rewarding enterprise.

There is much more to learn about dairy goat production, and the Resources section will help you to find more information. Your best source of information is another farmer; talk to as many as you can, and learn from their experience.

“Sustainability” is proven with time, and the following story illustrates some of the necessary ingredients for a sustainable dairy goat business. Our thanks to the author/farmer, Debbie Taylor, for sharing her story.
Blufftop Farm, Arkansas

Debbie and Randy Taylor

By Debbie Taylor, 2004

Blufftop Farm is located in Pope County, Arkansas, in the foothills of the Ozark mountains. The soil is sandy and shallow. Most of our farm is used to grow timber of many species.

We (my husband Randy and I) began raising goats in 1974 as a hobby and for milk for ourselves. We began with a grade doe, a purebred Nubian doe, and a purebred Nubian buck. We had been married two years and lived on a farm owned by his family, who lived out of the state. I was a city slicker who had always wanted to live on a farm; he had a little farming experience, mostly with grain. The hobby persisted and grew, and gradually more breeds were added. We began showing the goats and went on DHIR test. Eventually there was too much milk, and commercial production was investigated.

Throughout this time we had a few jobs, Randy went to college, and our logging business evolved. We purchased our own land and built fences, barns, shops, and our house in 1985, the dairy in 1986. Though I do not work in the log woods anymore, I do the bookwork for our company. Randy does not help with the daily goat-related chores but helps fix everything that needs fixing and operates the hay baler. Our daughter, Jessica, helps with the goat operation. I was a licensed American Dairy Goat Association judge for 15 years, but it is too hard to do all that traveling and do a good job with the operations at home.

Currently, we milk 72 head. The milk is marketed to the only plant currently operating in our state (Jackson-Mitchell, Yellville, Arkansas). A tanker picks it up at the farm weekly. The milk is processed, evaporated, and canned.

We sell most of the doe kids and quite a few of the bucks, mostly to other breeders who want goats for showing or family milk, and we export some goats. Having the herd on DHIR test, appraising them yearly, and showing some, has helped sales of kids. We like having registered stock, and though it requires a lot more planning and paperwork, kid sales are an important part of the income.

It was not difficult to get set up. In our state, a person contacts the Milk Program department of the Health Department and asks for a set of regulations. The person then designs a dairy and asks a rep from the Program to come out to view the plans and the site before construction begins. Before milk is shipped, the dairy has to be inspected and the water source tested. Although our milk is used for manufacturing, we built our dairy to be Grade A so that we can sell Grade A milk if we choose to. The difference in a Manufacturing Grade dairy and the Grade A dairy is not much. The dairy is inspected regularly. I like to visit with the inspectors, as they have a lot of good ideas and are helpful. The inspectors are the same ones that inspect the cow dairies and milk processing plants.

The scale of production needed to make a living is going to depend on the price received for the milk, and many other factors. The biggest challenge for us now is getting a better price for our product.

The venture has been very interesting to me; I enjoy the work and the animals. It has not been very financially rewarding. This job is not for everybody. The person has to really like animals and not mind the twice-daily chores. We milk at 12-hour intervals and NEVER skip a milking, because twice-a-day milking is very important to decent milk production.

My advice to farmers—do not go overboard on expenses. Be practical.
An excellent source of information is the Hometown Creamery Revival Project. This project is funded by the Sustainable Agriculture Research and Education (SARE) program of the USDA and managed by Vicki Dunaway. The Hometown Creamery Revival promotes on-farm processing as a means of making dairying a sustainable way of life for small farms. For additional information about this project, contact:

Vicki Dunaway  
Hometown Creamery Revival Project  
P.O. Box 186  
Willis, VA 24380  
540-789-7877 (call before 9 p.m. Eastern time)  
ladybug@swva.net  
www.ibiblio.org/creamery

Currently the project produces a quarterly newsletter, *CreamLine*, and maintains a Web site with a list of equipment suppliers, events, and links to other relevant Web sites. A free sample issue of *CreamLine* is available on request. *CreamLine* takes a holistic approach to farmstead and small-scale dairying and includes farm interviews and stories, recipes, a chef’s column, processing instructions, guest articles, and lists of resources. There is also a companion magazine called *Home Dairy News*. These can be ordered by visiting www.small-dairy.com/news.html#order.

The first major publication of the Hometown Creamery Revival was *The Small Dairy Resource Book*. It is a 56-page annotated bibliography of books, periodicals, videos, and other materials on farmstead dairy processing. It is intended for farmers and others interested in adding value to dairy products. The resources cover such topics as on-farm cheesemaking, ice cream, butter, dairy processing, business and marketing, food safety, and feeds and grazing. The book can be ordered from:

Sustainable Agriculture Publications  
Hills Building, Room 210  
University of Vermont

To order, send $8.00, plus $3.95 for postage, by check or money order, or visit www.sare.org/san/htdocs/pubs/. You may also print a copy from the Web.

Steve Hart, Terry Gipson, and Steve Zeng at Langston University’s Institute for Goat Research are valuable sources of information. Langston has a Grade A goat dairy. They can be contacted at:

E. (Kika) de la Garza  
American Institute for Goat Research  
Langston University  
P.O. Box 1730  
Langston, OK 73050  
405-466-3836  
www.lurcorp.edu/goats/index.htm

Prairie View A&M University is another dairy goat research center.

International Dairy Goat Research Center  
Prairie View A&M University  
Prairie View, TX 77446  
409-857-3926

Carol Delaney is the Small Ruminant Dairy Specialist at the Vermont Small Ruminant Dairy Project. She can be reached at:

Vermont Small Ruminant Dairy Project  
200B Terrill Hall  
University of Vermont  
Burlington, VT 05405  
802-656-0915  
carol.delaney@uvm.edu  
www.uvm.edu/sustainable-agriculture/smallrumin.html

Dr. George Haenlein was a Dairy Extension Specialist at the University of Delaware. He is retired, but still answers questions about dairy goat production.

Dr. George Haenlein  
Dairy Extension Specialist  
University of Delaware  
531 S. College Ave.  
039 Townsend Hall  
Newark, DE 19717  
302-831-2524
Judy Kapture and her husband operate a commercial dairy where they milk 150 does, supplying milk to a cheese plant and to a Grade A market. She is also a dairy-goat consultant.

Judy Kapture
P.O. Box 298
Portage, WI 53901
608-742-1622 FAX

New England Dairy/Meat Goat and Dairy Sheep Directory

This directory was developed through the Center for Sustainable Agriculture’s Small Ruminant Dairy Project, and lists producers, service providers, and resources for farming with dairy goats, dairy sheep, and meat goats in Vermont, New Hampshire, Maine, Rhode Island, Connecticut, and Massachusetts. Producers are listed alphabetically by state/town, and indexed by breed; service providers are listed alphabetically and indexed by state/town. The directory also lists resources, including programs, associations, and periodicals. $5.00 suggested donation per copy to cover copying/shipping/handling. To order or for more information, call 802-656-5459 or e-mail sustainable.agriculture@uvm.edu. Or you can mail your order to Center for Sustainable Agriculture, 63 Carrigan Drive, Burlington, VT 05405. Make checks payable to “UVM”. No credit card orders.

SARE Project Producers

Below are some producers who have done SARE projects with dairy goats. You can visit the SARE Web site at www.sare.org to search all projects and read the specifics of these producers’ projects. This site also links to the Regional SARE pages.

George van Vlaanderen and Kristan Doolan
Does’ Leap Farm
1703 Rt. 108 South
East Fairfield, VT 05448

Darrell Baker
Box 1776
Tucumcari, NM 88401

Brit Pfann
Celebrity Dairy
144 Celebrity Dairy Way
Siler City, NC 27344
919-742-5176
theinn@celebritydairy.com
www.celebritydairy.com

Lee B. Dexter
White Egret Farm
15704 Webberville Road
Austin, TX 78724
512-276-7408

Tim Pedrozo
Pedrozo Dairy and Cheese Company
7713 County Road 24
Orland, CA 95963
530-865-9548

Web sites

University of California Cooperative Extension
On-line publication Goat Care Practices

Georgia Goat Research & Extension Center,
Fort Valley State University
www.ag.fvsu.edu/html/publications/goatcenter/publications.htm
Georgia Small Ruminant Research & Extension Center newsletters and publications

Dairy Research & Information Center, University of California—Davis

American Dairy Goat Association
www.adga.org/ and
www.adga.org/StartDairy.htm
On-line publication Starting a Grade A or Grade B Goat Dairy

Langston University
www.luresext.edu/goats/index.htm
www.luresext.edu/goats/library/fact_sheets/d04.htm
On-line publication Grade A Dairy Goat Farm Requirements
www.luresext.edu/goats/library/field/hart02.html
On-line article Forage Based Dairy Goat Management

North Carolina State University- Extension Animal Husbandry (see Meat Goat)
  www.cals.ncsu.edu/an_sci/extension/animal/eahmain.html

Oklahoma State University
  www.ansi.okstate.edu/breeds/goats Descriptions and pictures of goat breeds

University of Florida Institute of Food and Agricultural Sciences

The Hometown Creamery Revival
  www.smalldairy.com

National Scrapie Education Initiative
  www.animalagriculture.org/scrapie Information about the Scrapie Eradication Program

Celebrity Dairy in North Carolina
  www.celebritydairy.com

Goat Lady Dairy of North Carolina
  www.goatladydairy.com

Associations

Annual membership to the American Dairy Goat Association costs $35 and includes a quarterly newsletter and a membership directory that is updated each year. The ADGA offers educational materials; a list of national breed clubs; a production calendar; a list of upcoming meetings, shows and youth programs; and videos about goat basics, showing, and cheesemaking; etc.

  American Dairy Goat Association
  Box 865
  Spindale, NC  28160
  828-286-3801
  828-287-0476 FAX
  info@adga.org
  www.adga.org

The American Cheese Society also has lists of resources and other practical information available to its members. Membership is $125 for individuals and $75 for associates.

  American Cheese Society
  P.O. Box 303
  Delavan, WI  53115
  262-728-4458
  262-728-1658 FAX
  www.cheesesociety.org

Periodicals

The Dairy Goat Journal is published bi-monthly. It offers articles describing dairy goat operations and provides many resources and other helpful contacts.

  Dairy Goat Journal
  Countryside Publications, Ltd.
  W11564 Hwy 64
  Withee, WI  54498
  715-785-7979
  800-551-5691 (toll-free)
  715-785-7414 FAX
  csymag@midway.tds.net
  www.dairygoatjournal.com
  Subscription is $21 per year.

  The United Caprine News
  P.O. Box 328
  Crowley, TX 76036
  817-297-3411
  www.unitedcaprinenews.com
  Subscription is $22.50 per year.

Suppliers

Caprine Supply
  P.O. Box Y
  DeSoto, KS  66018
  913-585-1191
  800-646-7736 (toll-free)
  www.caprinesupply.com

Hoegger Supply Company
  P.O. Box 331
  Fayetteville, GA  30214
  770-461–6926
  800-221-4628 (ordering only)
  770-461-7334 FAX
  www.hoeggergoatsupply.com

Hamby Dairy Supply
  2402 SW Water Street
  Maysville, MO 64469-9102
Books

Some of the following books are available from bookstores and on-line booksellers. If a book is listed as out-of-print, you may be able to obtain it through Interlibrary Loan; check with your local librarian. You may also be able to buy a copy through an on-line used-book search site. Many goat supply companies offer many of these listed books, as well as other books related to dairy goats and their products.

Guidelines for Production and Regulation of Quality Dairy Goat Milk
Order from:
Dairy Practices Council
51 E. Front Street, Suite 2
Keyport, NJ 07735
732-203-1947
www.dairypc.org

The Legal Guide for Direct Farm Marketing
Order from:
Neil Hamilton
Drake University Law School
Agricultural Law Center
2507 University Ave.
Des Moines, IA 50311
515-271-2947

Vermont Dairy Goat Manual
Order from:
Vermont Department of Agriculture
116 State St., Drawer 20
Montpelier, VT 05620-2901
802-828-2416

Home Cheese Making: Recipes for 75 Homemade Cheeses
Order from:
Storey Publishing, LLC
800-441-5700 (toll-free)
www.storeybooks.com

The New Goat Handbook
Order from:
Barrons Educational Series, Inc.
250 Wireless Blvd.
Hauppauge NY, 11788
800-645-3476 (toll-free)
631-434-3723 FAX
www.barronseduc.com

Raising Milk Goats Successfully
Order from:
Williamson Publishing
P.O. Box 185
771 Cedar Beach Road
Charlotte, VT 05445
800-234-8791
www.williamsonbooks.com

Goats Produce, Too!: The Udder Real Thing
Order from:
Mary Jane Toth
2833 N. Lewis Road
Coleman, MI 48618
989-465-1982
Goatowner’s Guide to Milking Machines

Cheesemaking Made Easy

Available for $14.00 + $3.95 S/H by calling 802-656-0484 or 800-909-6472. Publication can also be viewed at www.misa.umn.edu/publications/bizplan.html.

Budgets
Sample budgets are available from the following sources.


Pennsylvania State University Web site at http://agalternatives.aers.psu.edu/live-stock/dairygoat/dairy_goat.pdf (Includes helpful article and resource list.)

Vermont Small Ruminant Dairy Project. Contact Carol Delaney at 802-656-0915.


Rutgers Cooperative Extension
http://aesop.rutgers.edu/~farmmgmt/ne-budgets/ORGANIC/DAIRY-GOAT-2100LB-MILK.HTML
http://aesop.rutgers.edu/~farmmgmt/ne-budgets/ORGANIC/DAIRY-GOAT-1800LB-MILK.HTML

There are many goat and dairy goat discussion groups located at www.groups.yahoo.com.

References


Hart, S. E. (Kika) de la Garza American Institute for Goat Research, Langston University. E-mail from author, January 2004.


Stanton, T. Extension Associate, Department of Animal Science, Cornell University. E-mail from author, 2002.


This publication is frequently updated. Your comments and suggestions are most welcome; please call ATTRA to let us know what other information should be included.

Linda Coffey
lindac@ncat.org
800-346-9140 (toll-free)

The ATTRA Project is operated by the National Center for Appropriate Technology under a grant from the Rural Business-Cooperative Service, U.S. Department of Agriculture. These organizations do not recommend or endorse products, companies, or individuals.

By Linda Coffey, Margo Hale, and Paul Williams
NCAT Agriculture Specialists
Formatted by Robyn Metzger
© 2004 NCAT
Permits and Licenses Required for startup of Artisan Cheese Plants in Oregon
Contents

Steps involved in startup of an artisan cheese plant in Oregon ................................................................. 2

Preliminary steps .............................................................................................................................................. 2

Permits .......................................................................................................................................................... 3

Zoning permit ............................................................................................................................................... 3
Waste water discharge permit ..................................................................................................................... 4
Building or structural permit ....................................................................................................................... 5
Water use permit and water right .................................................................................................................. 6

Licenses .......................................................................................................................................................... 8

Dairy product plant license ............................................................................................................................ 8
Vat pasteurizer operator’s license .................................................................................................................. 9
HTST pasteurizer operator’s license ................................................................................................................ 10
Milk sampler/grader license .......................................................................................................................... 10
Scale license ................................................................................................................................................ 10

Approval of cheese label ............................................................................................................................... 11

Planning and business registration ............................................................................................................. 11

Appendix I. Relevant Skills and Knowledge ............................................................................................... 13

Appendix II. Resources for the Artisanal/Farmstead Cheese Maker ........................................................... 15

Appendix III. License Fee Structure ........................................................................................................ 18

Appendix IV. References ............................................................................................................................. 19

Appendix V. Glossary ..................................................................................................................................... 20

Appendix VI. ODA Study Materials .......................................................................................................... 21

Photo credits

Tom Gentle: front cover (top left and bottom right), page 1 (top), 3, 6, 8, 9, 13
Lynn Ketchum: front cover (top right and bottom left), page 1 (bottom), 4, 5, 10, 11
Permits and Licenses Required for startup of Artisan Cheese Plants in Oregon

J. Ravikumar, C. Durham, and L. Meunier Goddik

This publication is primarily intended for entrepreneurs who wish to start a new artisan cheese business and for dairy farm owners seeking new business opportunities for profitable use of milk.

This guide outlines and describes the key steps involved in starting an artisan cheese plant in Oregon. These steps primarily involve obtaining approvals, permits, and licenses from various agencies. In explaining these steps, the guide provides general information about relevant laws and regulations.

This guide does not cover legal requirements for starting a grade A dairy farm (e.g., CAFO or dairy fluid milk producer’s license). This guide is not to be used as a source of legal advice. Contact the agencies listed in this publication if you have specific questions about laws and regulations. While an effort has been made to identify all pertinent Oregon laws and regulations effective in 2008, new or revised laws may be passed.

The guide contains the following sections:

• A flowchart of the key steps involved in the startup of a cheese plant (page 2)
• Preliminary steps for starting up an artisan cheese plant (pages 2–3)
• Procedures involved in obtaining zoning permits, waste water permits, building permits, and water usage permits (pages 3–8)
• Information about dairy product plant licenses, pasteurizer’s licenses, milk sampler’s licenses, and scale licenses (pages 8–11)
• Information about planning and business registration (pages 11–12)
• Appendix I—skills, knowledge, and preparatory steps to take prior to registering an artisan cheese business in Oregon (pages 13–14)
• Appendix II—resources for the farmstead/artisanal cheese producer (pages 15–17)
• Appendix III—license fee structures (page 18)
• Appendix IV—references (page 19)
• Appendix V—glossary (page 20)
• Appendix VI—study materials for ODA licenses (page 21 and following)

There are many steps from milk to finished cheese, but perhaps just as many to start your business. Be sure to obtain all of the necessary permits and licenses before beginning cheese production.

Jayasri Ravikumar, graduate student in food science and technology; Cathy Durham, marketing economist, Food Innovation Center; and Lisbeth Meunier Goddik, associate professor and Extension specialist in dairy processing; all of Oregon State University.
Preliminary steps

Milk sources

Milk is the most important raw material for cheese manufacture. Most artisan cheese makers are farmstead operations, which means they manage and milk their own herd of cows, goats, or sheep. Thus, milk for cheese making is produced on the farm.

Non-farmstead artisan cheese makers must purchase milk. Milk can be purchased only from dairies that meet Grade A requirements of the Pasteurized Milk Ordinance (PMO) and are licensed and inspected by the Oregon Department of Agriculture (ODA) Food Safety Division. The ODA Food Safety Division website has a search feature to help you find a list of licensed milk producers in Oregon (http://www.oda.state.or.us/dbs/licenses/search.lasso?&division=fsd). Note that availability of milk from outside sources may be limited due to exclusivity contracts between dairy farmers and cooperatives/creameries.

Milk can be transported only by licensed milk haulers. Various designs of tanker trucks are available. For example, a flatbed trailer with a bulk tank attached can be used if approved by ODA. Although trailers typically are not refrigerated, they must be insulated to assure that the milk arrives at the plant at or below 45°F. We highly recommend contacting the ODA Food Safety Division before purchasing a trailer.

ODA requires all dairy plants to screen all bulk milk for beta-lactam antibiotic residues prior to processing, using an approved testing facility. Milk cannot be unloaded from the trailer until the test demonstrates no detectable beta-lactam residue. The person responsible for receiving the milk and taking raw milk samples for regulatory analysis must have a sampler/grader license. See page 10 for more information about this license.

For further details about milk testing requirements, see appendix N of the PMO (http://www.fda.gov/Food/FoodSafety/Product-SpecificInformation/MilkSafety/NationalConferenceonInterstateMilkShipmentsNCIMSModelDocuments/PasteurizedMilkOrdinance2007/default.htm) or contact ODA lab services at 503-872-6633.

Raw fluid milk

The ODA Food Safety Division website (http://www.oregon.gov/ODA/FSD/program_dairy.shtml) states that “A person may not sell or distribute for sale unpasteurized milk or fluid milk from cows, or dairy products from unpasteurized milk or fluid milk from cows, other than to a distributor, producer-distributor, dairy products plant licensee or nonprocessing cooperative.
“The dairy law exempts from licensing a person owning not more than three dairy cows that have calved at least once, nine sheep that have lactated at least once or nine goats that have lactated at least once. The fluid milk from these animals may be sold for human or other consumption only if:
• The person does not advertise the milk for sale;
• The milk is sold directly to the consumer at the premises where produced; and
• No more than two producing dairy cows, nine producing sheep or nine producing goats are located on the premises where the milk is produced.”

**Raw milk cheese**

It is legal to sell cheese made from raw milk if the cheese is aged for at least 60 days at a temperature greater than 35°F. This means that all cheeses consumed in less than 60 days must be made from pasteurized milk. Cheeses generally consumed in less than 60 days include cottage cheese, ricotta, Mexican-style cheeses, bloomy rind cheeses, and many washed rind cheeses.

If pasteurized milk is purchased from an outside source and transported to the plant, it is considered raw milk when it arrives at the plant. It should be repasteurized or utilized for raw milk cheese.

