PennState Extension

AGRICULTURAL ALTERNATIVES

Farmstead and Artisan Cheesemaking

Starting a value-added dairy enterprise may be an attractive option to dairy producers looking to diversify, increase profitability, or sustain the dairy business for the next generation or additional family members. Cheese is a popular first value-added dairy product to produce due to its high consumer demand and ability to be stored for long periods of time. The renaissance of farm-based dairy processing can be attractive, but it is imperative that farmers research and plan all aspects of a new enterprise. This publication is intended to provide aspiring farmstead and artisan cheese processors with guidance on the areas of planning and decision making required for this type of start-up enterprise.

There are no legal or regulatory distinctions of "farmstead" or "artisanal" cheeses. Both categories imply that the cheeses are produced in small batches, primarily by hand, with a focus on the traditions of the cheesemaker's art. The American Cheese Society defines "farmstead" as cheeses being made from "milk from the farmer's own herd, or flock, on the farm where the animals are raised" (**www.cheesesociety.org**). Both farmstead and artisanal cheeses may be made from any type of milk (cow, goat, sheep, or water buffalo) and may include flavorings.

According to the USDA Economic Research Service, per capita consumption of cheese has steadily risen since 1970 and in 2015 stood at approximately 35 pounds per person in the United States. U.S. production of cheese has risen similarly: from 8,250 million pounds in 2000 to over 12,150 million pounds in 2016, per information from the USDA National Agricultural Statistics Service. In the Northeast, cheese production topped 1,400 million pounds in 2016. Although specialty cheeses like farmstead and artisan

constitute only a small percentage of total cheese production, they represent an increasingly important value-added opportunity for farmers.

Marketing

Farmstead and artisan cheesemakers have several options when it comes to marketing their cheeses. Both wholesale and retail markets are available to them depending on personal preference and ability to supply needed or desired quantities. Many beginning cheesemakers start with marketing and selling their cheese at farmers markets as well as directly to consumers from a store on their farm. The form in which cheese is sold is largely determined by its type or by how it is produced. Cheeses that are made into large blocks and wheels, such as cheddar, blue, and Gouda, are sold in blocks or wedges. Soft, surface-ripened cheeses, such as Brie and goat cheeses, are made and sold as flat disks, pyramids, or logs. Fresh cheeses, such as chèvre and ricotta, are packed in containers. Prices for high-quality cheeses can easily start at greater than $10 per pound.

If cheese production reaches a large enough quantity, wholesale marketing to grocery stores, specialty stores, and restaurants is an option that can be considered. Wholesale marketing may require the use of a distributor to access

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market outlets. In such cases, it is necessary to understand distribution costs when pricing your product, as a margin will need to be built in for the distributor and store. Some specialty store and restaurant accounts may be also done by direct sales.

It is critical that you understand consumer preferences for cheese styles and flavors in your target market. Take time to perform consumer research to understand the demographics of your potential customers. For instance, older individuals tend to prefer cheeses with stronger or adventurous flavors, such as blue and goat cheeses, while families with small children tend to prefer cheeses like cheddar and other milder-flavored cheeses.

Keep in mind that market research and product development is a continuing process. You'll want to either reaffirm that your target market is correct for your product mix or develop new products to fill the desires of the target market you are trying to reach.

Cheese Production

There are many options available for making cheese. A thorough understanding of your desired markets and your cheesemaking goals is very important in determining what cheeses you will make, as it will determine the ingredients, equipment, and facilities you will need to be successful.

Styles of Cheese

The most common milks used in the United States for cheesemaking are cow, goat, sheep, or a mixture of these. There are several ways to categorize cheese styles, and different organizations and groups use different criteria. Cheese styles may be categorized by the type of milk used, texture, age, characteristics, and manufacturing techniques. The following is a list of the various styles of cheeses, with a short description of their characteristics and some examples of each type.

Initial Resource Requirements

The following is a noncomprehensive list of equipment, building, and system needs. The total cost for setting up a cheese enterprise will vary depending on your specific circumstances but can easily total over $100,000.

■ Equipment/capital investment:
- Cheese vat
- Batch pasteurizer
- Brine tank
- Sinks
- Drainage racks
- Cheese press
- Cheese molds
- pH meter

■ Building and systems:
- Piping
- Flooring
- Wall materials
- Refrigeration
- HVAC
- Whey handling

Fresh:
- An unripened cheese made to be eaten within days or a few weeks of manufacture
- Ricotta, mascarpone, cottage cheese, farmer's cheese, chèvre

Soft-ripened:
- A soft-texture, high-moisture (more than 50 percent) cheese; may be ripened with white mold (bloomy rind)
- Brie, Camembert, many goat cheeses

Semi-soft and semi-hard:
- A semi-soft-texture, easily sliceable cheese that has intermediate moisture (between 39 percent and 50 percent)
- Gouda, Edam, Havarti, mozzarella, provolone, Swiss, Monterey Jack, Colby