**Selecting a building or plant location**

When selecting a building or plant location, consider the following factors:
• Proximity to sources of raw materials, distribution systems, and sales outlets
• Availability of skilled labor
• Access to water resources and waste discharge venues
• Size of property: Plan for adequate space for animal housing and milking parlor (if the business is a farmstead), raw milk storage, pasteurization, cheese manufacturing, and cheese aging. You also may wish to plan for expansion to accommodate business growth.
• Zoning: Contact the local Zoning and Planning Division to determine appropriate zoning (e.g., urban industrial, rural industrial, exclusive farm use). If the plant is within the city limits, the location is classified as an urban industrial zone. If the plant is located outside the urban growth boundaries within the county, it is classified as a rural industrial zone. If the plant is located on a farm (i.e., a farmstead cheese plant), and the farm provides at least a quarter of the milk needed by the plant, it is classified as an exclusive farm use (EFU) zone.

• Permitted land use activities: Oregon counties list permitted land use activities under development codes in the county’s zoning ordinances. This information is available on county websites. For activities not listed in the zoning ordinances, contact the county Zoning and Planning Division to determine whether special approval is required.

**Permits**

**Zoning permit**

After selecting a suitable building or plant location, you must obtain a zoning permit. This permit is a government-issued document that allows the use of land for a specific purpose, such as an artisan cheese plant. This zoning permit is issued by the Zoning and Planning Division of the county where the plant is located. ODA requires that the zoning permit be obtained before beginning plant construction.

The steps for obtaining a zoning permit are as follows.

1. Determine the county in which the property is located and visit the county website. The application form, list of required enclosures, zoning map, assessment map, and other resources are available on county websites.

2. Set up a 1-hour preapplication conference with a land use planner in the county’s Zoning and Planning Division to get assistance with the application process. If you need additional help, contact a private land use planner, surveyor, or county assessor. Contact information for Oregon county assessors’ offices is available at [http://egov.oregon.gov/DOR/PTD/County.shtml](http://egov.oregon.gov/DOR/PTD/County.shtml).
3. Access the interactive zoning map: This Geographic Information System (GIS) map is available on county websites. For example, the zoning map for Benton County is available at http://gis.co.benton.or.us/ZoningMap/index.htm. Use the interactive zoning map to determine the tax lot number, street address, and zoning of the property.

4. Prepare the application packet. The application packet varies among counties. Check your county website for specific requirements. For example, the zoning permit application packet requirements for Lake County are available at http://www.lakecountyor.org/Forms/Applications/Zoning%20Permit%20Application%20Packet.pdf. The application packet generally includes the following:
   • Application form (typically 4–5 pages). You will need to provide the location and size of the property, a narrative about the proposed use of the property, proposed methods of water supply and waste discharge, and details about parking and access to the property.
   • Assessment map (http://www.ormap.com/maps/index.cfm)
   • Administrative fee
   • Aerial view photograph (available on Google Earth at http://earth.google.com/) or a ground photograph of the property (not required by all counties)
   • Plot plan map drawn to scale showing the location and size of existing buildings and existing and proposed access roads. A sample plan and instructions for preparing a plot plan are available on some county websites.

The processing time for a zoning permit application varies based on county and zoning of the property. For example, in Washington County, it usually takes about 120 days to obtain a zoning permit if the property is located in an urban industrial zone and about 150 days if the property is located in a rural industrial zone. After obtaining a zoning permit, apply for a waste water discharge permit. This permit is discussed next.

**Waste water discharge permit**

Obtain information about waste water discharge permits from your city or county or from the Oregon Department of Environmental Quality (DEQ). If the plant is located in an urban industrial zone, contact the city Public Works Department. The city is responsible for collecting waste water and transporting it to the waste water treatment plant. Depending on the kind of waste water, the city may require pretreatment by the facility discharging it.

If the plant is located in an EFU zone or a rural industrial zone, contact the county. Some counties support onsite sewage disposal. Depending on the size of the facility and amount of waste discharge, the county will decide whether a permit from DEQ is required.

An alternative for a farmstead operation is to contact the ODA Natural Resources Division (http://www.oregon.gov/ODA/NRD/contact_us.shtml) with regard to the most relevant Confined Animal Feeding Operation (CAFO) permit system that covers the farm and plant waste discharges.

If a DEQ permit is required, you can acquire it yourself or hire a consulting engineer or DEQ consultant. The permit must be obtained before discharge of waste water occurs. The discharge of waste water may be done through several types of disposal systems such as irrigation, seepage ponds, onsite sewage systems, and dry wells. The waste water must be pretreated and monitored to meet DEQ’s standards. The pretreatment system must be set up with the help of a registered engineer or an approved design engineer.

DEQ has two permit systems:
   • National Pollutant Discharge Elimination System (NPDES) permit: This permit is a requirement of the federal Clean Water Act and Oregon law. The EPA has authorized DEQ to issue this permit. It is required for discharge of waste water (processing water, wash water, noncontact cooling water, and sewage) into surface waters (wetlands, ponds, lakes, streams, rivers, etc.) through any type of channel.
• Water Pollution Control Facilities (WPCF) permit: This permit is a state requirement for discharge of waste water into the ground. It requires the waste water to be collected, screened for solids, and used on the property where it is produced. It allows use of waste water for irrigation and discharge into waste water lagoons, onsite sewage disposal systems, and underground injection control systems such as dry wells, sumps, etc. It does not allow discharge of waste water into surface waters.

Both the NPDES and WPCF permit systems use “individual” and “general” permits.

Individual NPDES and WPCF permits individually address dissimilar discharge activities of a business. General NPDES and WPCF permits cover a category of similar discharge activities. Individual permits are more expensive and need more time for issuance than general permits. This is because the individual permit process involves more review and inspection by DEQ, more frequent monitoring to ensure compliance with DEQ standards, and monitoring for various pollutants.

For detailed information, forms, and fees for general and individual DEQ permits, visit [http://www.deq.state.or.us/wq/wqpermit/genpermits.htm](http://www.deq.state.or.us/wq/wqpermit/genpermits.htm).

**New plants**

The steps to obtain a DEQ permit for a newly constructed plant are as follows.

1. Contact the nearest DEQ regional office. The DEQ officials will help determine whether an individual permit or a general permit would be applicable to cover the waste discharge activities of the business. Contact information for regional offices is available at [http://www.deq.state.or.us/about/locations.htm](http://www.deq.state.or.us/about/locations.htm).

2. Complete a land use compatibility statement (LUCS). The LUCS form can be obtained either from the DEQ website or from regional DEQ offices. Fill out the applicant’s section of the LUCS form and mail it to the local land use planning authority. The land use planning staff will review the form, fill out the local government section, sign and date it, and return it to you.

Regional land use contacts are available at [http://www.deq.state.or.us/pubs/permithandbook/lucs.htm](http://www.deq.state.or.us/pubs/permithandbook/lucs.htm). The LUCS form and more information about LUCS are available at [http://www.deq.state.or.us/pubs/permithandbook/generallucs.pdf](http://www.deq.state.or.us/pubs/permithandbook/generallucs.pdf).

3. Obtain a permit application from DEQ by mail, in person, or from the DEQ website. Forms and fee schedules are available at [http://www.deq.state.or.us/wq/wqpermit/indinfo.htm](http://www.deq.state.or.us/wq/wqpermit/indinfo.htm). The fee has two parts: an application fee and an annual fee for maintaining the permit. Both NPDES and WPCF permits are renewed every 5 years. No additional fee is required for renewal.

4. Mail the completed application form, along with the fees and the completed LUCS form, to DEQ at least 30 days prior to the start of the intended activity.

The permit application may be approved or denied. If the application for a general permit is denied, you may need to obtain an individual permit.

**Existing plants**

If you purchase an existing plant, the DEQ water permit may be transferred to the new owner. To do so, submit a name change/transfer of ownership form and a transfer fee of $74 to the nearest regional DEQ office. After receiving the permit, you may have to set up a treatment facility with the help of an approved engineer.

**Building or structural permit**

The building or structural permit is issued by the local Building Department that has jurisdiction over the city or county where the plant is located.

Before applying for a building or structural permit, find out whether local zoning approvals are required for electrical and plumbing work. According to the Building Code Division (BCD) website ([http://www.oregonbcd.org/pdf/3019.pdf](http://www.oregonbcd.org/pdf/3019.pdf)), “permits are required for any new construction and alterations and additions to existing buildings, including structural, plumbing, mechanical, electrical, manufactured dwelling, boiler, and elevator work. However, there are some exceptions to permit requirements.”
To learn about permit exemptions, contact the local Building Department that has jurisdiction over the county where the plant is located. Application forms for various permits, including electrical, plumbing, mechanical, and building or structural permits are available at http://www.bcd.oregon.gov/pdf/4613t.pdf.

The steps to obtain a building or structural permit are as follows.

1. Find the local Building Department that has jurisdiction over the county where the plant is located. Use either the address locator form or the link to participating jurisdictions at https://buildingpermits.oregon.gov/ to find contact information.

2. Schedule a preapplication meeting with the building services officer or Oregon certified plans examiner in the Building Department to discuss the permit process. He or she can provide information about application forms, application requirements, and fees.

Some counties use a “quick permits” system, which is an online “e-permitting” system. This system also can help you find contact information and printable applications. Access the e-permitting system at https://buildingpermits.oregon.gov/index.cfm?fa=e_search.jurisLookup.

3. Prepare the application packet, which must include the following:
   • Copy of zoning permit
   • Copy of DEQ waste water discharge permit (if required)
   • Completed building permit application form
   • Two copies of your building plans, including plot map; floor plans; elevations; electrical, mechanical, and plumbing drawings; and structural calculations
   • Application fees

4. Mail, fax, or deliver the completed permit application form to the local Building Department.

You will be notified if a building plan review is required. After review, one set of the building plans will be returned to you with an “approved” stamp.

After approval of the building plan, the permit will be issued by mail, fax, or over the counter. Construction work must begin within 180 days from the date of issue of the permit. The approved building plan and the building permit must be available to the inspector at the construction site.

Resources to find a builder are:

- Oregon construction contractor license: https://ccbed.ccb.state.or.us/ccb_frames/consumer_info/ccb_index.htm
- Hiring a licensed contractor: http://www.hirealicensedcontractor.com/

**Water use permit and water right**

According to Oregon law, all water is publicly owned. The ODA requires that the water used in the plant be approved by the state water control authority, the Oregon Water Resources Department (OWRD). The OWRD website is at http://egov.oregon.gov/OWRD/.

Obtaining OWRD approval involves the following steps.

1. Obtain a water-use permit from OWRD.
2. Use the water in compliance with conditions specified in the permit.
3. Hire a certified water right examiner to get assistance with submitting proof of beneficial water use to OWRD.

4. Obtain a water right certificate from OWRD.

A water-use permit is an authorization from OWRD to use water and is necessary before beginning construction of a water system. Permit approval is not automatic. OWRD determines whether water is available during the time requested and whether the proposed use is allowed. The department also provides notice about proposed new usage of water to interested parties and publishes this information at http://www1.wrd.state.or.us/cgi-bin/notices.pl?water_rights. This
notice is to ensure the protection of public resources and the rights of existing water users. If anyone protests, the department will approve the permit application only if the protest is resolved in favor of the applicant.

After obtaining the water-use permit, a water right certificate must be obtained from OWRD. The water right allows the use of water in the plant from both groundwater (wells) and surface water (lakes, rivers, streams). However, surface water is currently unavailable in Oregon due to rights of prior users. Groundwater is the recommended source of water. City water can also be used. Additional information about each source is provided below.

The Oregon administrative rules (OAR) for water resource management can be found at http://arcweb.sos.state.or.us/rules/OARS_600/OAR_690/690_310.html.

Additional details regarding the permitting process are available at http://www.wrd.state.or.us/OWRD/PUBS/aquabook_newrights.shtml.

**Groundwater**

Most businesses use groundwater from either an existing well or a newly constructed well. A well permit is required if more than 5,000 gallons of well water is used per day. This includes water used for cheese manufacture and wash water, but does not include water for irrigation. The permit is renewed every 5 years.

The permit application form for use of groundwater is available at http://www1.wrd.state.or.us/pdfs/groundwaterapp.pdf. The permit application guidebook is available at http://www1.wrd.state.or.us/pdfs/groundbook96.pdf.

The application packet must include the following:

- Completed application form
- Land-use zoning approval from the county
- Legal description of the property
- Fee ($1,000)
- Map with description of the well and the plant, including well identification number

If a well identification number does not exist or has been lost, you will need to obtain one. The application form and instructions for obtaining a well ID are available at http://www.wrd.state.or.us/OWRD/GW/well_id.shtml.

In addition to the above, the following items are required, depending on whether you will use an existing well or construct a new well.

**For an existing well:** Provide a well log (a detailed record of the well, its measurements, water level, etc.) to obtain a well identification number (if one does not exist). Detailed information on location of wells, maps, and water level data for existing wells is available at http://www.wrd.state.or.us/OWRD/GW/well_data.shtml#View_Water_Level_Data.

**For a well that is to be newly constructed:** Provide contact information for the well driller and the expected date of completion of construction. The well must be constructed by a licensed and bonded contractor. A list of licensed well constructors in Oregon is available at http://apps2.wrd.state.or.us/apps/gw/well_license/default.aspx.

The Consumer’s Guide to Water Well Construction, Maintenance, and Abandonment, published by OWRD, provides guidelines on how to construct a well. You can access the guide at http://www.wrd.state.or.us/OWRD/PUBS/wellconguide.shtml. The Pasteurized Milk Ordinance (http://www.fda.gov/Food/FoodSafety/Product-SpecificInformation/MilkSafety/NationalConferenceonInterstateMilkShipmentsNCIMSModelDocuments/PasteurizedMilkOrdinance2007/default.htm) also provides detailed guidelines on how to construct a well and processes for filtering, chlorinating, testing for potability, and checking for free chlorine.

Provide well information (number of wells, name and distance of nearest surface water body, elevation of the surface water body, etc.).

Describe methods used to manage and conserve water (for wells with natural flows).

**Surface water**

The following information about surface water usage is provided as a reference in case surface waters become available to cheese makers in the future.

- Search for surface water availability in Oregon at http://apps2.wrd.state.or.us/apps/wars/wars_display_wa_tables/.
- Locate information about an area’s water rights, water availability, basins, etc. at http://gis.wrd.state.or.us/apps/map/owrd_map/Default.aspx.
- The permit application guidebook is available at http://www1.wrd.state.or.us/pdfs/surfacebook96.pdf.
- The application form and supplemental forms for use of surface water are available at http://www1.wrd.state.or.us/pdfs/surfacewaterapp.pdf.
- Uses of surface water that are exempt from obtaining a water right are listed at http://www.wrd.state.or.us/OWRD/PUBS/aquabook_laws.shtml.
The application packet must contain the following:

- Completed application form
- Completed land-use information form signed and dated by the county planning authority. If the land-use information form cannot be completed while you wait, you can ask a local government representative to sign the receipt stub provided with the form and include it with the application filed with OWRD.
- A map that accurately shows the source of water and location of water use. The map should clearly indicate the township range, section, and tax lot numbers, the proposed points of diversion, and place of use. Details and instructions for creating a map are available in the guidebook.
- Legal description of the property. A copy of the deed, land sales contract, title insurance policy, or a lot book report prepared by a title company can provide this information. OWRD does not accept a copy of the tax bill.
- Water right examination fees and water usage recording fees. Information about these fees is available at http://www1.wrd.state.or.us/pdfs/fees2007.pdf.

City water

City water is another recommended source of water. A permit from the city’s Community Development Department is required for use of water from the city water system. Utility rates are based on consumption rates and are available on city websites.

Licenses

When starting a cheese plant, the following licenses must be obtained:

- Dairy product plant license
- Vat pasteurizer operator’s license
- Milk sampler/grader license
- Scale license

Details about each license follow.

Dairy product plant license

The dairy product plant license is issued by the ODA Food Safety Division. This license allows you to receive milk and process or manufacture dairy products. It must be renewed annually.

- The procedure for obtaining a license for new dairy plant construction is more involved than that for purchasing an existing business. Both procedures are outlined below.

- **Newly constructed dairy plant**

  1. Review laws and rules: ORS 621.122 (http://www.leg.state.or.us/ors/621.html) and OAR 603-024 (http://arcweb.sos.state.or.us/rules/OARS_600/OAR_603/603_024.html).
  2. Review the Pasteurized Milk Ordinance (PMO) guidelines (http://vm.cfsan.fda.gov/~ear/pmo01toc.html). The PMO provides standards for equipment and detailed guidelines on how to build a dairy plant. Although artisan cheese is not a Grade A product, the facility must meet PMO Grade A requirements because ODA has adopted the PMO regulations. A Grade A dairy plant is a facility that complies with the applicable provisions of the PMO.
  3. Contact the ODA Food Safety Division inspector before starting construction. There is no charge for the initial consultation.
  4. Prepare a plan for plant construction and submit it to ODA for written approval. Refer to PMO section 12—Plans for Construction and Reconstruction (http://www.fda.gov/Food/FoodSafety/Product-SpecificInformation/MilkSafety/NationalConferenceonInterstateMilkShipmentsNCIMSModelDocuments/PasteurizedMilkOrdinance2007/default.htm).
  5. Complete plant construction. It is recommended that the inspector be involved at the time of construction.
  6. Arrange for inspection 1 or 2 weeks before starting operations. The inspector will inspect the completed plant.
facility, examine equipment compatibility, and collect samples of milk and water and test them for regulatory compliance. If the inspection results are satisfactory, the inspector will grant approval and provide a license application with his or her signature, date, and establishment number on it.

7. Submit the completed license application with the appropriate fee (See Appendix III for fee schedules) to the inspector or to ODA.
   - If you submit the application to the inspector, you will receive an approval completion report and receipt of payment. These documents serve as the temporary license until the official license is received.
   - You can submit the completed application and appropriate fees to ODA as follows.
     — For payment with a credit card, mail or fax the completed application form, including credit card information and signature, to:
       Oregon Department of Agriculture
       635 Capitol Street NE
       Salem, OR 97301-2532
       Fax: 503-986-4746
     — For payment by check, mail the completed application form and check to:
       Oregon Department of Agriculture
       PO Box 4395
       Unit 16
       Portland OR 97208-4395

8. Receive the license by mail and post it in the business.

Existing business
If the business is currently licensed by the ODA Food Safety Division, the steps are as follows.
1. Review laws and rules (http://www.leg.state.or.us/or5621.html).
2. Obtain a license application from the Salem office:
   Oregon Department of Agriculture
   635 Capitol Street NE
   Salem, OR 97301-2532
   Phone: 503-986-4720
   Fax: 503-986-4729
3. Send the completed application with appropriate fees (see Appendix III for fee schedules), following the instructions in Step 7 above. If you pay the fees by check, you will receive a payment receipt. A receipt is not issued for credit card payments.
4. Receive the license by mail and post it in the business.

If you plan to add a new room to the plant, you must submit a plan to the inspector before starting construction and arrange for inspection after completion of construction. In case of minor changes to the existing plant, it is recommended that you notify the inspector in order to avoid unnecessary expenses. Notification is not required for minor changes, however.

Vat pasteurizer operator’s license
This license is issued by the ODA Food Safety Division. A vat pasteurizer operator’s license officially authorizes a person to pasteurize milk and/or dairy products using vat or batch pasteurizing equipment. The license is not required if you use heat shock treatment rather than pasteurization.

This license is valid for 2 years. The license fee is currently $50 for 2 years.

In order to obtain a vat pasteurizer operator’s license, the applicant must pass an examination. The examination consists of both written and practical components. Both parts are mandatory. The exam has a total of 100 possible points, 50 points for the written section and 50 points for the practical exam. An overall minimum score of 80 percent and a minimum score of 40 points on each part is required to pass the examination. The exam can be taken any number of times.

The written examination is an open book exam. It can be taken on any week day between 8:00 a.m. and 5:00 p.m. at the plant site, the local area division office, or at the following ODA office:

   Oregon Department of Agriculture
   Food Safety Division
   635 Capitol Street NE
   Salem, OR 97301-2532
   Phone: 503-986-4720
   Fax: 503-986-4729
The written exam includes questions pertaining to the following topics:

- Laws and regulations pertaining to pasteurization of milk for cheese making. The laws and regulations are contained in the PMO, ORS 621, and Division 24 ORS 621.122 (http://www.leg.state.or.us/ors/621.html).
- Theoretical and practical knowledge of pasteurization using a vat pasteurizer. Detailed information on these topics is available at http://www.fda.gov/ Food/FoodSafety/Product-SpecificInformation/ MilkSafety/default.htm.

Study material for the written exam can be obtained from the ODA Food Safety Division. Also see Appendix V of this publication.

The practical examination is taken after the written exam. The practical examination must be taken in a dairy processing facility. Before the practical examination, the ODA food safety inspector will check the functioning of the plant’s vat.

During the practical exam, the operator must demonstrate the ability to do the following:

- Operate the pasteurizer
- Pasteurize the milk following PMO guidelines
- Keep records of pasteurization
- Care for, clean, and maintain equipment and utensils

The applicant will be notified of the results by ODA. After passing the exam, the applicant must send the license fees to the ODA Food Safety Division. The license will arrive by mail within a few days.

**HTST pasteurizer operator’s license**

This license is issued by the ODA Food Safety Division. The HTST pasteurizer operator’s license officially authorizes a person to pasteurize milk and/or dairy products using high-temperature, short-time (HTST) pasteurizing equipment. The HTST pasteurizer is used for large-scale cheese production. Most artisan cheese makers are small-scale producers and use a vat pasteurizer.

Applicants are required to have at least 2 months practical experience helping to operate pasteurization equipment. Applicants are required to take a written and practical examination. The examination process is identical to that for the vat pasteurizer operator’s license. The license fee is $50.

**Milk sampler/grader license**

The milk sampler/grader license is issued by the ODA Food Safety Division. The sampler/grader is responsible for grading milk received from an outside source and for collecting regulatory samples. This person may be a milk hauler who picks up milk at dairy farms or a milk receiver at the cheese plant. The license is valid for 1 year, with an annual license fee of $25.

A written and practical test is required to obtain the license. A “Milk Receiving, Grading, and Transport” fact sheet (see Appendix V) can be used to prepare for the exam. Examination specifics are similar to those outlined under “Vat pasteurizer operator’s license.”

**Scale license**

All commercially used weighing and measuring devices must be licensed with ODA’s Measurements and Standard Division. Each type of device requires a separate license and associated fee. The fee is based on the manufacturer’s rated capacity for that device. License classifications and fee details are available at http://oregon.gov/ODA/MSD/device_license_list.shtml. Licenses are renewed annually and are transferable to a new owner.

The following steps apply to scales with a manufacturer’s rated capacity of 0–400 lb, the type most commonly used by artisan cheese makers.

1. Purchase the scale and arrange for installation by a licensed installer. The installer must complete a “placed in service report” (PISR). This report must be completed within 24 hours of installation of any new or used measuring or weighing device. Additional details about the PISR can be obtained at http://oregon.gov/ODA/MSD/pisr_info.shtml.
2. Obtain a scale license application form from the ODA Measurements and Standards Division (phone: 503-986-4670; e-mail: msd-info@oda.state.or.us). You will need to provide your business mailing address, location address of the scale, phone and fax numbers of the business, manufacturer’s rated capacity of the scale, and how you would like to receive the application form.

3. Submit the completed application form, PISR, and fee (currently $37 per scale per year) to the following address:
   Oregon Department of Agriculture
   Measurements and Standards Division
   635 Capitol Street NE
   Salem, Oregon 97301-2532

   After completing this step, you may begin using the scale for commercial purposes.

   A Measurements and Standards Division inspector will inspect the devices. He or she will place an approval seal on the device if it meets the required standards. This completes the scale licensing process.

Approval of cheese label

Labels on food packages must be approved by the ODA Food Safety Division prior to use. An excellent summary of label requirements is outlined at [http://www.oregon.gov/ODA/FSD/docs/pdf/pub_label_general.pdf](http://www.oregon.gov/ODA/FSD/docs/pdf/pub_label_general.pdf). Nutritional content labels can be generated based either on USDA databases ([http://www.nal.usda.gov/fnic/foodcomp/search/](http://www.nal.usda.gov/fnic/foodcomp/search/)) or on compositional analysis at a food laboratory. Label requirements vary based on sales outlet. Thus, it is a good idea to contact ODA early. The OSU Food Innovation Center in Portland (503-872-6680) also offers assistance with label development.

Planning and business registration

There are many factors to consider when planning a startup business, including selecting a business structure; understanding federal, state, city, county, and property tax obligations; selecting and reserving a business name; preparing a business plan; identifying required insurance; identifying sources of financing; and formal registration of the business.

Consider each of these steps carefully, as each will have long-term implications for your business. For example, the choice of business structure (e.g., sole proprietorship, family business, general partnership, etc.) affects multiple aspects of a business, including tax obligations, liability, and ownership succession.

A business plan will provide you with a better understanding of the financial needs and profit potential of your business. It will be very useful in obtaining seed money and loans for starting a business and will create a strong foundation for new ideas, markets, and strategies in the future.

You will need to identify startup capital costs, cash-flow requirements, and a reserve pool of money before starting your business. One way to obtain loans and seed money is to present a business plan to angel investors. The premise behind such groups is to provide seed money for small-scale startups. Such groups also generally provide business expertise and mentoring. Applicants must go through a screening process to make sure they are a good financial risk. An example is the Valley Venture Group (V2G), which formed a financing agency in 2008 with the Willamette Valley Investors Network. Contact information is provided in Appendix II.

Another step is to establish and sustain good relationships with key bankers in your area. Experienced bankers are a good source of local information, including average income, level of competition, and real estate and rental values. Establishing a credit line, a good relationship with the banker, and a good credit history are all advantageous when applying for business loans.

You can obtain information on state loan programs from the Business Finance Section of the Oregon Economic and Community Development Department (503-986-0160; [http://econ.oregon.gov/](http://econ.oregon.gov/)).
Sources of assistance

The Oregon Secretary of State’s Corporation Division operates a Business Information Center, which is a cooperative outreach effort of many state agencies, in Salem. A service of the Business Information Center is the “Business Wizard,” which can provide a customized list of key contacts and Internet links to appropriate forms, publications, and information about requirements for doing business in Oregon. The web link to the Business Information Center is http://www.filinginoregon.com/business/index.htm.

The Secretary of State Office also provides reports and other services for and about Oregon businesses. They publish the guides “How to Start a Business in Oregon” and “Employer’s Guide to Doing Business in Oregon,” which offer information about sources of help for businesses. These guides are available at http://www.filinginoregon.com/online/services.htm.

“How to Start a Business in Oregon” provides a general checklist to guide an entrepreneur through the process of planning and registering a business. It also lists business assistance programs such as the following:

- Small Business Administration (http://www.sba.gov/or)
- Small Business Development Centers (SBDC): Oregon’s Small Business Development Centers provide services to anyone who owns, operates, or is considering starting a small business in Oregon. Oregon’s SBDCs can guide you through the basics of developing a business plan. SBDC contact information is available at http://www.bizcenter.org.

- Service Corps of Retired Executives/Counselors to America’s Small Business (SCORE): SCORE is a volunteer organization whose professional members provide counseling and training to small business owners, managers, and potential owners. Information about SCORE chapters in Oregon is available at http://www.score.org (503-326-5211). All of these guides and services are valuable resources and can be used independently or together, depending on the specific needs of your business.

- For referrals to a CPA: the Oregon Association of Independent Accountants (503-282-7247; http://www.oaia.net) and the Oregon Society of Certified Public Accountants (503-641-7200; http://www.orcpa.org)

- For referrals to attorneys and legal services: the Oregon State Bar (1-800-452-7636; http://www.osbar.org) and Legalzoom (http://www.legalzoom.com)
Artisan cheese-making skills

Each artisanal cheese is a unique product. The sensory characteristics (i.e., color, appearance, texture, and flavor) of a certain type of artisan cheese vary from batch to batch. This individualized quality distinguishes artisan cheese from industrial, mass-produced cheeses. Nonetheless, the finest cheese may vary only within a certain standard if it is to be commercially marketable. Thus, artisan cheese makers adhere to the traditional methods of their craft, while working to bring forth the individualized quality in their product. Achieving the right blend of uniqueness and consistent high quality is an art that requires integration of craft with scientific principles. Hence, it is necessary to have relevant knowledge and experience in making artisan cheese (Kindstedt 2005).

Knowledge of food safety

The production of safe, high-quality products should be a primary goal of the artisan cheese producer. Knowledge of food safety in the cheese industry begins with an appreciation for cleanliness. Food safety comes from good agricultural practices, an understanding of microbiology, good manufacturing practices, safe procedures for cleaning and sanitizing, and an understanding of principles of a Hazard Analysis Critical Control Point (HACCP) (Curtis 2005).

You will need to have an understanding of microbiology and the factors that suppress or promote the growth of organisms (e.g., temperature, water, atmospheric conditions during storage, and acid production). Experienced cheese makers understand these factors, their effects, and how to use them to their advantage. Jay et al. (2005) provide an overview of how these factors affect the growth of organisms.

Good Manufacturing Practices (GMPs), Sanitation Standard Operating Procedures (SSOPs), and HACCP are explained briefly below. Although these practices are valuable to an efficient food manufacturing business, they are not a specific part of the PMO or required by ODA.

You should also be aware of relevant government regulations (e.g., aging of raw-milk cheeses for at least 60 days) and legal requirements for food labeling (see page 11).

Good Manufacturing Practices

An organization that is conscientious about food safety documents current Good Manufacturing Practices (GMPs). GMPs address the design of the manufacturing environment, the attire worn by employees in the processing plant, and personal hygiene practices at work. Having both a documented set of GMPs and an employee handbook that addresses the “whys” of the GMPs will benefit your business (Curtis 2005).

Standard Sanitation Operating Procedures

Similarly, procedures for cleaning and sanitizing are typically documented in the form of pre-operational and operational Standard Sanitation Operating Procedures (SSOPs). It is important to have a basic knowledge about SSOPs (Curtis 2005).

Hazard Analysis Critical Control Point

It is important to be aware of the principles of a Hazard Analysis Critical Control Point (HACCP). The emphasis of HACCP is to identify and control potential hazards so that real-time decisions can be made to ensure a safer end product. HACCP can and should be adapted to each individual cheese-making process. The artisan cheese maker who has intimate knowledge of the cheese-making process should be actively involved in the quality and safety control of the cheese being produced (Curtis 2005).
Management experience and knowledge of target market, business, and risks

Before venturing into a new business, you should be sure there is sufficient demand for your product; understand the target market, the various activities of the business, and the industry in which the business operates; and study the feasibility of the business. After starting your business, you will never again have such a good opportunity to do comprehensive planning. This section provides some suggestions related to these issues.

Good market research is essential for the success of a startup business. A farmer’s market or local restaurant can be a good venue to start selling cheese, obtain preliminary feedback from customers, and better understand customers’ needs and preferences.

Sound accounting practices, financial management, and an approximate estimation of how long it will take to break even are important for a startup business. A good break-even analysis requires a good understanding of major cost drivers of the business. An entrepreneur with experience in the artisan cheese industry can readily recognize important cost drivers, such as ingredients (e.g., milk), plant equipment, human resources, packaging, labels, shipping, and distribution. A successful entrepreneur also gives careful thought to production capacity, pricing strategy, cash flow, marketing, sales, and distribution strategies when performing a break-even analysis.

It is desirable to have experience in managing people, a cheese plant, and a farm (if applicable). You will need to provide excellent customer service and network effectively with relevant agencies, cooperatives, and potential customers. Good editorial testimonies and word-of-mouth recommendations from customers are very effective and affordable means of advertising for a startup artisan cheese business.

You must be aware of potential risks involved in the business. For example, some potential risks for a new artisan cheese startup include the following:

- Yielding to the temptation to develop too many new cheeses without checking on availability of resources, plant capacity, market demand, and distribution strategies
- Inadequate attention to good safety practices and quality
- Selling to customers who do not pay on time

It is important to have a good understanding of the activities of your business. These interrelated activities add value in transforming raw materials to finished product and are referred to as value chain activities (Porter 1985). An efficient value chain results in efficient operations. A business that consistently performs some or all of its value chain activities better than other businesses can have a distinct edge over its competitors.

For an artisan cheese business, value chain activities include research and development of new cheeses, selection of milk suppliers, procurement of ingredients and equipment, human resource management, pricing strategy, financial management, transformation of milk to cheese, food safety practices, quality control measures, selection of sales outlets and storage areas, marketing and sales, packaging, labeling, distribution, and customer service.

Based on the market, value chain, and industry analyses, you should analyze the strengths, weaknesses, opportunities, and threats (SWOT) for your business. The SWOT analysis, industry analysis, and value chain analysis will allow you to effectively study the feasibility of your business. Successful entrepreneurs do these analyses quickly (based on their gut as opposed to documented detailed analyses) before launching the venture and then constantly monitor the environment external to their business. The purpose of these analyses is to do a quick feasibility study and to formulate a business strategy to leverage strengths and opportunities, while minimizing risks by taking into account threats and weaknesses. Pages 234–235 of Paul Kindstedt’s book (see Appendix IV) provide a quick SWOT analysis for artisan cheese businesses.

In summary, for a startup business to be successful, it is essential to do the following:

- Understand the target market, business activities, and industry
- Have experience in managing people, plant, and finances
- Be aware of potential risks involved in the business
- Realize the importance of human networks and excellent customer service
- Receive good testimonies from customers and media editors
- Be prepared to handle surges in customer demand
Appendix II. Resources for the Artisanal/Farmstead Cheese Maker

References

Cheese Reporter
   http://www.cheesereporter.com

Government agencies

FDA Center for Food Safety and Applied Nutrition
   http://www.cfsan.fda.gov/
The National Organic Program
   http://www.ams.usda.gov/nop
Oregon Department of Agriculture, Food Safety Division
   http://www.oregon.gov/ODA/FSD/program_dairy.shtml. E-mail: fsd-expert@oda.state.or.us

Government publications

Oregon business guides
   http://www.filinginoregon.com/online/services.htm
*From Growing to Processing: A Guide for Food Processors*, published by Oregon Department of Agriculture. This guide can be obtained from ODA or through university libraries.

University organizations

OSU Dairy Processing Program
   http://oregonstate.edu/dept/foodsci/dairy/welcome.htm
Dr. Lisbeth Goddik
Associate professor and Extension specialist in dairy processing
Phone: 541-737-8322
Fax: 541-737-1877
E-mail: Lisbeth.goddik@oregonstate.edu
OSU Department of Animal Sciences
Dr. Michael J. Gamroth
Oregon State University
112 Withycombe
Corvallis, OR 97331
Phone: 541-737-3316
E-mail: mike.gamroth@oregonstate.edu
Food Innovation Center (Oregon State University/Oregon Department of Agriculture)
   http://fic.oregonstate.edu/economic-and-marketing-research
Cathy Durham, program leader—Marketing and Trade Economics Program
Phone: 503-872-6680
Fax: 503-872-6648
E-mail: cathy.durham@oregonstate.edu

Producer organizations

Local dairy and cheese organizations

Dairy Farmers of Oregon
   http://www.dairyfarmersor.com/
Oregon Cheese Guild
   http://www.oregoncheeseguild.org/index.html
Oregon Dairy Industries
   http://odi.fst.oregonstate.edu/
Oregon Dairy Council
   http://www.oregondairycouncil.org/dairy_links/
Oregon Tilth
   http://www.tilth.org

National dairy and cheese organizations

American Cheese Society
   http://www.cheesesociety.org
American Dairy Goat Association
   http://www.adga.org/
Dairy Practices Council
   http://www.dairypc.org/index.htm
Dairy Sheep Association of North America
   http://www.dsana.org/
Sarah Masoni, product development manager
Phone: 503-872-6655
E-mail: sarah.masoni@oregonstate.edu

OSU Small Farms website
http://smallfarms.oregonstate.edu/

University of Guelph Department of Food Science
http://www.foodsci.uoguelph.ca/cheese/welcom.htm

Center for Sustaining Agriculture and Natural Resources, Washington State University, College of Agriculture
http://csanr.wsu.edu/

University of Nebraska, Food Processing Center,
“The Specialty Cheese Market”
http://fpc.unl.edu/Reports/The_Specialty_Cheese_Market.pdf

University of Idaho/Boise State/Idaho State
http://www.techhelp.org/indexcfm?fuseaction=services.food

Small Business Development Center
Thomas Dorr, director
119 N. Commercial Street, Suite 195
Bellingham, WA 98225-4455
Phone: 360-733-4014
E-mail: tom.dorr@wwu.edu

Equipment
Agri-Services LLC
Larry Wampler
11606 Greencastle Pike
Hagerstown, MD 21740
Office phone: 301-223-6877
Cell: 301-573-4044
E-mail: lwamper@afo.net

Dairy Technologies USA
http://www.schuller.us/

Darlington Dairy Supply
http://www.ddsco.com/

Equipment Specialists (used dairy equipment)
http://www.equipmentspecialists.com/

Fromagex
http://www.fromagex.com/

Heritage Equipment Company
http://www.heritage-equipment.com/

International Machinery Exchange (new and rebuilt equipment)
http://www.imexchange.com/about.html

JayBee Precision
http://www.jaybeeprecision.com/

Kusel Equipment
http://www.kuselequipment.com/

Schier Company, Inc.
http://www.schiercompany.com/

Sunnyside Dairy Equipment and Supplies
116 South 9th Street
Sunnyside, WA 98944
Office phone: 509-839-2697
Cell: 509-840-1346
Fax: 509-839-6461

Utensils, supplies, and cultures

Dairy Connection
http://www.dairyconnection.com
Phone: 608-242-9030
E-mail: getculture@ameritech.net

Dairy Fab LLC (curd knives)
http://www.curdknives.com
Phone: 920-849-4452

Danlac
http://www.danlac.com

Fromagex
http://www.fromagex.com/

Glengarry Cheese Making and Dairy Supplies
http://www.glengarrycheesemaking.on.ca

Hoegger Supply Co.
Phone: 800-221-4628

Nelson Jameson
http://www.nelsonjameson.com
Phone: 800-826-8302

New England Cheese Making Supply
http://www.cheesemaking.com

Plant construction

Cascade Floors (floor coatings)
http://www.cascadefloors.com/

Floor Seal Technology, Inc. (concrete moisture control)
http://www.floorseal.com/

Hansen-Rice, Inc. (construction)
http://www.hansen-rice.com/indexy.cfm

Hussmann (refrigeration system installation, service, and maintenance)
http://www.hussmann.com/

Zero-loc (insulated panel manufacturing and installation)
http://www.zeroloc.com/
Laboratory services

Am Test, Inc.
   http://www.amtestlab.com/services/testing_services.asp

Bodycote Food Products Lab
   12003 NE Ainsworth Circle, Suite 105
   Portland, OR 97220
   Phone: 503-253-9136

Columbia Food Laboratories, Inc.
   http://www.columbiafoodlab.com/
   36740 E. Historic Columbia River Highway
   Corbett, OR 97019
   Phone: 503-695-2287

Exact Scientific Services
   http://www.exactscientific.com/

Food Quality Labs
   6400 SW Canyon Court, Suite 80
   Beaverton, OR 97221
   Phone: 503-297-3636

Microchem Laboratory, Inc.
   http://www.microchemlab.net/

Pace Analytical
   http://www.pacelabs.com/about-us/locations/
   seattle-wa.html

Cheese consultants

Alliance Pastorale
   Ali S. Haidar, international development manager
   http://www.alliancepastorale.fr/
   E-mail: international@alliancepastorale.fr

Bates Consulting
   Marc Bates
   E-mail: cheeseguy@pullman.com

Cheezsorce
   Neville McNaughton
   PO Box 15009
   St. Louis, MO 63119
   Phone: 314-664-4397
   E-mail: Cheezsorce@sbcglobal.net

NW Ag Business Center
   http://www.agbizcenter.org/
   Phone: 888-707-2021

Washington Manufacturing Services
   http://www.wamfg.org/

Financial agency

Valley Venture Group (V2G)
   Krishna Rao
   Phone: 541-760-1700
   E-mail: krao@rr2llc.com

The Oregon State University Extension Service neither endorses products and companies listed nor intends to discriminate against products or companies not mentioned.
Appendix III. License Fee Structure
(July 1, 2009—June 30, 2010)

Milk fee schedules

Fluid Milk Producer
Producer-Distributor Grade A
Producer-Distributor Grade B
Fluid Milk Distributor
Non-Processing Distributor Grade A
Non-Processing Distributor Grade B
Dairy Products Plant

Annual Gross Sales
$0 to $50,000
$50,001 to $500,000
$500,001 to $1,000,000
$1,000,001 to $5,000,000
$5,000,001 to $10,000,000
Greater than $10,000,000

License type 02
License type 03
License type 04
License type 05
License type 06
License type 07
License type 19

$137
$190
$324
$487
$649
$812

Contract Milk Hauler
Flat rate fee
License type 20
$25 each

Dairy operator's license fees

Milk Sampler/Grader (expires yearly 6/30)
Flat rate fee
License type 18
$25

Vat Pasteurizer (2-year license)
Flat rate fee
License type 79
$50

HTST Pasteurizer (2-year license)
Flat rate fee
License type 81
$50

Appendix IV. References

Publications


Websites

The web links mentioned in this publication were accessed through the following home pages. All of these home pages were verified as accessible in August 2009.

Benton County Community Development Planning Division
http://www.co.benton.or.us/cd/planning/index.php

Columbia County Planning Division
http://www.co.columbia.or.us/lds/planning.php

Grade “A” Pasteurized Milk Ordinance, 2003 revision
http://www.cfsan.fda.gov/~ear/pmo03toc.html

Lake County Planning and Building Division
http://www.co.linn.or.us/Planning/lcd.htm

Oregon Administrative Rules, OAR chapter 603
http://www.sos.state.or.us/archives/banners/rules.htm

Oregon Building Codes Division
http://www.oregonbcd.org/

Oregon Construction Contractors Board (the Oregon construction contractors license search page)
http://www.oregon.gov/CCB/

Oregon Department of Agriculture, Food Safety Division, Dairy Program page
http://www.oregon.gov/ODA/FSD/program_dairy.shtml

Oregon Department of Agriculture, Measurements and Standards Division, Weighing and Measuring Devices page
http://www.oregon.gov/ODA/MSD/device_intro.shtml

Oregon Department of Environmental Quality, Industrial Water Quality permit program page
http://www.oregon.gov/DEQ/

Oregon Hire a Licensed Contractor
http://www.hirelicensedcontractor.com/

Oregon Revised Statutes, ORS chapter 621
http://www.leg.state.or.us/ors/

Oregon Water Resources Department
http://www.wrd.state.or.us/

Polk County Planning Division
http://www.co.polk.or.us/Planning

Washington County Community Development Code
http://washtech.co.washington.or.us/LDS/index.cfm?id=7
Appendix V. Glossary

Farmstead cheese  Also known as “cheese from the farm.” In a farmstead operation, the cheese plant is on the farm, and the milk for the cheese plant comes from animals raised on the farm.