Hard:
- A hard-texture cheese that may be sliced or grated and has low moisture (less than 39 percent)
- Cheddar, Parmesan, Pecorino Romano

Washed-rind:
- Made by washing the outside of the cheese with a brine solution or other liquid to impart flavor and texture characteristics; typically has a semi-soft texture
- Taleggio, Époisse, American specialty cheeses

Natural-rind:
- Aged in conditions to develop a hard rind with some mold and other unique flavor characteristics; cheeses are packaged after aging
- Clothbound cheddar, many hard cheeses

Pasta filata:
- Require stretching of the curds during processing to achieve the characteristic texture, usually a semi-soft texture that gets harder with aging
- Mozzarella, provolone

Blue cheese:
- Contains a blue mold, has an open texture, and may be creamy or crumbly
- Blue Cheese, Gorgonzola, Roquefort

Cheese with eyes:
- Have gas holes or "eyes" as part of their characteristic appearance; texture is semi-soft and waxy
- Swiss, Baby Swiss

Processed:
- Cooked with emulsifiers to make a smooth, spreadable cheese
- Cheese spreads, cold-pack cheese

Often a cheese will fall into several categories, such as a one-year-old (sharp, aged) hard cheddar with a natural rind. Cheese styles and cheese names can be different things. You may decide to name your cheese "Dad's Favorite," and it could be a cheddar, a Swiss style, or a new style of cheese that you develop. Not all "styles" are names, and names don't

necessarily indicate the style of cheese. Many cheeses have catchy names—that's the fun of cheesemaking and putting your unique influence on your product. Educating your customers is helpful to let them know the general style, flavor, and texture of the cheeses they are buying.

A key aspect of being a cheesemaker is paying attention to regulations. The Federal Code of Regulations has standards of identity for 72 cheeses (21 CFR 133). If you make a cheese with a standard, then you must always conform to those standards. For example, if you make "cheddar," then it must have a maximum of 39 percent moisture and a minimum of 50 percent fat in the solids portion (21 CFR 133.113). If your cheese is 40 percent moisture, then it can no longer be called "cheddar."

There are regulations that allow some cheeses to be made from raw milk. All raw-milk cheeses must be aged a minimum of 60 days at not less than 35°F for safety reasons. The Code of Federal Regulations defines what cheeses may and may not be made with raw milk. For example, cheddar may be made with raw milk, but Monterey Jack (21 CFR 133.153) can only be made from pasteurized milk. Current Pennsylvania regulations (PA Chapter 59a) are more restrictive than the federal regulations and only allow hard cheeses (39 percent moisture maximum) to be made from raw milk.

Cheese Manufacture

The type of cheese you make will determine the ingredients needed, manufacturing processes, and facility requirements. The choice to make pasteurized cheeses or raw-milk cheese has pros and cons. If you are interested in making fresh cheeses that can be sold immediately or certain varieties, you will need a pasteurizer. Raw-milk cheeses do not require the expense of a pasteurizer, but there are expenses related to having the labor and capital needed to age your inventory in temperature-controlled rooms for a minimum of 60 days prior to sale.

High-quality cheese starts with high-quality ingredients, and the most important ingredient is milk. Factors such as animal health, milking practices, raw milk composition, storage conditions, and sanitation throughout the production process will impact the quality of cheese. Following best practices will ensure a high-quality cheese. The American Cheese Society has developed an excellent *Best Practices Guide for Cheesemakers*.

There are many types of bacterial cultures, molds, and yeasts available for making cheese. The cultures needed for making cheddar are different than those used for making Swiss cheese that are cooked at higher temperatures during manufacture. Different cultures can be used for making the same type of cheese to impart minor changes in the flavor profile and texture. Cheeses with eyes use cultures that produce gas to make the characteristic holes and flavor. Cheeses such as blue and Brie use blue or white molds to get the characteristic flavors and textures.

Manufacturing differences in cheeses will dictate equipment and facility requirements.

Salting:
- Cheeses such as cheddar are salted directly in the cheese vat prior to putting the curds into the forms and pressing.
- Blue cheese is formed and unhooped, and then the outside surface of each wheel is dry salted.
- Gouda cheese is formed, unhooped, and then put into a tank with a brine (salt) solution.

Specialty techniques:
- Blue and white mold cheeses need time for the mold to grow. Different molds have different optimum temperatures and humidity conditions for growth.
- Pasta filata cheese curds must be stretched, either by hand or with a stretching machine, to meet regulatory requirements.
- Swiss-type and other cheeses with eyes need to be held in a warm room for several weeks to allow the gas holes to develop.