Artisan cheese  Individualized, unique cheese that is handmade in small batches using traditional methods and minimal mechanization. These products are differentiated from industrial mass-produced cheeses.

BCD  Oregon Building Codes Division

CAFO  Confined Animal Feeding Operation. The CAFO permit program assists farm owners and operators to manage animal wastes without contaminating surface water and groundwater. In Oregon, the program is overseen by ODA’s Natural Resources Division.

CPA  Certified Public Accountant

DEQ  Department of Environmental Quality. An Oregon regulatory agency whose objective is to protect the quality of Oregon’s environment.

EFU  Exclusive Farm Use zone. The zoning of a plant if it is located on the farm.

FDA  Food and Drug Administration

GIS  Geographic Information Systems. GIS maps are available on county websites. These maps can be used to locate a property and determine its zoning, street address, and tax lot numbers.

GMP  Good Manufacturing Practice

HACCP  Hazard Analysis Critical Control Point

HTST  High-temperature, short-time pasteurizer

LUCS  Land Use Compatibility Statement

NPDES  National Pollutant Discharge Elimination System permit

OAR  Oregon Administrative Rule

ODA  Oregon Department of Agriculture

ORS  Oregon Regulatory Statute

OWRD  Oregon Water Resources Division

PISR  Placed In Service Report

PMO  Pasteurized Milk Ordinance. According to the PMO, the “Grade ‘A’ PMO, with Appendices, is recommended for legal adoption by states, counties, and municipalities in order to encourage greater uniformity and a higher level of excellence of milk sanitation practice in the United States. An important purpose of this recommended standard is to facilitate the shipment and acceptance of milk and milk products of high sanitary quality in interstate and intrastate commerce” (PMO, 2005).

SBDC  Small Business Development Center

SCORE  Service Corps of Retired Executives. A resource partner with the Small Business Administration.

SSOP  Standard Sanitary Operating Procedure

WPCF  Water Pollution Control Facilities permit

Acknowledgments

This document was made possible with help from many individuals. Special thanks to Janice Neilson, Kathryn Obringer, Laurie and Terry Carlson, Marc Bates, Janice Chellis, and Jim Postlewait.
Appendix VI. ODA Study Materials

- Farm Bulk Milk Hauler’s Manual
- Milk Receiving, Grading and Transport Fact Sheet
- Vat Pasteurization
Farm Bulk Milk Hauler’s Manual
Acknowledgement is made to the Manufacturing Milk Committee, Dairy Division, National Association of State Departments of Agriculture for their help in preparing the Farm Bulk Milk Hauler's Manual.

August 14, 1980
# FARM BULK MILK HAULERS MANUAL

## Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.  Purpose</td>
<td>1</td>
</tr>
<tr>
<td>II. Introduction</td>
<td>1</td>
</tr>
<tr>
<td>III. Licensing</td>
<td>1</td>
</tr>
<tr>
<td>IV. Definition of Terms</td>
<td>2</td>
</tr>
<tr>
<td>V.  Appearance</td>
<td>2</td>
</tr>
<tr>
<td>VI. Checklist Prior to Starting on the Route</td>
<td>3</td>
</tr>
<tr>
<td>VII. Odor and Appearance of Milk</td>
<td></td>
</tr>
<tr>
<td>Odor</td>
<td>4</td>
</tr>
<tr>
<td>Appearance</td>
<td>6</td>
</tr>
<tr>
<td>VIII. Measuring the Milk</td>
<td>7</td>
</tr>
<tr>
<td>IX. Correct Agitation Time</td>
<td>8</td>
</tr>
<tr>
<td>X.  Temperature</td>
<td>8</td>
</tr>
<tr>
<td>XI. Sampling Plans</td>
<td>9</td>
</tr>
<tr>
<td>XII. Sampling the Milk</td>
<td>9</td>
</tr>
<tr>
<td>XIII. Sani-Guide Discs</td>
<td>11</td>
</tr>
<tr>
<td>XIV. Connection of Hose</td>
<td>11</td>
</tr>
<tr>
<td>XV. Pumping the Milk</td>
<td>11</td>
</tr>
<tr>
<td>XVI. Disconnect the Hose and Rinse the Farm Bulk Tank</td>
<td>11</td>
</tr>
<tr>
<td>XVII. Recording Results</td>
<td>12</td>
</tr>
<tr>
<td>XVIII. Final Farm Check</td>
<td>12</td>
</tr>
<tr>
<td>XIX. Recap of Proper Procedure</td>
<td>12</td>
</tr>
<tr>
<td>XX. Composition of Milk</td>
<td>15</td>
</tr>
<tr>
<td>XXI. Milk Quality</td>
<td>17</td>
</tr>
<tr>
<td>XXII. Rules for Good Milking Techniques-</td>
<td>17</td>
</tr>
<tr>
<td>XXIII. Sample Questions</td>
<td>18</td>
</tr>
</tbody>
</table>
Farm Bulk Milk Haulers Manual

I. Purpose

The purpose of this manual is to provide farm bulk milk haulers with the proper techniques, principles, and procedures to use on the job. It will also serve to refresh the experienced hauler with the same techniques and principles which are required by the dairy industry.

Uniform methods are essential in agitating, weighing, sampling, and pick-up of farm bulk milk in order to assure the producer, plant manager, and quality control personnel that everyone concerned is being treated equally and fairly.

II. Introduction

The quality of milk delivered to the plant depends on how well the hauler identifies and eliminates all unsatisfactory milk before pumping it into the tank truck. The frequency of pick up should never be longer than three days.

The licensed bulk milk hauler is more than a truck driver. He is frequently the judge of acceptable milk quality before it leaves the farm. He determines the amount of milk purchased; and is the collector of official samples for laboratory examination and payment.

This places a great responsibility on the bulk hauler. He must check the odor and appearance of the milk. He must also use accurate and proper procedures in measuring and sampling the milk.

Sampling and measuring the milk are important duties to insure a fair and accurate transaction between the producer and buyer. The milk must always be measured accurately and a true sample obtained so that quality and composition tests will accurately represent the contents of the farm bulk tank. If proper procedures are not strictly followed and an error in evaluation occurs, the milk may have been improperly accepted or rejected. This will cause an economic loss for either the producer or the plant.

If there is more than one bulk tank located on a farm, each tank should be separately sampled, measured, and checked for odor and appearance. When a bulk tank is in use, no milk stored in cans may be sampled or picked-up for delivery.

III. Licensing

The grading, sampling, measuring, and pumping of milk from a farm bulk tank, and the delivery of the milk to a dairy plant, receiving station, or transfer station shall only be done by a licensed bulk hauler. This also includes the relief or part time hauler.
The valid license shall be kept in the hauler's place of employment or the office where he most frequently delivers milk. This license shall be available for inspection upon the request of an authorized official.

The hauler should also receive a wallet sized, numbered identification card to certify his right to sample. This card shall be carried with him at all times on the job.

A prospective hauler shall immediately apply for licensing. Upon receipt of the application, the appropriate state regulatory agency will issue the prospective hauler an instruction manual, and notification of the date and location of the next bulk haulers training and licensing session. Upon satisfactory completion of the bulk milk haulers examination, a permanent hauler and sampler license will be issued.

The license shall be renewable yearly and every licensed hauler is required to attend a licensing session once every three years as a refresher course.

IV. Definition of Terms

1. Farm Bulk Milk Hauler - A licensed person wins grades, samples, and measures the milk in a farm bulk tank; pumps the milk from the tank; and delivers the milk to a dairy plant, receiving station, or transfer station.

2. Milk - The normal lacteal secretion, practically free from colostrum, obtained by the complete milking of one or more healthy cows.

3. Producer - The person or persons who exercise the control over the production of milk delivered to a processing plant or receiving station, and those who receive payment for this product.

4. Dairy Farm - A place or premise where one or more milking cows are kept, a part or all of the milk produced thereon being delivered, sold, or offered for sale to a plant for manufacturing purposes.

5. Farm Bulk Tank - The tank located on a dairy farm in which properly cooled raw milk is stored prior to collection by a bulk milk hauler.

V. Appearance

The bulk milk hauler is a handler of human food and his appearance and sanitary habits should reflect this role. A clean, neat appearance and good personal habits create an image vital to the dairy industry and establishes confidence in the hauler's ability to do his job. White clothing is the most impressive. However, color is not as important as cleanliness.
The clean outward appearance of the bulk truck also establishes confidence in the hauler's ability to handle a food product. The bulk tank truck must be of sanitary design and construction. Preferably the tank should meet the requirements of the 3-A Standard for farm pick up service. Any new or replacement tank must meet the applicable 3-A Standard.

VI. Checklist Prior to Starting on the Route

The hauler must have certain supplies and equipment in order to satisfactorily perform the requirements of measuring, sampling, pumping, and transporting the milk. Before starting out, check for the following supplies and equipment.

1. The tank truck and the transfer equipment has been properly washed and sanitized. The responsibility to clean and sanitize the tank and/or pump of the farm bulk truck may lie with a plant employee. However, it is the bulk hauler's responsibility to check the tank and pump to insure its sanitary condition.

2. The most recent wash tag must be attached. This wash tag should contain the following information:
   a. The location the tank was cleaned and sanitized.
   b. The date and time.
   c. The signature or initials of the employee who washed and sanitized the tank.
   d. The type of sanitizer used.
   e. A statement that this tag must not be removed until the tank is recleaned.

3. The following sampling equipment is present on the truck:
   a. An adequate supply of sample containers.
   b. Sample transfer instrument, unless stored and maintained at the farm.
   c. An accurately prepared sanitizing solution of 100 p.p.m. chlorine or its equivalent in a suitable container that is covered.
   d. Insulated sample carrying case.
   e. Adequate ice or other refrigerant to maintain sample temperature of 32-40°F.
4. A dial thermometer with an adjustment for calibration which is accurate to plus or minus 2°F. The thermometer used must include the normal temperature range of milk, and a dial range of 25°F to 12.5°F is recommended.

5. An adequate supply of sani-guide discs.

6. A waterproof, indelible marker to identify samples.

7. Watch or other timing device.

8. Adequate supply of milk weight tickets and a pencil to record the required information.


10. Flashlight.

VII. **Odor and Appearance of Milk**

**Odor**

The most important factor in consumer acceptance of dairy products is flavor. Milk flavor control must begin at the farm.

It is important that the hauler not taste the milk for off-flavors because of potential health problems caused by raw milk. Nevertheless, the hauler should realize that off-flavors in raw milk invariably show up as off-odors, and if off-odors are found by the hauler, off-flavors are also present.

Normal milk has virtually no odor. The hauler should have a firm impression as to what constitutes normal milk so that he can judge the milk he collects with confidence.

If the milk has a serious off-odor or appearance (such as those that follow), the hauler should reject it. The plant fieldman should be contacted immediately so that the cause can be determined and corrected. In case a hauler is uncertain as to whether a tank should be accepted, contact the plant for guidance, and obtain a sample for the plant on which a final decision may be made.

Any slight change in quality should be immediately brought to the attention of the producer and the milk plant by making an appropriate comment on the producer’s milk weight ticket. This warning may often be the earliest indication of the start of trouble.

Some of the more common off-odors and their possible causes are:

1. **Feed.** The feed a cow eats may impart certain odors to milk. Some stronger feeds will carry through more noticeably than others. Odors resembling green grass, silage, turnips, and alfalfa hay are outstanding examples. Feed odor can be minimized or eliminated by taking the cows off offending feeds at least 4 hours before milking. Certain feeds can be
detected in milk if fed to the cow even 15 to 30 minutes before milking

2. **Barny.** This odor is caused by cows breathing foul air due to poor barn sanitation and/or ventilation. Proper ventilation, good sanitation, and proper milking procedures will correct this problem.

3. **Foreign.** Any seriously objectionable odor foreign to milk, such as sanitizers, fly spray, paint, oil, kerosene, creosote, or a medicinal substance, will render the milk unacceptable or unfit for use. Such an odor may be caused by direct contamination of the milk or may be absorbed from the air.

Sanitizers are included in this category because the residue of sanitizers, such as hypochlorite and iodophor, if left on dairy equipment, may be absorbed by milk and impart a foreign odor. Phenolic compounds used in udder ointments may combine with iodophor or hypochlorite sanitizers to form a highly objectionable foreign odor which is detectable in a very low concentration.

4. **Garlic/Onion.** This obnoxious weed flavor, imparted to milk when the cow eats garlic, onions, or leeks, is not classified as one of the usual feed flavors described above. The garlic/onion flavor is recognized by the distinctive odor suggestive of its name. It may be actually so objectionable as to render the milk undesirable for use.

5. **Musty.** This odor is suggestive of musty or moldy hay. It may be absorbed directly by the milk, but is more likely to come from feed or stagnant water consumed by the cow.

6. **Rancid.**

   A. **Oxidative Rancidity.** Oxidized milk gives off odors usually described as cardboardy, metallic, or tallowy. It is usually more noticeable during the winter months when cows are on dry feed. The most frequent cause of oxidative rancidity is by the contamination of milk with small amounts of copper or iron from milk contact surfaces.

   B. **Hydrolytic Rancidity.** Hydrolytic rancidity found in milk will give off an odor resembling spoiled nut meats. It is more noticeable during winter, when cows are on dry feed, or during late lactation. Agitation of warm raw milk in the presence of air, causing foaming, will result in a rancid type odor within a few hours.

7. **Sour.** Sour milk will have a malty odor and will be found when poorly cooled milk results in excessive bacterial growth. It also may result from bacterial growth due to insanitary milking practices and/or insanitary equipment. Good sound sanitary practices and prompt cooling in the bulk tank will prevent this problem.

8. **Weedy.** The weedy odor is not included among the usual feed odors. It may include obnoxious odors resembling such plants as ragweed, bitterweed, or peppergrass, and may become a very troublesome flavor
defect, It can be eliminated or minimized by keeping cows away from weed-infested pastures or by not offering feeds containing such weeds until after the cow is milked.

**Checking for Odors**

The odors gather just below the cover of the bulk tank. To properly check for off-odor, remove a small port opening, put your nose down to the opening and smell the milk. Never open the entire lid; this will let the odors escape into the air. The detection of off-odors can be affected by a number of external factors. The hauler should strive to eliminate these factors:

1. Milk house odors.
2. Gasoline fumes adhering to clothing.
3. Smoking immediately prior to checking for odors or smoking in the milk house.
4. Eating or chewing aromatic candy, tobacco, medicine, beverages, foods, etc.
5. Highly scented shaving lotion, soap, and other toiletries on the hauler.

**Appearance**

Following are some milk quality problems which may become evident while checking for appearance. Any of these defects would be sufficient reason to reject the tank of milk.

1. **Bloody Milk.** The milk from mastitic cows may contain blood. A small amount of bloody milk can give a large quantity of normal milk a reddish tinge.

2. **Flaky Milk.** Milk from cows having mastitis may show light flakiness or pronounced stringy curd particles.

3. **Extraneous Matter.** Floating extraneous matter includes such things as insects, hair, chaff, and straw. The presence of extraneous matter may result from careless handling of milk, open doors, torn screens, dusty feeding conditions, and improper cleaning of the udder before milking.

Other problems which may become evident while checking for appearance include frozen and partially churned milkfat. These problems, depending on their severity, may or may not be reasons for rejecting the milk.

**Checking for Appearance**

Normal milk color ranges from bluish white to golden yellow and is free from all foreign or clotted matter. When you are checking the appearance of a bulk tank of milk, make sure the tank light is on and/or the area is well lighted. Lift the lid and observe the complete, undisturbed milk surface. Any evidence of partially churned butterfat, frozen milk, or other conditions which may alter the reliability of your
sample, should be indicated on the sample container to inform the lab. Bring this to the attention of the producer and notify the fieldman to have this problem corrected.

VIII. **Measuring the Milk**

The milk shall be completely motionless when measurements are made. If the agitator is running when you arrive, it may be easier for you to sample before shutting off the agitator.

Turn the agitator switch to off, to make sure the agitator doesn't start while you are measuring. Wait at least 5 minutes for the milk to become completely motionless.

**Preparation of the Measuring Stick**

The essential steps to assure an accurate measurement of the milk volume are:

1. The measuring stick must be clean, dry, and free of fat. It also must be warmed to room temperature (65-70°F) before the milk is measured. The measuring stick should be stored in the bulk tank in its proper position between readings. To prepare the stick, rinse with cold water, then warm to room temperature with warm water, finally, wipe dry with a clean, dry single service paper towel. A measuring stick prepared in this manner will give you an accurate reading.

2. Now the stick is ready to be positioned into the milk. If there is any foam, gently move the foam away from the measurement area with the end of the measuring stick. Then lower it slowly into the milk until it reaches a point approximately 1/4 inch from its proper position. Wait a few seconds, then gently lower the rod till it seats itself naturally.

3. Remove the stick and read at once. The markings should be read at eye level and in a well lighted area. Make at least 2 readings to insure the correct weight is obtained. The measuring stick is graduated into 1/32 of an inch. Each graduation is equivalent to a determined number of pounds of milk posted on a conversion chart specifically calibrated for each tank. The serial number of the bulk tank, measuring stick, and conversion chart must be the same.

When the milk line is close to but not exactly on a specific mark, it is read as if it were exactly on that mark. When the milk line falls exactly between two marks, always read to the nearest even number. It is important to always read the stick in this manner to avoid inaccurate results. Immediately record the reading on the weight ticket.

The farm bulk tank and its calibration is the responsibility of the producer under the supervision of the plant and State regulatory agency. However, there are conditions that the hauler should be aware of that could contribute to inaccurate weight problems.

a. The tank is incorrectly calibrated.
b. Errors in the weight conversion chart.
c. Bulk tank is out of level.
d. Heaving, cracking, or settling of milk house floor causing the bulk tank to shift.

e. Improper footings under the tank legs.

f. A weaving or distortion of the measuring stick bracket or seat.

If you notice any discrepancies, you should contact the plant or plant fieldman and have them investigate the problem.

**IX. Correct Agitation Time**

In order to obtain a sample that is truly representative of the milk in the tank, proper agitation must be accomplished.

A general rule is five minutes of constant agitation (or more if determined by testing) for a 100 to 900 gallon tank; and for a tank of 1,000 gallons or more, constant agitation for at least 10 minutes (or more if determined by testing).

The proper agitation time should be determined by the fieldman. He should have taken sufficient samples to insure that the milk in all areas of the tank is completely mixed during the specified time.

Check your watch or timing device when you turn on the agitator. If the agitator is running when you arrive, start the timing then.

**X. Temperature**

The hauler should take and record the temperature of milk at each pick-up. Temperature determinations provide much useful quality control information for both the producer and the receiving plant

1. All bulk tanks shall cool the milk to a blend temperature of less than 50°F. It is recommended that milk should be cooled to less than 40°F for the production of quality milk.

2. The reading and recording of the temperature will provide a history of the bulk tank efficiency. If the temperature readings of milk in the tank gradually increase, it will show the hauler that the tank is not cooling properly. Contact the producer and the plant to resolve the problem.

3. A high milk temperature can be a warning that the milk may have an off-flavor or be high in bacteria.

4. Check the thermometer on the bulk tank, and inform the producer if the thermometer is incorrect.

A metal stem dial thermometer is recommended. Glass mercury thermometers, although more accurate, are not recommended because of the danger of breakage during use.
The thermometer should have a stainless steel stem, an unbreakable plastic window, and have an external adjustment for calibration. The thermometer must include the normal temperature of milk range. A dial range of 25°F to 125°F is recommended.

The accuracy of the thermometer should be checked before initial use and at least monthly thereafter. The best way to check the thermometer is against an officially calibrated thermometer in a 32-40°F liquid in the plant laboratory.

Be sure to sanitize the thermometer stem in 100 p.p.m. chlorine or its equivalent each time before checking the temperature of the milk.

XI. Sampling Plans

The sampling of milk from a farm bulk tank is an important part of a hauler's responsibilities. Regardless of the sampling plan used, extreme care should be taken to obtain a representative sample.

A. Universal Sampling Plan A sampling plan that has become very popular is the Universal Sampling Plan. The true Universal Sampling Plan provides one sample that can be used for all laboratory analysis but not all analyses need necessarily be done on the same sample. This plan eliminates the need for the hauler to collect several types of samples and simplifies the sampling equipment necessary. It also enables the laboratory to monitor the producer's quality without requesting special samples from the hauler.

The producer is unable to anticipate when bacteria or sediment tests are to be run because the same size sample is removed from his tank at every pick-up. The universal sample of 1, 2, or 4 oz. also requires less milk, so, consequently, less milk is wasted.

B. Sampling for a Specific Test An alternate type of sampling plan requires that only a fat sample be taken daily. This sample, when returned to the plant, can be either tested daily as a fresh fat sample, or a portion of the sample can be placed in a bottle to be composited with samples taken on other days. The composite sample will be tested for fat at a later date. The composite bottle must not leave the plant.

The laboratory will periodically request additional samples for bacteria, sediment, antibiotics, or other desired tests. The laboratory will inform the hauler and the hauler is then required to sample for the tests requested.

This method requires that a hauler differ his sampling technique to suit the test required. For example, when sampling for fat, a sterile sample container is not needed, however, when sampling for bacteria count, a sterile container is required. When sampling for sediment, a 16 oz. (pint) sample may be needed instead of a smaller sample.

XII. Sampling the Milk

The proper analysis of a sample is dependent upon the reliability of the sampling procedure. To be satisfactory, the sample must be
Representative and the sampling procedure must be done in a manner to prevent contamination of the sample.

This sampling procedure should be strictly followed:

1. Wash and dry your hands.

2. Identify each sample container with the producer number, the date of pick—up, and the route number.

3. Make sure the tank is properly agitated. (See Section I.)

4. If a dipper is used, make sure it is clean and has been properly sanitized in a 100 p.p.m. chlorine solution or other equally suitable sanitizing solution. The sampling device should remain in the solution until it is removed to sample the milk. Do not remove the sampling device prior to entering the milk house.

   If the dipper is stored and maintained at the farm, make sure it is clean and properly sanitized before sampling the milk.

5. Open the sample container being careful not to contaminate the interior of the container and/or its cap. Contamination of the sample container will alter the laboratory results and possibly reduce the producer's payment. Do not dip the sample container in the milk.

6. Rinse the sampling device twice in the milk before taking the sample, being careful not to put your hands in the milk.

7. Sample the milk in the tank making sure the sample container is not held over the milk supply while pouring the sample. The sample container should not be filled more than three fourths full. This will enable the laboratory to properly mix the sample before testing.

8. Properly close the sample container, making sure it is sealed correctly so that it does not leak or puncture the sample container. When using a whirl—pak bag, make sure enough air is trapped inside the bag to properly agitate the sample.

9. Immediately place the sample in the refrigerated sample case and keep it at 32 to 40°F until delivery. Provide a method, such as the use of racks or drainage holes in the sample case, to keep the sample free from contamination due to melting ice.

10. After you have sampled the milk, rinse the sample dipper with tap water and return it to the sanitizing solution.

11. Always take a second sample of milk at the first stop as a temperature reference sample. Upon returning to the plant, check and record the temperature of this sample when the samples are delivered.
XIII. **Sani-Guide Discs**

The use of sani-guide discs will emphasize the importance of clean milk. The disc will show coarse sediment (flies, hair, straw, etc.) in a bulk tank of milk.

A new sani-guide disc is placed between the bulk tank valve and the transfer hose at each pick-up. When you finish pumping the milk, examine the disc and notify the producer and the fieldman if excessive visible contamination is evident on the disc.

The sani-guide disc should be left at the farm for the producer to see and become aware of any contamination problems.

XIV. **Connection of Hose**

The transfer hose should be brought into the milkroom through the hoseport. Remove the cap from the bulk tank outlet and sanitize the tank outlet before connecting the transfer hose. Then remove the cap from the transfer hose and connect it to the bulk tank valve outlet.

The only time the transfer hose is not capped is during loading and cleaning. If there is any evidence of the bulk tank valve leaking, notify the producer and the fieldman to correct this.

XV. **Pumping the Milk**

To aid in the removal of butterfat that may have clung to the side of the tank and to help protect the plant against a fat loss due to this factor, it is a good practice to leave the agitator running until the tank is at least half empty. Make sure the agitator is shut off before foaming or splashing begins to prevent product loss due to foam.

It is also important to shut off the pump as soon as possible after the tank is empty to avoid sucking air and milk house odors into the truck tank. When the tank is empty, shut off the refrigeration compressor on a direct expansion tank or the water circulation pump on an ice bank tank.

Never leave a farm bulk tank partially full. If the tank has not completely emptied when your truck tank is full, return to the farm and empty the tank before the producer adds any additional milk. If not emptied, the bulk tank could not be washed and sanitized before the next milking, nor would the samples and weight accurately represent the milk delivered.

Do not start rinsing the tank while the hose is still attached.

XVI. **Disconnect the Hose and Rinse the Farm Bulk Tank**

After the milk is pumped from the tank, and the pump shut off, remove the hose and cap immediately. Visually check the bottom of the
bulk tank for sediment. If it is excessive, make note of it and notify the producer and plant fieldman.

As a help to the producer, rinse the interior of the bulk tank with warm water (about 110°F). This will make it easier for the producer to clean up. Close the tank covers after rinsing to prevent the tank from drying out and keep out any foreign material.

Rinse the floor down to keep it clean and free of milk. Any milk remaining on the floor will sour and develop acid which will eventually erode the concrete.

XVII. Recording Results

To avoid error, promptly record all results. Each of the following results should be included on your bulk milk receipt:

1. Date of collection.
2. Time of pick-up.
3. Producer name.
4. Plant number.
5. Milk quality - odor and appearance.
7. Measuring stick reading.
8. Converted weight (milk weight).
9. Name of buyer.

XVIII. Final Farm Check

Before you leave the milkhouse, make note of any abnormalities to report to the producer and/or plant fieldman. Note the general condition of the milkhouse, its construction, and any situations which may cause contamination of product or incorrect results in performing your job.

Samples shall be taken of all milk, even if it is rejected or frozen. Any off-condition milk should be noted for the laboratory.

Before you leave, make sure the milkroom is in as good or better shape than when you arrived. Rinse the floor, hang up the hose, and turn the lights out.

XIX. Recap of Proper Procedures

As you do your job, mentally use one of the following charts. If the agitator is running as you enter the milkroom, follow Chart A. If it is not, use Chart B.
Chart 3

AGITATOR NOT RUNNING

Take all the required equipment into the milkroom

Milkroom adequately lighted

Agitator not running

Satisfactory → Examine odor → Unsatisfactory

Turn agitator switch off

Allow 5 min. for milk to settle

Unsatisfactory → Examine appearance → Satisfactory

Examine appearance

Agitate

Check temperature

Sample for lab

Inform producer and fieldman

Do not pick up

50°F or below

Check temperature

Above 50°F

Mark sample containers

Properly sample milk

Transfer milk to bulk tank truck

Turn agitator off before foaming occurs

Disconnect hose

Rinse farm bulk tank and floor

Satisfactory → Examine semi-guide disc → Unsatisfactory

Leave for producer to examine

Notify producer and fieldman

Leave for producer to examine
XX. **Composition of Milk**

A general knowledge of the composition of milk will prove useful in the hauler's contact with producers. The main constituents of milk are water, milkfat, protein, lactose (milk sugar), and ash.

The average composition of milk is:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>87.0%</td>
</tr>
<tr>
<td>Milkfat</td>
<td>4.0%</td>
</tr>
<tr>
<td>Lactose</td>
<td>5.0%</td>
</tr>
<tr>
<td>Protein</td>
<td>3.3%</td>
</tr>
<tr>
<td>Ash</td>
<td>0.7%</td>
</tr>
</tbody>
</table>

**Causes of milkfat variations**

The variation in the percent of milkfat has the greatest effect on the producers returns. The bulk milk hauler must provide an adequately mixed, reliable sample for milkfat analysis. This is done by following the proper sampling procedure outlined in this manual. There are, however, some reasons for milkfat variations which the hauler cannot control. These variations are commonly due to:

1. Breed of cow.
2. Age of cow.
3. Genetic potential of individual cows.
4. Stage of lactation.
5. Seasonal changes.
6. Udder infection.
7. Type and quality of feed.
8. Milking procedure.
11. Excitement.

XXI. **Milk Quality**

Often times the hauler will be asked by farmers about the quality tests performed by the laboratory. The following summary will help him explain the reasons for the tests and his responsibilities as the official sampler.

A. **Milkfat**

The results obtained from the fat tests are the basis for payment to the producer for his milk. It is important that the bulk milk hauler has a knowledge of the proper procedure to insure that this test is accurate and representative of all the milk in the farm bulk tank.

The Babcock, Gerber, and Milk-O-Tester are the common tests used for determining milkfat.
B. **Bacteria Count**

Bacteria are microscopic one-celled organisms which are found on and in all living animals, in the soil, water, ponds, and even wells. Manure, flies, insects, rodents, utensils, and equipment are sources of many types of harmful bacteria. Because of the widespread presence of bacteria, contamination of equipment which comes in contact with milk must be avoided.

The amount and kind of bacteria found in a sample of milk is an indication of the sanitary conditions and practices occurring on the farm and the extent of milk cooling. Contamination can occur when measuring, sampling, and transferring milk. Therefore, extreme care must be taken to prevent further contamination due to the hauler.

C. **Inhibitor Test**

The presence of antibiotic residues can cause violent allergic reactions in some individuals. These residues are of medicine and drugs used to treat the milking animals for udder or other infections. Therefore, tests are run periodically to determine their presence in milk.

Excessive residues or sanitizers used on milk handling equipment will also show up in these tests.

D. **Sediment Tests**

This is a rapid method to determine whether the milk is being properly protected from contamination due to dust, and/or improperly cleaned udders. The presence of sediment indicates insanitary methods of milking and milk handling practices. A clean sediment disc pad, however, does not prove that sanitary practices exist.

The test consists of filtering a sample of milk through a white cotton disc and checking the amount and kind of residue left.

E. **Added Water**

The temperature at which milk will freeze is a fairly constant factor and can easily be determined by laboratory tests. If water is added either deliberately or by accident, the freezing point will become closer to that of pure water. Adding water to milk is illegal.

The hauler must exercise care and make sure the transfer hose is disconnected before the bulk tank is rinsed in order to prevent adulteration with water.

F. **Somatic Cell Count**

Somatic cells are primarily white blood cells. Many factors influence the number of somatic cells in milk. The cow's age, production capacity, and stage of lactation influence the normal level of somatic cells in the milk. Irritation and infection of a cow's udder caused by
poor milking practices, improper cattle housing, improperly operating milking machine, or poor pasture conditions will show up as increased somatic cell counts. High somatic cell counts signify that some cows in the herd are experiencing illness or injury.

The test measures the level of white blood cells in the milk. A level of 500,000 or less indicates normal milk and a mastitic condition would not be expected. Somatic cell counts exceeding 500,000 to 1,000,000 per ml. indicate that mastitis may be a herd or cow problem and individual cow samples should be tested to identify problem cows. Somatic cell counts exceeding 1,000,000 per ml. indicate that there is a mastitic problem and corrective action must be taken immediately. Counts exceeding 1,500,000 per ml. also indicate a severe mastitic problem and the milk should not be used for human consumption.

XXII. Rules for Good Milking Techniques

The producer may from time to time have questions concerning mastitis. A general knowledge of good milking techniques is necessary to answer his questions. The following 10 rules will aid in the prevention of mastitis problems in the producer's herd.

1. Wash the udder with a warm sanitizing solution and dry with a single service paper towel.

2. Remove 2 or 3 streams of foremilk from each quarter and examine for abnormalities.

3. Attach the teat cups approximately 1 minute after starting udder preparation - or when the teats are full of milk.

4. Adjust the teat cups during milking as necessary to insure that the quarters milk out properly.

5. Start machine stripping when milk flow slows to a minimum (usually 3 to 4 minutes). Machine strip quickly. Do not overmilk.

6. Dip the teats in a teat dip proven to be safe and effective immediately after the teat cups are removed.

7. Treat all clinical cases of mastitis.

8. Treat all cows at drying off.

9. Conduct a cowside screening test such as the California Mastitis Test (CMT) at monthly intervals, and record the results for future reference.

10. Have the entire milking system analyzed twice a year by a qualified milking machine service man.
XXIII. **Sample Questions**

Some sample questions are enclosed with the Bulk Milk Hauler's Manual to help prepare the applicant for the licensing examination.

**True or False** - In the space provided following the question, place an "X" in the correct column.

<table>
<thead>
<tr>
<th></th>
<th>True</th>
<th>False</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The Bulk Milk Hauler's license is renewable every other year.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Normal milk color ranges from bluish white to golden yellow and may contain a limited amount of foreign or clotted matter.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. A milk temperature above 50°F can be a warning that the milk may have an off flavor or be high in bacteria.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Fill in the blank** - In the following questions, fill in the blank with the correct word or words.

1. ___________________ is a serious off-odor that is sufficient reason to reject a farm bulk tank of milk.

2. The detection of off-odors can be affected by external factors including, ___________________, ___________________, ___________________, and ___________________.

3. The correct agitation time for a 800 gallon tank is _______ minutes.

**Multiple choice** - Each question is followed by a series of answers; Check the answer or answers which are correct. More than one answer can be correct.
1. The only time the transfer hose *is* not capped is:

   _____ a. during loading  _____ c. while you rinse the farm bulk tank
   _____ b. between stops   _____ d. during tank truck cleaning

2. The Somatic Cell Count determines:

   _____ a.) the level of white blood cells in the milk  
   _____ b.) the percentage of milk fat  
   _____ c.) amount of added water  
   _____ d.) amount of *sediment in* the milk

3. The hauler should be aware of the following conditions which could contribute to inaccurate weight problems:

   _____ a.) tank incorrectly calibrated
   _____ b.) amount of milk in the tank
   _____ c.) improper footings under the tank legs
   _____ d.) heaving, cracking, or settling of the milk house floor causing the bulk tank to shift
MILK RECEIVING, GRADING AND TRANSPORT

Fact Sheet*

The true measure of milk quality, as far as the consumer is concerned, is flavor. The quality measures used by most regulatory agencies and milk handlers are bacteria counts and sediment tests. While milk of low bacteria count and low sediment content may be of good flavor, this is not necessarily the case. For example, milk can be rancid, oxidized, or feedy even though it is relatively free of bacteria and sediment—in other words, sanitary quality and milk flavor need not be related.

Marketing experts contend that flavor is an important factor influencing the repeated purchase of food products. Until recently, primary sales efforts on dairy products have been concentrated around food value, convenience, and uses in menu planning. Milk has been promoted as "nature's most nearly perfect food" with little or no attention to billing it as "nature's best tasting food."

No one would deny that the milk hauler's job requires training, knowledge and initiative—and tact or diplomacy when it comes to those occasional dairymen, who we shall refer to as characters.

The operator of a tank truck is at once a truck driver, a sampler, a weigher, a milk quality judge and the contact man for the processor who receives the milk.

The important decision making of accepting or rejecting milk is an "all or none" business. Training and experience play a big role here.

Milk haulers must:

1. Be alert
2. Willing to take responsibility
3. Maintain day-to-day relationship with producers
4. Have integrity—measure and sample with equity
5. Have a keen sense of smell.

The decisions that are made by the hauler govern the type of milk the processor can offer consumers.

"Milk hauler or receiver" means a person who, in the course of his employment, accepts bulk milk or milk products from a producer, milk plant, receiving or transfer station, and transports such commodity to a milk or dairy products plant. (ORS 621.152)

ACCEPTABLE QUALITY OF FLUID MILK. "Acceptable quality of fluid milk" is that which is free of objectionable flavors and odors and is normal in appearance. Flavors and odors including those of obnoxious weeds which are not removed by plant processing, are objectionable for grade A use, but slight or moderate feed flavors and odors which are normally removed during the processing are not objectionable. (OAR 24-623.5)

*Based on Oregon Agricultural Regulations (OAR) Chapter 603, dated 11/1/71

Oregon State University Cooperative Extension Service
Oregon State Department of Agriculture, Food and Dairy Division
GRADING. (1) Each shipment or pick-up of grade A fluid shall be graded as to its acceptable quality by a licensed grader. If it is not acceptable and is rejected as unfit for grade use, a record (forms supplied by the department) is to be made showing:

- (a) Producer's name and number;
- (b) Market or pooling agent;
- (c) Date and time;
- (d) Quantity; and
- (e) Cause for rejection.

(2) The original copy of the record is to be forwarded to the department, Food and Dairy Division, not later than 7 days following the rejection. (24-641.5)

SAMPLING PERIOD STANDARD means the examination or testing of at least four samples of milk and milk products every six months period for compliance with standards. (24-622.5)

ABNORMAL MILK STANDARDS. Compliance with the abnormal milk standards for retail raw milk for pasteurization shall be determined by examination or testing for total somatic cells (leukocyte count) of at least four samples of milk from each producer or producer-distributor every six-month period. The leukocyte count shall be determined by the Wisconsin mastitis test (W.M.T.) the direct microscopic leukocyte count (DMSCC) or any other test, which will give comparable results and is approved by the department. (24-621.5)

EXAMINATION FOR ABNORMAL MILK. Examination of milk and enforcement of the standard shall be as follows:

(1) A Wisconsin mastitis test or DMSCC shall be conducted on each producers or producer-distributors raw milk at least four times in each six-month period.

(2) A milk sample having a leukocyte count of one million or more per milliliter (ml) shall be deemed to be violative of the abnormal milk standard.

(3) The three (3) out of five (5) compliance method shall apply in the case of all abnormal milk showing one million (1,000,000) or more leukocytes per ml. except that a period of four weeks shall be allowed between warning notice and the taking of the next official test (including a DMSCC) for enforcement purposes.

(4) Whenever two of the last four consecutive leukocyte counts exceed the limit of the standard, the producer shall be given a warning letter that shall be in effect so long as two of the last four samples exceed the limit. An additional sample shall be taken but not before the lapse of four weeks. Immediate suspension of the milk shall be instituted whenever the standard is violated by three of the last five leukocyte counts. No action is taken if the additional sample is within the standard (less than 1,000,000 cells per ml.) Release from suspension will be made with first satisfactory sample. Milk shall be degraded whenever the standards is violated by three of the last five leukocyte counts. (24-639.5)
SEDIMENT TEST. (1) If upon examination the department or grader shall obtain a sediment test which is in excess of a No. 2 sediment standard, the department shall give the licensee a written notice of such fact. An additional sample shall be taken after an interval of not less than three days and if the test of the additional sample is also in violation of the sediment standard of the licensed grade then held, the licensee shall be given a written notice to suspend the sale, exposure or offering for sale of such grade of milk for a specified content within the standard for the license grade.

(2) Milk or cream showing a sediment test in excess of a No. 3 sediment standard is deemed to be unlawful milk and the grader shall immediately affix to the container thereof a condemnation tag, which shall be in such form as the department may prescribe, and in addition thoroughly mix with that milk such harmless red food coloring matter as will prevent the same from being sold, offered or exposed for sale for human consumption in accordance with ORS 621.085. (24-634.5)

SEDIMENT STANDARDS. The official Oregon sediment standards for milk and cream according to the official chart adopted by the department are as follows:

- Standard No. 1 - No visible sediment
- Standard No. 2 - Does not exceed 0.5 mg. of sediment.
- Standard No. 3 - Does not exceed 2.5 mg. of sediment.

BACTERIAL INHIBITER TEST. Antibiotic tests on each producer's milk or on commingled raw milk shall be conducted at least four times during any consecutive six (6) months. When commingled milk is tested, all producers shall be tested when test results on the commingled milk are positive. (24-640.5)

GRADE A RAW MILK FOR PASTEURIZATION is fluid milk produced by a disease-free herd on a dairy farm in conformance with all the items of sanitation (24-654.5)

Grade A raw milk for pasteurization shall at no time between transfer from the original producer container and pasteurization have an average bacteria count exceeding 160,00 per milliliter. Also the bacterial count average of fluid milk for pasteurization from individual farm bulk milk tanks shall not exceed 80,000 per milliliter, the temperature shall not exceed the average of 45° F., and the sediment content must not be in excess of a No. 2 sediment test. (24-670.5 & 24.654.5)

MISCELLANEOUS REQUIREMENTS. (e) The loading and unloading area used by milk tank trucks at dairy farms shall consist of a concrete platform, or slab of sufficient size in area to prevent hose or milk piping while in use from coming in contact with the ground or other such unprotected surfaces. Such platform shall be kept clean, in good repair and sloped to drain. A port of sanitary design with an approved type cover shall be provided in the wall of the milk house where a farm tank is installed for the passage of the milk hose from the tank truck to the farm tank. The port shall be kept closed except when it is in use. (24-656.05)
TANK TRUCKS. (a) Each delivery container or tank used in transporting bulk raw milk or milk products for pasteurization between milk plants shall be tagged or labeled as to the name and address of distributor and grade of milk or milk products contained therein.

(b) Tank trucks used and methods employed in transportation of bulk milk from dairy farm or receiving station to a milk plant shall be subject to approval by the department. (In granting its approval, the department will take into consideration the minimum sanitary standards known as the 3A Sanitary Standards for dairy equipment established by the International Association of Milk Sanitarians, New York; U.S. Public Health Service, and Dairy Industry Committee.

(c) All hose, piping, fittings and pumps used in transferring milk to or from tank trucks, and which are to be carried on the truck, shall be stored in a sanitary compartment designed and constructed as to exclude dust and moisture. The compartment shall be equipped with a drain properly plugged or capped to facilitate cleaning. The hose, pipe or milk pump openings shall be properly capped or plugged when not in use.

(d) All milk inlets or outlets to tank trucks shall be equipped with approved type tight fitting metal or plastic dust cap or cover. These covers shall be in place at all times except when the tank truck is being cleaned, loading or unloading milk.