Each type of cheese will have its own specific sequence of steps, times, temperature, pH targets, and aging requirements during the manufacturing process. The main steps, or processes, in making cheeses are similar (Figure 1). Learning the science of cheesemaking will help you understand what is happening chemically and microbiologically at each step in the process of your cheese so that you know how to adjust the process to make the cheese you want, make it consistently, and troubleshoot problems.

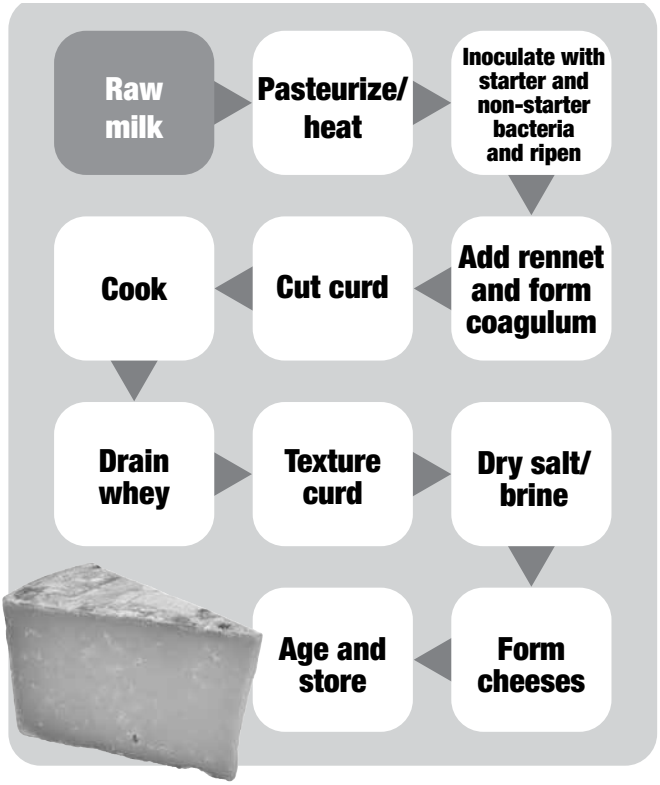

Figure 1. Steps in the cheesemaking process.

Facilities

Care should be put into designing facilities for a cheesemaking operation. Facilities should be designed to meet regulations, have efficient traffic flow patterns, minimize food safety concerns, and consider employee comfort and future expansion. There are strict requirements for equipment and facility design and materials allowed in dairy processing plants. Most states, including Pennsylvania, defer these requirements to the Pasteurized Milk Ordinance. It is best to contact your state Department of Agriculture prior to constructing facilities. It is advisable to work with your local inspector as much as possible during the planning stages, for it is far better to invest in planning time than to have your facilities and production shut down for failing to meet requirements or inspections once you have begun cheesemaking.

The specific rooms and areas needed depend on the cheeses you are making and may include:

- Milk receiving
- Laboratory
- Processing room (pasteurizer, cheese vat, draining and work tables, cheese press)
- Brine tank area
- Aging rooms
- Cheese packaging
- Packaging and shipping material storage
- Office

If you plan to do on-farm sales, you may also want to have a retail show room where you can display product and serve customers. While this does not need to be a large space, it should be pleasing for customers and provide you with enough space to properly serve them.

Regulations

An aspiring cheesemaker must be familiar and comply with a wide range of federal and state regulations. All food manufacturers must register their facilities with the Food and Drug Adminisitration and obtain the necessary permits from their state Department of Agriculture. Regulations for facilities and some testing may be defined by the state or deferred to the Pasteurized Milk Ordinance.

State regulations will define the types of permits needed, inspection criteria and frequency, and testing requirements for water, milk, and finished products. The Pennsylvania regulations for dairy processing plants are in Chapter 59a, Milk Sanitation. In Pennsylvania, different permits are required for facilities making pasteurized milk and raw-milk cheeses. Regulations relating to cheese types and composition were discussed above in the cheese styles section (see also the Federal Code of Regulations and PA Chapter 59a).

The Food Safety Modernization Act (FSMA) implemented regulations that all food manufacturers must follow regarding good manufacturing practices (GMPs) and other aspects of food safety. FSMA requires documentation that all employees are trained in their job responsibilities and basic food safety practices. The requirements to conduct hazard analyses and implement risk-based preventive controls depend on the size of your facility and adherence to other state inspection requirements.

Risk Management

There are several risk management strategies you should consider for your operation, including general and product liability, property, and, perhaps, key employee insurance. Discuss the types of coverage you may need with your insurance agent or broker. If you are engaged in direct marketing (especially farmers markets or an on-farm market) or agritainment activities, you need adequate liability protection. For more information on agricultural business insurance, see “Agricultural Alternatives: Agricultural Business Insurance.”