(e) Milk shall be conducted to and from tank trucks only through sanitary pipes or approved type flexible tubing which complies with the requirements of section 24-656.12.

(f) Tank trucks used in taking delivery of milk from farm milk holding tanks shall be equipped with sanitary metal dust tight compartment for the storage of containers of milk sampled for bacterial analysis. The compartment shall be so constructed that the samples can be iced or otherwise refrigerated while in transit so as to maintain a temperature of 32-40 degrees F. or less while stored in the compartment.

(g) Adequate sanitary facilities shall be provided at the dairy farm, receiving station and milk plant, as the case may be, for the tank truck to load or unload fluid milk.

(h) Tank trucks shall not receive any milk from producer dairy except that stored in approved type farm bulk milk storage tanks. (24-656.09)

UTENSILS AND EQUIPMENT--CLEANING. All multi-use containers, equipment, tank trucks and other utensils used in the handling, storage, or transportation of milk and milk products shall be thoroughly and promptly cleaned after each usage. Exterior surfaces of such equipment shall be kept clean. (24-656.09)

Tank trucks including piping, connections, and pumps used to load and unload tanks shall be cleaned at receiving plant immediately after being emptied, or at least once daily. (24-656.10)

All vehicles used in the transportation of milk or milk products shall be kept clean and no substance capable of contaminating milk or milk products shall be transported with such milk or milk products in such manner as to permit contamination. (24-656.20)
UTENSIL AND EQUIPMENT--BACTERICIDAL TREATMENT. Tank trucks and other utensils used in the production, handling, storage, or transportation of fluid milk products shall after cleaning and immediately before each usage be effectively sanitized by being subjected to an approved bactericidal process. Outlet valve to farm tanks shall be capped after bactericidal treatment and while in use. 

The following methods of sanitization are approved or any other method which has been demonstrated to be equally effective and is approved by the department:

(1) Hot water at 170° F. for 5 minutes.
(2) Steam at 170° F. for 15 minutes or steam at 200° for of 5 minutes or jet steam for not less than 1 minute.
(3) Chemical sanitizers at minimum required strength via for at least 1 minute immersion or flow (24-656. 11)

PERSONNEL-CLEANLINESS AND HEALTH. (1) Hands shall be washed clean and dried with an individual sanitary towel immediately before milking, before performing any milk house function, and immediately after the interruption of any of these activities. Milkers and milk haulers shall wear clean outer garments while milking or handling milk, milk containers, utensils, or equipment. No person with an infected cut or lesion on the hands shall milk cows or handle milk utensils.

(2) All milkers and handlers of milk and milk products shall be free of communicable diseases which may be transmitted through milk and milk products and may be required to take such physical examinations as the department may direct.

COOLING (2) In the case of raw milk for pasteurization, milk must be cooled by an approved method to 45° F. or less within two hours after milking and maintained at that temperature until delivered. (24-656.19)

PROTECTION FROM CONTAMINATION. Suitable filters to the manholes of transport tanks during unloading shall be required; filtering equipment shall be stored off floor in a sanitary manner when not in use.

(3) Whenever air under pressure is used for the agitation or movement of milk, or is directed at a milk-contact surface, it shall be free of oil, dust, rust, excessive moisture, extraneous at materials, and odor. The use of steam containing toxic substances is prohibited. Whenever steam is used in contact with milk or milk products, it shall be of culinary quality. (24-674.15)

TAGGING AND COLORING UNLAWFUL MILK OR CREAM. (1) Whenever a grader determines that any milk or cream is unlawful, he shall immediately affix to its container a condemnation tag. Condemnation tags shall be in such form as prescribed by the department. The grader shall also thoroughly mix with the condemned milk or cream some harmless coloring matter.

(2) As used in this section the term "unlawful milk or cream" means:
(a) Milk or cream which contains dirt, filth, oil or other foreign matter which may render them, or dairy products from them, unfit for human consumption.
(b) Milk or cream which is stale, cheesy, rancid, putrid, decomposed or actively foaming.
(c) Milk or cream which contains an unreasonable amount of sediment of any kind. (ORS 621.226)

LICENSES FOR MILK SAMPLER AND GRADERS, AND PASTEURIZER OPERATORS. (1) All applications for a license as a milk sampler and grader, or pasteurizer operator shall be made to the department on forms provided by it. Any licenses issued by the department under this section may be restricted in their application to the person licensed so as to authorize the holder to engage only in a limited line of activity commensurate with the holder's ability.

(2) The applicant shall be required to pass a reasonable written examination and give a practical demonstration of his ability to carry out the duties required under the license. Each application for a license shall be accompanied by a fee of:

(a) Milk sampler and graders, $25.
(b) Pasteurizer operators, $25.

(3) The fee shall not be refunded for any reason. The Pasteurizer operator license shall be valid for the lifetime of the person to whom it is issued, except as provided in ORS 621.276. (ORS 621.266).

(4) The milk sampler and grader license expires on June 30 next following the date of issuance unless sooner revoked and may be renewed upon application of the licensee. [621.072 (4)]

LICENSEES UNDER ORS 621.266 TO SHOW KNOWLEDGE OF AND ABILITY TO COMPLY WITH CHANGES IN LAWS OR REGULATIONS. (1) When any amendment is made in the laws of this state or new regulations are promulgated relating to a change in the grades of milk and cream or the operation of pasteurizing equipment. The department may require any person licensed under ORS 621.266 to demonstrate his knowledge and familiarity with such amendments or changes if this is not accomplished within a specified time, the license to sample and grade milk and cream shall be suspended automatically. (ORS 621.276)

LICENSE TO SAMPLE AND GRADE FLUID MILK. Any person, or milk hauler or receiver, grading fluid milk as unfit for processing as fluid milk due to quality, odor, flavor or wholesomeness, shall first obtain a license and shall thereafter be authorized to sample and grade fluid milk as herein provided. The grader shall make a true written record of grade, the reason for rejection with the name of the producer, the date of rejection and the quantity involved. A copy of the record shall be made available to the department or other official milk inspection agency. [ORS 621.072(2)]

SUSPENSION OR REVOCATION OF LICENSES ISSUED UNDER ORS 621.266. If any person licensed under ORS 621.266 fails, neglects or refuses to fully and faithfully comply with any provisions of ORS 621.151 to 621.291 required of persons so licensed, his license may be revoked or suspended, or otherwise limited. (ORS 621.281)

No licensee or licensed milk sampler and grader shall:

(a) Negligently sample, weigh or test any milk or cream.
(b) Fraudulently manipulate any weight, sample or test of milk or cream.
(c) Make a false entry or record of the weight, or test of milk or cream on any statement, record or invoice. (ORS 621.286)

SALE OR POSSESSION OF MILK OR CREAM TO WHICH WATER HAS BEEN ADDED. No producer, producer—distributor, distributor, or nonprocessing distributor as defined by ORS 621.055, or licensee as defined by ORS 621.152, or a dairyman who producers and sells milk for manufacturing purposes, his employee or agent shall offer or expose for sale, sell, exchange or deliver to any person, the retail trade or other places or have in his possession or under his control, with the intent to
sell, expose, deliver, purchase for resale or receive for manufacture any milk or cream to which water has been added, as evidenced by official department laboratory test, except as may be permitted by the department in (1) the reconstitution of fluid milk from dried milk solids or (2) the transportation of the product containing added water to a dairy products plant, as defined in ORS 621.152 for recovery of the milk food solids. (ORS 621.088)

ADULTERATED-BACTERIAL INHIBITER STANDARD. The antibiotic test standard shall be deemed to be met providing the sample(s) of milk and milk product when examined and/or tested shows a negative reaction (not inhibiting bacterial growth as determined by he disk assay method or any other test approved by the department. Enforcement authority is under the Oregon Food Act ORS 616.235. (24-617.5)

WHAT FOOD DEEMED ADULTERATED. A food shall be deemed to be adulterated:

(1) (a) If it bears or contains any poisonous or deleterious substance which may render it injurious to health.

(h) If it is milk drawn from cows within 15 days next before and five days after parturition, or from cows fed on unwholesome food. (ORS 616.235)
<table>
<thead>
<tr>
<th>Off-flavor</th>
<th>Possible Causes</th>
<th>Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>OXIDIZED</td>
<td>Exposure to &quot;white metal&quot; worn tinned, or rusty surfaces on milk-handling equipment</td>
<td>Use stainless steel, glass, plastic or rubber on all milk contact surfaces</td>
</tr>
<tr>
<td>cardboardy</td>
<td>Winter or dry lot feeding</td>
<td>Provide green feed</td>
</tr>
<tr>
<td></td>
<td>Exposure to daylight or artificial light</td>
<td>Protect from artificial light/daylight</td>
</tr>
<tr>
<td></td>
<td>Copper or iron in water supply</td>
<td>Water treatment may be necessary</td>
</tr>
<tr>
<td>RANCID</td>
<td>Late lactation (over 10 months) or low producing cows</td>
<td>Discard milk from low producing or late lactation cows</td>
</tr>
<tr>
<td>bitter soapy</td>
<td>Excessive agitation or foaming of raw milk</td>
<td>Keep fittings tight and air admission to a minimum</td>
</tr>
<tr>
<td></td>
<td>High blend temperatures</td>
<td>Cool milk to at least 40° F and hold</td>
</tr>
<tr>
<td>FEED CR WEED</td>
<td>Eating or inhaling odors of, strong feeds (grass or corn silage, green forage, wild anion, or other weeds) prior to milking</td>
<td>Feed after milking, ventilate barn, withhold objectionable feed or remove cows from pasture 2 to 4 hrs. prior to milking, store silage carts out of barn</td>
</tr>
<tr>
<td>unnaturally sweet</td>
<td>Sudden feed changes</td>
<td></td>
</tr>
<tr>
<td>aromatic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEED CR WEED</td>
<td>Eating or inhaling odors of, strong feeds (grass or corn silage, green forage, wild anion, or other weeds) prior to milking</td>
<td>Feed after milking, ventilate barn, withhold objectionable feed or remove cows from pasture 2 to 4 hrs. prior to milking, store silage carts out of barn</td>
</tr>
<tr>
<td>unnaturally sweet</td>
<td>Sudden feed changes</td>
<td></td>
</tr>
<tr>
<td>aromatic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UNCLEAN</td>
<td>Damp, poorly ventilated barns</td>
<td>Keep barns clean and well ventilated</td>
</tr>
<tr>
<td>barny cowy</td>
<td>Dirty cows or barn</td>
<td>Clean cows</td>
</tr>
<tr>
<td></td>
<td>Dirty milk-handling equipment</td>
<td>Clean/sanitize all milk-handling equipment</td>
</tr>
<tr>
<td></td>
<td>Improper preparation and milling</td>
<td>Wash and dry cow's older prior to milking; handle milker to avoid sucking up bedding</td>
</tr>
<tr>
<td></td>
<td>Cows with Ketosis (Acetonemia)</td>
<td>Withhold milk, treat cows</td>
</tr>
<tr>
<td>MALTY OR HIGH ACID</td>
<td>Dirty milk-handling equipment</td>
<td>Clean milk-handling equipment after each use, Sanitize milk-kindling equipment prior to use</td>
</tr>
<tr>
<td>grapenut-like</td>
<td>Slow or insufficient cooling</td>
<td>Promptly cool milk to 40° F and hold</td>
</tr>
<tr>
<td>sour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OTHER OFF-FLAVORS</td>
<td>Medication, insecticides</td>
<td>Use according to directions Use odorless medication</td>
</tr>
<tr>
<td>medicinal</td>
<td>Certain disinfecting or sanitizing agents</td>
<td>Avoid strong smelling disinfectants, use sanitizers properly</td>
</tr>
<tr>
<td>disinfectant</td>
<td>Mastitis, late lactation cows</td>
<td>Discard milk</td>
</tr>
<tr>
<td>salty</td>
<td>Low total solids</td>
<td>Evaluate feeding program</td>
</tr>
<tr>
<td>flat</td>
<td></td>
<td>Thoroughly drain equipment before use</td>
</tr>
<tr>
<td>NO.</td>
<td>FEED</td>
<td>AMOUNT OF FEED (LBS)</td>
</tr>
<tr>
<td>-----</td>
<td>----------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>1</td>
<td>Alfalfa hay</td>
<td>2-6</td>
</tr>
<tr>
<td>2</td>
<td>Alfalfa hay</td>
<td>2-6</td>
</tr>
<tr>
<td>3</td>
<td>Alfalfa hay</td>
<td>2-6</td>
</tr>
<tr>
<td>4</td>
<td>Alfalfa silage</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Alfalfa silage</td>
<td>15-25</td>
</tr>
<tr>
<td>6</td>
<td>Clover hay</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>Clover hay</td>
<td>15-20</td>
</tr>
<tr>
<td>8</td>
<td>Clover silage</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>Clover silage</td>
<td>15-20</td>
</tr>
<tr>
<td>10</td>
<td>Green corn</td>
<td>25</td>
</tr>
<tr>
<td>11</td>
<td>Green corn</td>
<td>25</td>
</tr>
<tr>
<td>12</td>
<td>Dry beet pulp</td>
<td>7</td>
</tr>
<tr>
<td>13</td>
<td>Oat hay</td>
<td>12</td>
</tr>
</tbody>
</table>

Accepted from data of R.R. Hedrick, Montana State College, Bozeman, Montana

bm1130-R380
VAT PASTEURIZATION

PURPOSE: To understand the basic principles, and public health reasons for the requirements of proper design and operation of a batch type or vat pasteurizer.

OBJECTIVES:
- To understand and be able to list and explain the compliance and construction requirements of a vat pasteurizer.
- To list the correct operational methods of a vat pasteurizer.
- To be able to describe and perform all required regulatory tests for a vat pasteurizer.
- Know and be able to list the CRITICAL CONTROL POINTS of a vat pasteurizer.

GENERAL DISCUSSION

The heating of milk in a vessel has long been one of the most effective methods of rendering a relatively organism free and hopefully pathogen free milk product.

The product is heated in a jacketed stainless steel vat which has been fitted with water and steam to the jacket liner, thermometers to monitor and record product temperatures, and some means of agitation to assure uniformity in temperature distribution. Other requirements include properly designed valves, time/temperature requirements, and methods of operation, which will be discussed in this chapter.

Generally, we can say that all vat or batch type pasteurizers should conform to "The 3-A Sanitary Standards for Non-Coil Type Batch Pasteurizers For Milk and Milk Products", Number 24-01. This standard provides guidelines for the installation, approved materials, finish, and fabrication of vat pasteurizers. Also all vat pasteurizers must comply with Item 16p(A) of the PMO, including all operational and construction requirements.
VAT PASTEURIZATION

VAT PASTEURIZATION-CRITICAL CONTROL POINTS

✔ TIME AND TEMPERATURE REQUIREMENTS MET

✔ NO TEMPERATURE ABUSE

✔ COVERS IN PLACE DURING OPERATION

✔ VAT CONSTRUCTION WITHIN COMPLIANCE

✔ AGITATION DURING OPERATION

✔ NO INGREDIENTS ADDED AFTER PASTEURIZATION

✔ PRODUCT PROTECTED AFTER PASTEURIZATION
Figure 1
Schematic of a Vat Pasteurizer
**VAT PASTEURIZATION**

**BATCH PASTEURIZER CONSTRUCTION STANDARDS**

1) **Valves** - Outlet valves must comply with the close coupling standards established by the 3-A Standards.

   a) The valves must be constructed of **solid stainless steel** to permit adequate heat transfer to the inner portions of the valve and so designed as to prevent the accumulation of unpasteurized milk in the milk passages of the valve when the valve is in a closed position.

   b) All outlet valves must be of the **leak protector type**, which are designed to prevent leakage of raw milk past the valve body. The leak detector groove must be at least 3/16 inch in width and 3/32 minimum depth at the center to prevent clogging. (Note - presently there are no air-operated valves acceptable for use as vat pasteurizer outlet valves). There are a limited number of cone bottom tank approved valves of the leak protector type. These valves are designed with spiral shaped. grooves designed which expel! any leakages past the valve seat to the floor.

   c) All vat pasteurizer outlet valves must be fitted with **stops** which provide the operator with a physical indication of complete valve closure during the **entire filling, heating, and pasteurization holding period operation**.

   d) Outlet valves must be of the **close-coupled** design; that is, designed so as to prevent the accumulation of unpasteurized milk in the milk passage of the valve when in the closed position.

   e) All vats used for pasteurization must be fitted with adequate means of **continuous mechanical agitation**.
f. The requirements outlined in Ma-76 prohibits the practice of leaving the raw milk fill line to remain in place in the vat pasteurizer during the holding time phase since this interpretation memoranda requires the complete separation between raw and pasteurized milk product at all times.

g. Outlet valves which are mounted vertically, as on cone bottom vats, must have a leak detector groove arrangement which will allow free drainage of any product past the plug while in the closed position. Grooves must be curved or placed at such an angle to accomplish proper draining. Diagrams of these valves may be found in the 3-A Standard 08-17, Part 2, drawings 100-28 and 100-29.

IMPORTANCE OF PROPER STOPS ON PLUG VALVES

Figure 2
Figure 3
Close Coupled Outlet Valves
2. Covers

   a. All openings must be provided with **covers constructed to prevent the entrance of surface contamination or foreign material**. The main cover or lid shall be designed to remain in the open position (to facilitate processing and/or cleaning), and shall be sufficiently rigid and self draining. The main lid shall be designed so that raising will not allow any liquid or other contamination to enter the pasteurizer.

   b. Openings in the tank or vat cover must be equipped with raised edges to prevent surface drainage into the milk.

   c. The vat cover and any opening into the tank interior must have overlapping or "shoe box" type edges. The covers must be relatively close fitting and overlap the opening.

   d. All pipe, thermometer, agitator shafts, or other appurtenances that extend down into the vat must do so only through condensation diverting aprons unless a water tight joint is used.

3. Agitators

   a. All vats used for pasteurization must be equipped with a **mechanical means** of assuring that each and every particle of milk is heated. This is accomplished by **mechanical/electrical motor driven agitators**. The most efficient agitators will be designed to push the product down and sweep the product across the heat exchange surface on the sides and bottom of the vat. Agitators shall be designed to result in uniform product and temperature throughout the vat. Product temperatures variances must not exceed 1°F between any two points within the vat at any time during the holding period.

   b. Agitators must meet construction criteria for **milk contact surfaces** and be designed to be easily cleanable and/or removable for manual cleaning.
c. Agitator shafts must be fitted with effective drip deflection shields to prevent contamination of the milk.

d. Agitator shaft openings shall have a minimum diameter of one inch to allow for removal and cleaning of the agitator shaft.

e. The annular space around the agitator shaft shall be fitted with an umbrella or drip shield of sanitary design to protect against the entrance of contaminants.

4. Indicating and Recording Thermometers

a. Indicating thermometers shall be of the mercury actuated, direct-reading type, scaled to a minimum of 0.625 of an inch, with a span of not less than 25 degrees F which includes the pasteurization temperature (plus or minus 5° F) and graduated in 1° F, and accurate to within 0.5° F. Provided that electronic RTD direct reading type thermometers that meet the requirements and are acceptable to FDA may be used as indicating thermometers on batch type pasteurizers.

b. The sensing bulb of the indicating thermometer (official thermometer) must be designed to extend fully into the product during pasteurization.

c. Each vat pasteurizer must be provided with an approved air space thermometer. The air space thermometer must meet the same general requirements of the indicating thermometer with exception of the bulb length, degree increments, and accuracy requirements.
e. On those vats used solely for pasteurizing at temperatures greater than 160° F, the recording chart may be graduated in 1° C (2° F). The 1° C (2° F) increments shall be in the 150° to 170° F range. On these type vats, the chart may be graduated in 15 minutes for a maximum of 24 hours.

The recorder device may be either electric or spring driven.

**Required recorder chart information** (for each product batch):

1. Name of milk plant.
2. Date.
3. Signature or initials of the operator.
4. Identification of the recorder when more than one vat is used.
5. Record of holding time including empty and fill times as required.
6. Reading of air space thermometer at the beginning of the holding time.
7. Reading of indicating thermometer at an indicated point during holding time.
8. Amount and name of product represented by each batch.
9. Record of any unusual occurrences.

Charts shall be retained for 3 months.
5. Air space heaters may be necessary to maintain minimum air space temperatures. These devices must be of sanitary design, meet all 3-A Sanitary requirements, including installation and culinary steam requirements. The air space heater must be easily demountable for cleaning (See Appendix H of the PMO, for culinary steam requirements or Figure 5 below.)

Figure 5
Air Space Heating
BATCH PASTEURIZER OPERATING STANDARDS

1. All product components must be added to the batch prior to beginning the pasteurization process. This includes any liquid sugar and sweeteners, water, milk powders and all other dairy products, flavorings, stabilizers, cocoa products, emulsifiers, and vitamins.

There are certain flavoring ingredients that may be added after pasteurization. These include flavoring ingredients having an $a_t$ of 0.85 or less, high acid content, dry sugars, fruits and roasted nuts, safe and suitable bacterial culture organisms, and flavorings containing a high alcohol content. Fruits and vegetables may be added to cultured products having a pH of 4.7 or less.