Sample Cheese Processing Budget

Included in this publication is an annual hard cheese processing budget that summarizes receipts, costs, and net returns for a cheese enterprise processing 250,000 pounds of fluid milk into a hard cheese, such as cheddar. While 250,000 pounds is the equivalent to the annual milk production per cow of approximately ten cows, realize that cheese processing typically occurs on a regular schedule. Many farmstead processors will make one type of cheese once a week on a weekly basis (cheddar on Mondays, mozzarella on Tuesdays, etc.). Additionally, most farmstead cheesemakers continue marketing a large proportion of their fluid milk in a traditional manner, simply diverting, or selling, the quantity of milk needed for cheesemaking to the cheese enterprise. The cheesemaking schedule is also dependent on your specific marketing needs. For instance, if you know that a cheese will be more heavily in demand around the holidays, you will want to plan your processing schedule accordingly. This may require securing more fluid milk at certain times of the year and less milk at other times.

Costs and returns are often difficult to estimate in budget preparation because they are numerous and variable. Therefore, you should think of this budget as an approximation and make appropriate adjustments in the “Your Estimate” column to reflect your specific production and resource situation. The sample budget should help ensure that all costs and receipts are included in your calculations. More information on the use of budgets can be found in “Agricultural Alternatives: Budgeting for Agricultural Decision Making.”

Sample Cheesemaking Budget

Based on 250,000 pounds of milk from an on-farm dairy and 10 pounds of milk per pound of cheese. Income will vary due to the cost of supplies and types of cheeses produced and sold.

	Quantity	Units	Value	Total	Your Estimate
Income					
Cheese Sales					
Wholesale Sales 85%	21,250	pounds	$8.00	$170,000.00	
Retail Sales 15%	3,750	pounds	$12.00	$45,000.00	
Total Sales				*$215,000.00*	

	Quantity	Units	Cost	Total	
Variable Expenses					
Milk	2,500	cwt	$18.00	$45,000.00	
Payroll expense	5,525	hours	$10.50	$58,012.00	
Utilities	25,000	pounds	$0.21	$5,250.00	
Outside smoking	640	pounds	$7.68	$4,915.20	
Sanitation supplies	25,000	pounds	$0.16	$4,000.00	
Employee healthcare	25,000	pounds	$0.09	$2,250.00	
Office supplies	25,000	pounds	$0.04	$1,000.00	
Bank charges	25,000	pounds	$0.02	$500.00	
Training and education	25,000	pounds	$0.01	$250.00	
Outside testing	25,000	pounds	$0.004	$100.00	
Operating interest expense	25,000	pounds	$4,576.66	4,576.66	
Marketing expense		% sales	16%	$34,400.00	
Total Production Expenses				*$160,254.36*	
Fixed Expenses					
Creamery non-food processing equipment	1	year	$1,646.75	$1,646.75	
Creamery processing equipment	1	year	$10,535.70	$10,535.70	
Insurance	1	year	$12,736.75	$12,736.75	
Legal and professional fees	1	year	$3,963.75	$3,963.75	
PA corporate tax	1	year	$31.00	$31.00	
Repairs and maintenance	1	year	$3,065.90	$3,065.90	
Telephone	1	year	$2,561.50	$2,561.50	
Interest	1	year	$533.69	$533.69	
Total Fixed Expenses				*$35,075.04*	
Total Expenses				**$195,329.40**	
Returns to Management				**$19,670.60**	

For More Information

Websites

Food and Drug Administration

Cheese and Related Cheese Products (21 CFR 133): **www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?CFRPart=133**

Current Good Manufacturing Practice, Hazard Analysis, and Risk-based Preventive Controls for Human Food (21 CFR 117): **www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfCFR/CFRSearch.cfm?CFRPart=117**

Food Safety Modernization Act Information: **www.fda.gov/Food/GuidanceRegulation/FSMA**

Pennsylvania Department of Agriculture, Milk Sanitation Program: **www.agriculture.pa.gov/Protect/FoodSafety/Dairy%20and%20Dairy%20Product%20Manufacturing/Pages/default.aspx**

Penn State Extension Dairy Foods: **extension.psu.edu/food/dairy**

Associations

American Cheese Society
2696 S. Colorado Blvd, Suite 570
Denver, CO 80222-5954
www.cheesesociety.org

Pennsylvania Cheese Guild
pacheeseguild.org

Vermont Cheese Council
www.vtcheese.com

Publications

Kindstedt, P., and the Vermont Cheese Council. *American Farmstead Cheese: The Complete Guide to Making and Selling Artisan Cheese.* White River Junction, VT: Chelsea Green Publishing, 2005.

Reed, C., L. J. Butler, and E. Rilla. *Farmstead and Artisan Cheeses: A Guide to Building a Business.* Richmond, CA: University of California, 2011.

Periodicals

Cheese Market News
www.cheesemarketnews.com

Cheese Reporter
www.cheesereporter.com

Culture
www.culturecheesemag.com

Dairy Foods
www.dairyfoods.com

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