Such ingredients addition shall be done in a sanitary manner and the ingredients must be of a safe and wholesome quality.

2. Pasteurization must be performed in equipment which is properly designed and operated, and which insures that every particle of product will be held continuously for the minimum time and temperature. Vats should be designed so that product can be heated to pasteurization temperatures in as short a time as practicable. In no case should this time exceed 4 hours. Following pasteurization the product must be cooled to $<45^\circ F$ as soon as possible. The only exception for this cooling requirement is for cultured products processing.

3. If for any reason the vat lid or any cover is lifted or mechanical failure of any kind (agitator malfunction, loss of temperature below the required minimum, etc) occurs after beginning of the pasteurization cycle, the timing process must be restarted and notes to that effect must be made on the recording chart by the operator.
4. The official thermometer is the indicating thermometer and the recording thermometer functions to only provide a record of the pasteurization cycle. For each product batch the operator is required to verify the accuracy of the recording thermometer using the indicating thermometer as the standard. This comparison is noted on the recording thermometer chart. **No batch of milk shall be pasteurized unless the sensors of both thermometers are covered.**

5. The air space thermometer reading must also be recorded on the recording chart during pasteurization. To assure that the minimum air space temperatures are being maintained, the air space indicating thermometer shall be read and recorded at the **beginning** of the holding period. It is also strongly recommended that the air space temperatures be noted and recorded **during and at the end of the holding period**. During pasteurization, the air space temperature must never be less than 5°F above the minimum legal pasteurization temperature required for the milk product contained in the vat.

6. Recording charts must be used only for the length of time for which it has been designed. **Overlapping of information on circular charts is never acceptable and is a violation of the PMO.** Required information on the recording chart must be legible and meet all the requirements as spelled out in the PMO.

7. The outlet valve is designed to **detect and expel any leakage past the valve seat and is close coupled to prevent cold pockets of milk from accumulating in the valve or piping.**

8. **At no time during the pasteurization cycle or following pasteurization may the outlet piping be directly attached to any line or vessel containing raw milk or any other contaminating substance.**
ASSURANCE OF HOLDING PERIODS

1. Vats must be operated so that every particle of milk is held for at least 30 minutes at or above the minimum required temperature for the specific product processed.

2. When the milk product is heated to pasteurization temperature in the vat and is partially cooled in the vat before opening the outlet valve, the recorder chart must show at least 30 minutes at or above the minimum pasteurization temperature.

3. When the milk product is preheated to pasteurization temperature prior to entering the vat, the recorder chart must show a holding time of 30 minutes plus the filling time of the vat from the level of the recorder bulb sensor to the maximum level of normal operation (pasteurization).

4. When cooling is begun after the outlet valve is opened or is done entirely outside the vat, the chart must show a holding time of 30 minutes plus the time necessary to empty the vat to the level of the recording thermometer bulb.

5. These filling and/or emptying times must be indicated on the chart by the operator by inscribing the start and end of the official 30 minute holding time.

6. Upon close inspection, vat pasteurization recording charts used that have been used must show clearly the four identifying holes (marks), which verify the chart, has not been rotated or manually turned to give a false time line accuracy.
Figure 6
Filling and Emptying Time
CHAPTER REVIEW

1. The requirements for vat pasteurization may be found in Section _____, Item _____ on pages of the current edition of the ___________________.

2. Another good reference for vat pasteurizers may be found in: ________________ ___________________________________________.

3. Currently vat pasteurizers found in many modern processing plants are used for products such as ________________________________ ________________________________ ________________________________ ________________________________.

4. Batch Pasteurization Time Temperature Standards:

<table>
<thead>
<tr>
<th>Product</th>
<th>Temperature</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole Milk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skim Milk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Half and Half</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eggnog</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frozen Dessert Mix</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. The PMO requires that if the fat content of the milk product is ______ percent or more, or if it contains added sweeteners or solids, the specified minimum temperature shall be increased by _____ degrees F.

6. The FDA Dairy, Inc, vat pasteurizes their cheese milk at 173° F. The operator Mr I.M. Messed Up must always check to make sure that the air space temperature reads at least ______° F during the entire holding time.

7. What is the purpose of VALVE close coupling?
8. You are the night manager of a large milk processing plant. The vat pasteurizer operator notifies of the following:

**CONDITION**

(a) He forgot to add dry sugar to the mix prior to pasteurization, however did add the sugar at only five minutes into the beginning of the 30 minute time and then added 25 minutes to the time after adding the sugar. The mix was packaged last night and is ready for shipment.

(b) The air space thermometer was damaged and the mercury slightly separated, however since the milk was pasteurized at 170 degrees he had decided to package the product and was delivered this morning to the store.

(c) The boiler lost steam pressure during pasteurization, but since the temperature never got below 145, the cream was packaged and in the plant cooler anyway.

(d) Pasteurized skim was put in a processing vat, super heated, culture was added, and then pumped to the vats for cottage cheese processing.

(e) The operator discovered that they had used the last vat recorder chart the previous day. HTST charts were used on the vat recorder, since the charts included the normal pasteurization temperature range used by the plant of 160 degrees F.

9. Are any regulatory seals required on a vat pasteurizer?  Y ____ N ______.

9. Provide the following vat pasteurizer thermometer criteria:

<table>
<thead>
<tr>
<th>Span</th>
<th>° F Grads</th>
<th>Accuracy</th>
<th>Chart Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicating</td>
<td>_____ ° F</td>
<td>_____ ° F</td>
<td>_____ ° F</td>
</tr>
<tr>
<td>Recording</td>
<td>_____ ° F</td>
<td>_____ ° F</td>
<td>_____ ° F</td>
</tr>
<tr>
<td>Air Space</td>
<td>_____ ° F</td>
<td>_____ ° F</td>
<td>_____ ° F</td>
</tr>
</tbody>
</table>

For pasteurizers suing temperatures greater than 160 ° F – see PMO, pages 217 –220.

<table>
<thead>
<tr>
<th>Span</th>
<th>° F Grads</th>
<th>Accuracy</th>
<th>Chart Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicating</td>
<td>_____ ° F</td>
<td>_____ ° F</td>
<td>_____ ° F</td>
</tr>
<tr>
<td>Recording</td>
<td>_____ ° F</td>
<td>_____ ° F</td>
<td>_____ ° F</td>
</tr>
<tr>
<td>Air Space</td>
<td>_____ ° F</td>
<td>_____ ° F</td>
<td>_____ ° F</td>
</tr>
</tbody>
</table>

*Except that strip charts may show a continuous recording over a _______ hour period.
10. List the four significant requirements for a vat pasteurizer outlet valve.

   a)
   b)
   c)
   d)

11. Explain the reasoning for the requirement that when pre-heated product is brought into a vat for pasteurizing, the filling time must be adjusted. How is this added time measured?

   Notes:
Rotational Grazing

By Alice E. Beetz and Lee Rinehart
NCAT Agriculture Specialists
November 2004
Updated Sept. 2010
© 2010 NCAT

Contents
Introduction ......................1
Choosing a Grazing System ............. 2
Making the Change ........ 3
Fencing and Water Systems .......... 4
Forage Growth .................. 5
Managing Forage Growth .......... 5
Seasonal Adjustments .......... 6
Effects on the Animals ........ 7
Grazing Planning and Economics ...... 7
Information Resources .......... 7
Conclusion .................. 8
References .................. 9
Resources .................. 9

Introduction

Ruminants such as cattle, sheep, and goats can convert plant fiber—indigestible to humans—into meat, milk, wool, and other valuable products. Pasture-based livestock systems appeal to farmers seeking lower feed and labor costs and to consumers who want alternatives to grain-fed meat and dairy products. The choice of a grazing system is key to an economically viable pasture-based operation.

Adding livestock broadens a farm’s economic base, providing additional marketable products and offering alternative ways to market grains and forage produced on the farm. In addition, soil losses associated with highly erodible land used for row crops decline when such land is converted to pasture. Besides these benefits, rotating row crops into a year or two of pasture increases organic matter, improves soil structure, and interrupts the life cycles of plant and livestock pests. Livestock wastes also replace some purchased fertilizers.

Because ruminants co-evolved with grassland ecosystems, they can meet their nutritional needs on pasture. A profitable livestock operation can be built around animals harvesting their own feed. Such a system avoids harvesting feed...
mechanically, storing it, and transporting it to the animals. Instead, the livestock are moved to the forage during its peak production periods. Producers manage the pasture as an important crop in itself, and the animals provide a way to market it.

Reduced feed and equipment costs and improved animal health result from choosing species well-suited to existing pasture and environmental conditions. In most operations, a good fit between animals and available pasture provides more net income. ATTRA’s publication *Ruminant Nutrition for Graziers* goes into more depth on this subject.

Some animals will produce acceptable meat with little or no grain finishing. Marketing these lean meats directly to consumers is an opportunity to increase profits. Skilled managers who can consistently offer high-quality forage to their animals, producing lean and tender meat, should consider pursuing this market.

### Choosing a Grazing System

Continuous grazing, the most common grazing system in the United States, often results in overgrazing and an increase of less-desirable plant species. When livestock graze without restriction, they eat the most palatable forage first. If these plants are repeatedly grazed without allowing time for their roots to recover and leaves to regrow, they will die. Plants not eaten by livestock mature and go to seed. Thus, populations of undesirable plants increase, while preferred plants are eliminated, reducing the quality of the forage in a given pasture. Trampling and animals’ avoidance of their own wastes further reduce the amount of usable forage.

Continuous grazing has the benefit of low capital investment, since fewer fencing and watering facilities are required than with rotational grazing systems. Because livestock are moved less frequently from pasture to pasture, management decisions can be simpler. Some research demonstrates that rotational grazing and continuous grazing have similar effectiveness on rangelands (Briske, et al., 2008). However, many range managers utilizing rotational grazing systems on rangeland have reported increased range health and animal performance (Sayre, 2001). Continuous grazing frequently results in higher per-animal gains than other grazing systems, as long as adequate forage is available to maintain high growth rates. But if overgrazing occurs, desirable plant growth rates will dwindle.

Rotational (or controlled) grazing, on the other hand, increases pounds of animal production per acre. How the system is managed influences the level of production, of course. In fact, Management-intensive Grazing (MiG) is another term for rotational grazing. This term emphasizes the intensity of the management rather than the intensity of the grazing.

MiG is grazing and then resting several pastures in sequence. The rest periods allow plants to recover before they are grazed again. Doubling the forage use is often possible by changing from continuous to controlled grazing. There is considerable profit potential for the producer willing to commit to an initial capital investment and increased management time (Kole, 1992). The producer can meet individual animal gain or gain-per-acre goals with sound management decisions.

Faced with low milk prices, the potential loss of price supports, and ever-rising costs, some dairy producers have changed to MiG to meet economic and quality-of-life goals. Some are providing cows fresh paddocks after each milking. Seasonal dairying—drying off the entire herd during times when pasture production is low—is often the next step, but it requires even more skillful management and may not be as profitable. For more information, see the ATTRA Publications.
As much as possible. A single strand of electric tape and temporary posts for interior paddocks instead of permanent interior fencing is a good way to reduce infrastructure costs.

**Making the Change**

When making a change in grazing management, a logical first step is an inventory of the farm’s resources. An aerial map of the farm is useful to mark fences, water supplies, and existing forage resources. Writing down farm and family goals in this process makes it easier to stay on course with management decisions. When a salesperson is applying pressure, for instance, it helps to be able to evaluate the cost of the product against some chosen goal.

Implementing rotational grazing requires subdividing the land into paddocks, providing access to water, adjusting stocking rates, and monitoring grazing duration. These decisions may seem overwhelming at first. Some of the reference materials listed at the end of this paper offer information about setting up paddocks to fit the landscape, calculating stocking rates, and estimating forage yield and availability. For more information, see ATTRA’s *Introduction to Paddock Design, Fencing, and Water Systems for Controlled Grazing*.

The change to controlled grazing will have impacts on the animals, the plant community, and the farmers. Livestock operators who have not monitored their livestock daily or weekly will feel the greater time demands. On the other

---

**What do you expect to get from a rotational grazing enterprise?**

- Identify problems to overcome and opportunities you can take advantage of
- List your on-farm assets
  - land
  - livestock
  - forages
  - water
  - lanes
- buildings
- machinery
- sensitive areas (such as riparian areas)
- wildlife
- Match your grazing goals to your resources to determine the feasibility of a rotational grazing enterprise.

---

publications *Dairy Production on Pasture: An Introduction to Grass-Based and Seasonal Dairying* and *The Economics of Grass-Based Dairying*.

MiG can be used in many other operations as well. Cow-calf and stocker operations benefit from increased forage and higher-quality feed under MiG. Some graziers specialize in dairy beef or in raising replacement heifers for dairy operations. When MiG is used with sheep and goats, fencing must be excellent in order to keep the livestock in and the predators out. (Guard animals can enhance predator protection. More in-depth information about guard animals is available from ATTRA.)

Economically successful rotational grazing requires careful analysis including whole-farm planning. Livestock require large capital expenditures relative to their value, and being profitable with MiG on a small scale is not guaranteed. This is because small operations often don’t have the scale necessary to justify the infrastructural improvements needed for intensive rotational grazing (Pratt, 2010). This necessitates minimizing the cost of improvements...
hand, the need for harvested forages declines, resulting in less time spent making hay or silage. Purchased feed costs also shrink.

Economic benefits come from improved animal health and increased production. Research confirms lower feed costs and fewer vet bills on most operations making this transition.

Actual figures vary widely, depending on the profitability and forage condition under the old system. As the new system is fine-tuned, feed quality improves, quantity increases, and management skills also grow. As a result, more animals can be raised on the same acreage, translating into more income for the farm.

It takes commitment to succeed in making the change to MiG, a system requiring more complex management skills. Old ways of thinking will need to shift as analytical and problem-solving skills develop. The new grazer’s commitment will be tested by mistakes, unexpected weather patterns, and neighbors’ attitudes.

**Fencing and Water Systems**

Rotational grazing requires additional fencing. High-tensile electric fencing is cheaper and easier to install than conventional fencing. Temporary as well as permanent electric fencing is available, and many producers use a combination of the two. This equipment offers flexibility in managing animal and plant resources.

Animals need to be trained in electric fences. Producers sometimes use a special paddock for introducing new stock into the system (fencing suppliers can furnish information). Once animals learn to respect the electrified wire, it becomes a psychological rather than a physical barrier.

Providing water is another capital requirement of rotational grazing systems. Experienced producers soon see the value of adequate water, and some regret that they did not invest more in the water system initially. Designing a water system for future expansion may be the best option for beginners with limited funds.

Many producers use pipes and portable waterers to create movable water systems and design permanent systems based on this experience. Flexibility in locating water within paddocks should be part of any final design, so the manager can control animal distribution and avoid trampling around the water source.

Some paddocks have alleyways that give animals access to one water source from several side-by-side paddocks. However, the area around a permanent water source will suffer from heavy traffic. This heavy-use area tends to accumulate nutrients and is a potential source of parasites, disease, and erosion. (Many producers see the same problems in any location where animals congregate, e.g., shade trees and mineral sources.)
Forage Growth

How much pasture area to offer animals and how long to keep them there are critical decisions for a successful grazier. These decisions influence the amount and quality of forage available throughout the grazing season. Figure 1 shows the natural progression of forage growth through three stages. Phase one is the first growth in the spring or the time required for regrowth after extreme defoliation. Photosynthesis is low because of the small leaf area available to capture solar energy.

During phase two, plants grow rapidly because leaf area is increasing. Toward the end of this growth phase, forage growth is near its peak, and it is of high quality. This lush and abundant forage is ideal for grazing.

The transition from phase two to phase three marks the beginning of reproduction and slower plant growth. Lower leaves begin to die as they are shaded out by those above. Plant resources are used for reproduction rather than more growth, and forage quality declines.

Managing Forage Growth

The grazier manages this forage growth-curve to keep pastures producing a maximum amount of high-quality forage. Decisions about moving animals from paddock to paddock are based on the amount of forage available, size of paddocks, and estimated seasonal growth rates. The number and nutritional needs of the livestock must also be figured into this balance.

After each grazing period, if adequate leaf area is left for photosynthesis, plants quickly replace leaves lost without depleting root reserves. The animals are moved to fresh, succulent pasture before plants are overgrazed. Thus, the plants and animals both benefit from good grazing management.

Many desirable plants, including legumes and native grasses, disappear from pastures that are

Heavy livestock traffic around ponds, springs, or streams can destroy vegetation. Piping water away from these sources or limiting animals’ access results in higher-quality water for them, and it benefits wildlife habitat. Some producers report economic benefits from providing cool, high-quality water, though little research exists.

Mineral blocks are typically placed near the water supply, but excessive use of the area can lead to the problems mentioned above. Placing the minerals away from water or other gathering areas helps redistribute the animals’ impact and avoids overuse of any one area. Dispensing soluble minerals in the water is another alternative. For more information on fencing and water, see ATTRA’s Paddock Design, Fencing, and Water Systems for Controlled Grazing.

Forage Growth

Heavy livestock traffic around ponds, springs, or streams can destroy vegetation. Piping water away from these sources or limiting animals’ access results in higher-quality water for them, and it benefits wildlife habitat. Some producers report economic benefits from providing cool, high-quality water, though little research exists.

Mineral blocks are typically placed near the water supply, but excessive use of the area can lead to the problems mentioned above. Placing the minerals away from water or other gathering areas helps redistribute the animals’ impact and avoids overuse of any one area. Dispensing soluble minerals in the water is another alternative. For more information on fencing and water, see ATTRA’s Paddock Design, Fencing, and Water Systems for Controlled Grazing.

is low because of the small leaf area available to capture solar energy.

During phase two, plants grow rapidly because leaf area is increasing. Toward the end of this growth phase, forage growth is near its peak, and it is of high quality. This lush and abundant forage is ideal for grazing.

The transition from phase two to phase three marks the beginning of reproduction and slower plant growth. Lower leaves begin to die as they are shaded out by those above. Plant resources are used for reproduction rather than more growth, and forage quality declines.

Managing Forage Growth

The grazier manages this forage growth-curve to keep pastures producing a maximum amount of high-quality forage. Decisions about moving animals from paddock to paddock are based on the amount of forage available, size of paddocks, and estimated seasonal growth rates. The number and nutritional needs of the livestock must also be figured into this balance.

After each grazing period, if adequate leaf area is left for photosynthesis, plants quickly replace leaves lost without depleting root reserves. The animals are moved to fresh, succulent pasture before plants are overgrazed. Thus, the plants and animals both benefit from good grazing management.

Many desirable plants, including legumes and native grasses, disappear from pastures that are
Other than salt, the need for mineral supplements is likewise difficult to determine. If soil tests show that micronutrients are missing, they can be added to the mineral mix. However, some may be present in the soil but unavailable to the plants. Adjusting pH often remedies this. While some consultants argue that missing micronutrients should be applied to the soil so they can be eaten as plant material, mineral supplements are often the most economical solution. Minerals not removed by grazing will cycle with other nutrients in the pasture as the years go by.

**Seasonal Adjustments**

Rotational grazing gives the livestock manager flexibility in responding to the changing forage supply. During periods of rapid plant growth, cattle are moved quickly through paddocks. Alternatively, if equipment is available or the work can be hired, excess forage can be harvested for feeding later. During periods of slow plant growth, delayed rotation allows plants in each paddock a longer time to recover after each grazing period.

Various strategies or specialized forages can delay having to feed harvested forages. In late fall, stockpiled fescue or other winter grasses can be strip-grazed. Grain and stalks left in corn or milo fields after harvest, offered as strips, provide another source of good-quality feed into the winter months. Small grains, grown alone or with brassicas, are a third option in some parts of the country for extending the grazing season.

In some regions, providing excellent grazing through the hottest summer months is the biggest challenge. Native grasses, summer annuals, and interseeded legumes can offset this slump. However, the costs of establishment—in time and money—are justified only if the resulting increase in livestock production translates into sufficient profit. A good resource for learning more about extending the grazing season with alternative forage systems is the *Extending Grazing and Reducing Stored Feed Needs*, by Don Ball, Ed Ballard, Mark Kennedy, Garry Lacefield, and Dan Undersander, available online at [www.agry.purdue.edu/Ext/forages/pdf/ExtendingGrazing-Auburn.pdf](http://www.agry.purdue.edu/Ext/forages/pdf/ExtendingGrazing-Auburn.pdf). The ATTRA publications, *Pastures: Sustainable Management* and *Pasture, Rangeland, and Grazing Management*, provide further information on this subject.
Effects on the Animals

Multiple paddocks make access and handling easier. Cattle become easier to work when they see people as the source of fresh pasture. Managers who observe their animals frequently can identify and treat health problems in their early stages.

If just beginning an animal operation, the producer should choose a breed adapted to the climate and grazing system or pick individual animals with good performance records on pasture. Some types of animals, even within a breed, can better use high-quality forage, and others are better adapted to low-quality range-lands. Some tolerate legumes without bloating.

There is as much variation among individuals within the breeds as between breeds. To some extent, animals learn grazing skills (Forbes, 1995). Therefore, animals that have been raised on pasture—especially those from a controlled grazing system—are desirable. In an established herd, culling animals that don’t adapt is essential to achieving a profitable grass-based livestock system.

Grazing Planning and Economics

A grazing plan helps producers visualize and anticipate the various changes that occur during the grazing season. Some of the factors to track in a grazing plan include grazing land inventory, such as number of acres, number of paddocks, and forage yield. Forage yield can be expressed in pounds per acre per inch. For most pastures, you can expect a yield in the range of 150 to 350 pounds per acre per inch, depending on forage density. Your local NRCS office will likely have data on forage yields for your area.

Knowing the forage requirements of grazing livestock is necessary for successful grazing planning. This is basically the number of animals you are grazing times their average weight times their daily utilization rate. Daily utilization rate is the animal’s forage dry matter intake expressed as a percent of the animal’s body weight. Beef cattle consume 2 to 3 percent of their body weight per day, whereas dairy cattle consume 2.5 to 4.5 percent of their body weight per day.

Rest periods for various grasses and legumes are important for grazing planning. Rest periods for cool season grasses and legumes is approximately 15 to 30 days, depending on the season. For warm season grasses, the rest period is 20 to 40 days, again depending on the season. Rest periods are important for calculating the size and number of paddocks.

These factors, as well as other planning factors such as paddock layout, size, and numbers, and how many animals a paddock will support, are addressed in the Minnesota Extension publication Grazing Systems Planning Guide, and is available online at www.extension.umn.edu/distribution/livestocksystems/DI7606.html or by calling 800-876-8636. In addition, the NRCS Grazing Lands team has many online tools and publications to assist producers in documenting a grazing plan. The NRCS Grazing Lands website is www.glti.nrcs.usda.gov.

As with any agricultural enterprise, an analysis of the economics of the operation is crucial in the planning process. A budget for a grazing operation should take into account the capital improvements as well as the yearly inputs to operate the enterprise. The ATTRA publication Grazing Contracts for Livestock includes budget spreadsheets that are useful for budgeting costs associated with a grazing operation.

Information Resources

A host of published and electronic information about rotational grazing is available to producers.

The Stockman Grass Farmer (SGF) is an excellent monthly publication for news about alternative forages and innovative management strategies, as well as for discussions among practitioners of management-intensive grazing. In addition, the commercial and classified ads offer many services, including grazing workshops and supplies that may be difficult to obtain locally. Suppliers and their salespeople often serve as consultants, having practical experience of many grazing operations. A free sample issue of SGF is available to those who call or write to request it.

Graze is another outstanding monthly publication that includes articles on all aspects of grazing, pasture management, and marketing. In a regular feature, five or more “grazing advisors” answer a question posed by the editor. These advisors, each an active grazing operation manager, represent a variety of livestock types and geographical locations.
Grazing Lands Conservation Initiative (GLCI) has a website that lists State GLCI Coordinators and Grazing Lands Personnel, available at www.glci.org/StateGLCI.htm. The site includes a map and list of designated GLCI grazing specialists for each state.

There are many agricultural discussion groups on the Internet covering a wide range of topics. Internet discussion groups operate via e-mail. Listserves receive and distribute postings. When you subscribe, your name gets added to the mailing list. If you wish to post to the discussion group, you only need to send one e-mail, and the listserv will send it to all members. Subscribing to newsgroups is a simple and painless process, and it is free. There are lists associated with most ruminant breeds. A search engine such as Yahoo! can help locate lists on the Web.

**Conclusion**

Management-intensive Grazing is not for every producer. It will not instantly provide wealth and leisure or solve all the problems livestock producers face. Some experienced graziers say it takes three years of observation and manipulation of soil, plant, and animal resources to really begin to manage them well. During these years there will be countless challenges and necessary adjustments. Every attempt to prepare for potential problems will make the transition smoother. An assumption that the system can continually be improved will help the manager to identify weak areas early. Being alert for difficulties ensures that they can be addressed before they become serious.

Nevertheless, those producers who have made the change to MiG report many benefits, including increased net income and improved quality of life. In groups of these innovative graziers, one is struck by the enthusiasm and creativity they bring to the management of their particular pasture systems. They observe the results of their decisions and are constantly fine-tuning their systems to meet their production and family goals.

**Acknowledgment:**

*Special thanks to Dave Pratt, CEO of Ranch Management Consultants, for providing technical review of this publication.*
References


Periodicals with a Grazing Focus

The Forage Leader
American Forage and Grassland Council
350 Poplar Avenue
Elmhurst, IL 60126
800-944-2342
630-359-4274 FAX
www.afgc.org
info@afgc.org
A membership benefit; membership cost $30/yr.

Graze
P.O. Box 48
Belleville, WI 53508
608-455-3311
www.grazeonline.com
graze@grazeonline.com
$30 for 1-year subscription

Hay & Forage Grower
7900 International Drive, Suite 300
Minneapolis, MN 55425
952-851-9329
952-851-4601 FAX
http://hayandforage.com
hfg@penton.com

Resources

Grazing Books

Try searching for these books at online bookstores, libraries, or from the websites listed.


International Plant Nutrition Institute
Suite 110
655 Engineering Drive
Norcross GA 30092
(770) 447-0335
http://ppi-store.stores.yahoo.net/soutfor.html

Rotational Grazing

provides the knowledge and support farmers and ranchers need to improve their land, their lives, and their bottom line.

Tom Trantham’s Twelve Aprils Grazing Program
www.southernsare.uga.edu/twelve/trantham.html

Tom Trantham’s Twelve Aprils grazing program has been part of three Southern Region SARE projects. Tom has influenced scores of experienced and beginning dairy farmers through presentations at conferences and magazine stories. This on-line manual addresses the most common questions about his system.


Grazing Systems Planning Guide
www.extension.umn.edu/distribution/livestocksystems/DI7606.html

A step-by-step guide to planning a grazing system, including inventory of resources, goal setting, designing fencing and water systems, forage requirements, and grazing system monitoring.


Rangelands West
http://rangelandswest.org

Provides access to many sources of information on rangeland management, including the Extension sites of the western land-grant universities.

American Forage and Grassland Council
www.afgc.org

Offers membership, conferences, and publications.

Web-Based Publications on Fencing and Water Systems from USDA-NRCS


Selected Web Resources on Grazing, Forages, and Pasture Management

Many resources are now available on the Internet. Several excellent resources that are applicable to most regions of the US are listed below. Also, be sure to check the websites of nearby land-grant universities. They often contain information useful to both the beginner and the experienced grazier. Note that these addresses change often.

Ranch Management Consultants, Inc.
953 Linden Ave, Fairfield, CA 94533
707-429-2292
www.ranchmanagement.com/index.html

Provides high-quality education and support programs such as the Ranching For Profit School and Executive Link

The Stockman Grass Farmer
P.O. Box 2300
Ridgeland, MS 39158-9911
800-748-9808 (toll-free)
601-853-8087 FAX
http://stockmangrassfarmer.net
sgf@stockmangrassfarmer.com
$32/yr

Holistic Management In Practice
The Savory Center
1010 Tijeras Ave. NW
Albuquerque, NM 87102
505-842-5252
www.holisticmanagement.org
hmi@holisticmanagement.org
free newsletter

The Stockman Grass Farmer
P.O. Box 2300
Ridgeland, MS 39158-9911
800-748-9808 (toll-free)
601-853-8087 FAX
http://stockmangrassfarmer.net
sgf@stockmangrassfarmer.com
$32/yr

Holistic Management In Practice
The Savory Center
1010 Tijeras Ave. NW
Albuquerque, NM 87102
505-842-5252
www.holisticmanagement.org
hmi@holisticmanagement.org
free newsletter

The Stockman Grass Farmer
P.O. Box 2300
Ridgeland, MS 39158-9911
800-748-9808 (toll-free)
601-853-8087 FAX
http://stockmangrassfarmer.net
sgf@stockmangrassfarmer.com
$32/yr

Holistic Management In Practice
The Savory Center
1010 Tijeras Ave. NW
Albuquerque, NM 87102
505-842-5252
www.holisticmanagement.org
hmi@holisticmanagement.org
free newsletter
Pasture & Hay Resource List

Most of these publications are from Oregon State University and are downloadable off the internet. They can also be purchased from OSU Extension Communications. For an order form call (541) 737-2513 or go on-line to:  http://extension.oregonstate.edu/catalog/

Grass

Forage Information System-OSU
(a useful website to check out)
http://forages.oregonstate.edu/

“Forages: An Introduction to Grassland Agriculture”
(an in-depth text book, can be ordered through a bookstore)
Editorial Authors: Robert Barnes, Darrell Miller, C. Jerry Nelson

Pasture and Hay Management

Fertilizer Guide for Western Oregon Pastures FG 63- OSU
http://extension.oregonstate.edu/catalog/pdf/fg/fg63-e.pdf

Pasture and Hayland Renovation for Western Washington and Oregon EB 1870- WSU, Farming West of the Cascades Series
http://cru.cahe.wsu.edu/CEPublications/eb1870/eb1870.pdf

Pasture Management Guide: Coastal Pastures in Oregon and Washington EM 8645-OSU
http://www.extension.org/mediawiki/files/2/21/Costal_Pastures_in_OR_and WA.pdf

Hay Making on the West Side EB 1987- WSU, Farming West of the Cascades Series
http://cru.cahe.wsu.edu/CEPublications/eb1897/eb1897.pdf

Testing

A List of Analytical Laboratories Serving Oregon EM 8677-OSU
http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/20037/em8677.pdf

How to Take a Soil Sample for Small Acreages EC 628- OSU
http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/18696/ec628 .pdf
Soil Test Interpretation Guide EC 1478-OSU
http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/22023/ec1478.pdf

Testing Hay

Understanding Your Forage Test Results EM 8801-OSU
http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/20216/em8801.pdf

Endophyte Toxins in Grass Seed Fields and Straw EM 8598-OSU
http://extension.oregonstate.edu/catalog/pdf/em/em8598-e.pdf

Poisonous Plants

Poisonous Plants Encountered in Oregon (on-line only)-OSU
http://extension.oregonstate.edu/douglas/sites/default/files/documents/Lf/Scan801.pdf

Natural Toxicants in Feeds, Forages and Poisonous Plants -OSU (In depth textbook available from bookstores) Author: Peter R. Cheeke
http://www.chipsbooks.com/natoxfee.htm

Weeds

2011 Pacific Northwest Weed Management Handbook (preview on-line)- OSU
http://pnwhandbooks.org/weed/

OSU Weed Science Program (good website, has on-line version of PNW Weed Management Handbook)
http://cropandsoil.oregonstate.edu/weeds/

Weeds of the West 9th Edition (Good color photos and descriptions of common weeds) Available through bookstores.

Resource list provide by OSU Extension Service, Small Farms Program
http://smallfarms.oregonstate.edu/
USDA’s Risk Management Agency (RMA)
Farm and Foreign AG Services is continuing its efforts of creating more awareness throughout the agricultural community about managing risks on the farm.

RMA Mission
Provide and support a cost effective means of managing risk for Agriculture producers in order to improve the economic stability of agriculture.

Multi-Peril Crop Insurance (MPCI)
Federally subsidized and insures against many weather-related losses on 130+ crops, nationally. Choose from 50-75 percent (85 percent in some areas) of yield, and 55-100 percent of price. For Catastrophic Risk Protection (CAT), a producer must pay $300 for each eligible crop insurance contract in each county. For coverage at levels in excess of CAT, the administrative fee is $30 per crop per county. Administrative fees for CAT and additional levels can be waived for Limited Resource Farmers.

The following crops are insurable in Oregon State:
Apples, Barley, Blueberry, Canola, Cabbage, ARH Cherry, Corn, Cranberry, Dry Bean, Dry Pea, Forage Production, Forage (Alfalfa) Seed Pilot, Grape, Green Pea, Mint, Mustard, Nursery, Oat, Onion, Pears, Potatoes, Processing Bean, Soybeans, Stonefruit, Sugar Beet, Processing Sweet Corn, and Wheat. Apiculture, Pasture Rangeland Forage, Livestock Gross Margin-Dairy & Swine, Livestock Risk Protection, AGR Pilot & Lite

Causes of Loss
Varies by crop and policy. In general, MPCI covers unavoidable loss of production. Examples are: drought, excess moisture, frost, freeze, other adverse weather conditions, insects, disease, wildlife, etc.

COMBO Products
The Common Crop Insurance Policy Basic Provisions provide both yield and revenue protection policies for barley, malting barley, canola/rapeseed, corn and wheat. Key features include:

- Revenue Protection Plan: provides protection against production loss, price decline or increase or a combination of both.
- Yield Protection Plan: provides protection against production loss for which revenue protection is available but is not elected.

Sales Closing Dates: vary depending on crop.

Adjusted Gross Revenue (AGR) Pilot
Provides an insurance safety net for producers growing insurable and non-insurable crops. AGR: 1) provides insurance coverage for multiple agricultural commodities in one insurance product; 2) uses a producer's historic Schedule F tax information as a base to provide a level of guaranteed revenue for the insurance period; 3) uses commodity production-cash receipts as the method of measurement; 4) reinforces program creditability using IRS tax forms; and 5) provides protection against low revenue due to unavoidable causes. Limited availability in Oregon: Benton, Clackamas, Columbia, Lane, Linn, Malheur, Marion, Multnomah, Polk, Washington and Yamhill counties. Sales Closing: 1/31.

Adjusted Gross Revenue-Lite (AGR-Lite)
Similar to AGR Pilot, the plan provides protection against low revenue due to unavoidable natural disasters and market fluctuations that affect income during the insurance year. Most farm-raised crops, animals, and animal products are eligible for protection. AGR-Lite also establishes revenue as a common denominator for the insurance of all agricultural commodities. The maximum liability of coverage is $1 million. Available in all Oregon

Livestock Risk Protection (LRP)
LRP offers protection against a decline in fed cattle, feeder cattle, swine and lamb prices during the term of the Specific Coverage Endorsement (SCE).

Livestock Gross Margin—Dairy (LGM)
LGM-Dairy offers protection against loss of gross margin (market value of milk minus feed costs) on milk produced from dairy cows.

Non-Insured Crop Disaster Assistance Program (NAP)
Production protection program for growers producing crops for which there is currently no insurance program available. For specific details, contact USDA Farm Service Agency.

Key Dates (dates listed are standard dates without regard to holidays/weekends)
Oregon Sales Closing Dates
Fall Canola/Rapeseed & Fall Onions (Umatilla County Only) - 8/31; barley and mint (w/winter coverage), Forage (Alfalfa) Seed, Forage Production and Wheat - 9/30; Apiculture, Pasture-Rangeland-Forage - 9/30; Apples, Blueberries, Cherries, Cranberries, Grapes, Pears & Stonefruit -11/20; Cabbage and Spring Onions - 2/1; all Other Spring Crops - 3/15. AGR Pilot and AGR-Lite current policy holders - 1/31; AGR-Lite 3/15 new applications.

Nursery, Livestock Gross Margin-Dairy & Livestock Risk Protection – Please contact your crop/livestock insurance agent.

Producers wishing to make changes in their choice of policy options must notify their insurance provider by the sales closing date (including CAT insureds who wish to buy higher levels). Producers not insured during the previous year who desire to be insured for the coming year must sign an application.

Insurance Effective Date At time of planting for annual crops or November 21 for perennial crops, UNLESS acreage is not timely reported. Can vary by crop, type, and variety being grown. Cancellation date ALL policies (including CATASTROPHIC [CAT] level coverage) automatically renew each crop year unless insureds cancel their insurance by the date shown in the crop provisions.

Oregon Reporting of Acreage and Crop Damage
Each crop year the producer is required to submit an acreage report by unit for each insured crop. The acreage report must be signed and submitted by the producer on or before the acreage reporting date contained in the Special Provisions for the county for the insured crop. In the event of crop damage, producers should immediately notify their insurance provider of the damage.

Oregon Production Reporting Dates
Earlier of Acreage Reporting Date or 45 days after cancellation date for annual crops; ARD for all perennial crops. All insureds must have reported or updated their APH to the insurance provider. If reports are not received timely, yields will be assigned which may result in lower approved yields. For certain crops, late reporting may void insurability.

Where to Purchase
All MPCI, including CAT coverage insurance policies, are available from private insurance agents. A list of crop insurance agents is available at all USDA Service Centers or at the RMA website: http://www3.rma.usda.gov/tools/agents/

USDA/Risk Management Agency/Spokane Regional Office - 11707 E Sprague # 201
Spokane Valley, WA 99206
Telephone 509 228-6320 Fax 509 228-6321

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination write to: USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.
Always wash hands and wear clean clothes when milking! Debris can fall into milk from your hat or clothes.

Use a stainless steel bucket and milk strainer with paper filter.

Before milking run a bleach water solution to sanitize clean utensils. One teaspoon of bleach in cold water for 2 minutes, do not rinse. Make sure you also sanitize the glass jar and lid that you are pouring your milk into.

Milk into your stainless steel bucket then pour milk through the filter and refrigerate immediately. The refrigerator need to be 45 degrees or under. 38 degrees is the best.

When finished milking, rinse equipment in lukewarm water, then wash with hot soapy water (if you use dairy soap it dissolves better and leaves less residue). Rinse with hot water then re-sanitize with bleach water, warm or cold. Your milk should taste fresh and clean for one week if you follow these guidelines. If there is off flavor, you need to check yours goats for mastitis or be more careful when milking.

There are bacteria that will survive cold and there are also bacteria that survive heat, so it is important to take as many safety precautions as possible when handling milk. You want your family and friends to be safe! Once you get into a routine it is easy.
JAN’S RESOURCE LIST

Websites:

Fiasco Farm-  www.fiascofarm.com
A good all around website about goats. Includes goat care, health and husbandry, cheese making, and resource books.

Caprine Supply- www.caprinesupply.com/
Goat and dairy supplies and information.

Hoegger Supply Company-  http://hoeggerfarmyard.com
Cheesemaking supplies and equipment.

New England Cheesemaking Supply-  www.cheesemaking.com/
Good source for cheesemaking supplies.

Glengarry Cheesemaking Supply-  glengarrycheesemaking.on.ca/
Good source for larger quantities of cultures, equipment, supplies and consulting.

Publications:

*Dairy Goat Journal* (monthly) http://www.dairygoatjournal.com/
Information, ideas, and insights for everyone who raises, manages, or just loves goats.

*Creamline*
A magazine about cheese

*Cheesemaking Made Easy* (book)
by Ricki Carroll

Treating Dairy Cows Naturally (book)
by Hubert J. Karreman, V.M.D

Local Supply Company:

Corvallis Brewing supply-  http://www.lickspigot.com/
Cultures, rennet, cheesecloth, cheese molds, cheesemaking books.
CHEESE MAKING SANITATION
By Jan Neilson

- Cleanliness is the most important factor in safe cheese making! So let’s keep it safe.

- You must be clean. Wear a hairnet; keep nails short and clean, hands washed. You cannot be too clean.

- Surfaces where cheese is handled, stored and made should all be washed with hot soapy water, rinsed with hot water, sanitized with warm bleach water and air dried. If making cheese in your kitchen—animals should not be present.

- Cheese cloth bags should be washed and rinsed hot water and you can bleach them. Use 1 teaspoon bleach and cold water then store them. I use a Tupperware bowl in the refrigerator until ready to use. You can also boil the bags and store them, instead of using bleach.

- If you remember that everything touching the milk or cheese needs to go through all the steps for sanitizing milk. Equipment sanitation will be the same. Spoons, knives, bowls, everything should all go through the sanitizing process.

- Make sure when making cheese that there is not bleach left on containers to be used for rennet or culture. There is a good possibility the bleach will kill the culture and make your rennet inactive or less active.

- Once you get the hang of this I guarantee you will have a great time making cheese! Having fun in the cheese room makes all the difference and you will have wonderful cheese.

- These are your babies! Take care of them, they will grow old and take care of you!
CHEESE MAKING
By Jan Neilson

- *Cheesemaking Made Easy* by Riki Carroll is the first book I used and the recipes all worked great. I was able to purchase all my supplies and ingredients from New England Cheesemaking Supply also (same company). Very good resource for the home cheese maker.

- Have all your equipment sanitized and ready to go.

- Start with clean fresh milk no more than two days old

Basic Instructions for Feta

- **Step One:** Pour milk (pasteurized or raw) into stainless steel pot heat to desired temp. 85 degrees for feta

- **Step Two:** Ripen cheese by adding culture mesophilic or thermophilic. Let ripen for desired amount of time, use mesophilic for feta.

- **Step Three:** Add rennet using exact measurements for recipe. Stir and let sit 30 minutes to 1 hour until you get a clean break.

- **Step Four:** Let the curd sit for 5 minutes, then gently sir the curd for 5-10 minutes.

- **Step Five:** Let sit for 30 minutes. Then, hang in cheesecloth bags for 4 hours.

- **Step Six:** Take out of bags, break up curd and put back in same bags. Place in cheese mold and press for 12 hours.

- **Step Seven:** Take out of press and place wheels in salt brine for two months.

Brine Solution: 2 cups of sea salt or un-iodized salt to one gallon of water.

Raw milk cheese must be aged two months to be safe for consumption. You can place up to three wheels in the solution, be sure to keep them under the brine. You can place small tubs of water with lids on top to keep them under the solution. Feta can be kept in the brine – forever, it will just keep aging and develop more flavor. Break off the amount you need when you need it or you can place the feta in a quart jar with brine in your fridge to make it easier to handle.