

Organic Dairy Cropping Systems

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Organic milk production is one of the fastest growing segments of organic agriculture today (McBride et al., 2007). From 2000 to 2005 the number of certified organic milk cows on U.S. farms grew about 25% each year from 36,000 to 86,000 (McBride et al., 2007). Relative to this increase, more than 80% of organic dairy operations are in either the Northeastern or Upper Midwestern United States. The primary difference in production practice between organic and conventional dairy farms is the feeding system. Most organic dairies center their feeding system around a pasture based cropping systems that provides more than 60% of seasonal forage. These organic dairies must supplement the herd during the winter months with stored feed and often feed concentrates. Currently, organic grain prices are three times that of conventional grains. This easily explains why feed costs can be to \$4 to \$5 per cwt higher for organic operations.

Given, the information provided above it should come as no surprise that top quality forage production should be the main component of any organic dairy cropping system. The objective should be to produce sufficient quantities and quality of forage to meet the energy and protein requirements of the dairy cow while reducing the quantity of expensive purchased concentrate feeds and protecting the environment (Weller et al., 2001).

It is important that you develop a cropping system that fulfills the needs and function of your own farm. As a cropping system is planned for the farm one must consider several factors including but of course not limited to:

1. Producing the quantity and quality of forages that can meet the nutrients and dry matter requirements to maintain production and growth of each group of cattle on the farm;
2. Maintaining sufficient acreage for grazing heifers, dry cows, and milking cows;
3. Maintaining fertility levels through proper management of manure resources, legume crops, rotational crops, and limited purchase of soil amendments.

Farmers can achieve this by growing any number of combinations of perennial and annual forage crops that will benefit the animal productivity and health, soil health, environmental health, and farm profitability.

Let's start with perennial forage crops. Some farms grow only perennial grass and legumes crops. This is sometimes termed "grass based dairying". The cows provide most of their diet through grazing and most of the stored feed is harvested as dry hay, baleage and/or haylage. These farms often but not always supplement the diets with purchased concentrates to balance the protein and energy requirements of the animal. The equipment requirements are focused on haying implement such as mowers, rakes, and balers. These systems can be low energy input and generally have low or no tillage requirements. Nonetheless these perennial crops must be managed to continuously produce high quality and yielding feed. The most important practice to maintain pasture production is through the utilization of management intensive grazing strategies. Soil fertility is most often maintained through a combination of manure/ compost applications combined with judicious use of soil nutrient amendments (i.e. lime and micronutrients). A diverse combination of perennial forages within pasture will aide in meeting the fertility requirements of the plants and the animals. For example, legumes such as white clover grown with grasses will increase overall forage protein values as well as provide nitrogen to the grasses. It is generally promoted that a forage mix that includes 1/3 legumes will provide the primary

portion of the nitrogen requirements of the grasses. Growing a diversity of perennial forages within a field not only helps with fertility but it can also buffer against losses from disease and winter kill. A continuous sod crops often require reestablishment of forage species through the years. Many farmers implement practices such as frost or no-till seeding to maintain or introduce species into established pastures. Some pastures are reinvigorated by a complete reseeding of pasture. This can be expensive due to its high tillage and seed requirements.

Although all organic dairy farms have pastures and perennial forage crop production some prefer to include annual forage and/or grain crops in their cropping system. Many farms find that the addition of annual crops can provide needed nutrients, diversity, flexibility, extra feed, bedding, and many other benefits. There are many cool and warm season annual crops that are suitable for dairy feed.

Cool season forages that are commonly grown by organic dairy farms include cereal grains and brassica crops. Cereal crops can provide a level of flexibility because they can be grown for grazing, stored forage, grain, and/or straw. Cereal crops grow best under cooler conditions. Depending where your farm is located they can be planted in the fall, spring or both. Wheat, barley, oats, triticale, spelt, and rye are all grains that are commonly grown on dairy farms. Cereal grains can extend the growing season into the late fall and early winter keeping cows off from store feed. They can also be used for early season grazing or forage harvest. Cereal crops are often harvested in the boot or soft dough growth stages. The boot stage provides a high quality forage but relatively low yields compared to harvesting in the dough stage. Harvesting in the early dough stage increases yields but decreases certain quality parameters such as protein. However, cereals harvested in the dough stage can provide a good amount of starch and minimal soluble protein. What stage you harvest is completely dependent on the forage needs of the farm. Lastly, the grains can be harvested as a grain crop and the remaining straw used as bedding. Cereal grains can provide needed energy in a feed ration.

Other cool season species with forage production value include brassica crops. This includes such plants as turnips, rape, typhon, and kale. The primary advantage of these crops is that they remain green and lush in the fall after most forage crops go dormant. Thus, they can produce good animal grains on pasture at a time when other forage crops are relatively low quality. Forage brassicas are almost always grazed and not harvested as stored feed (unless grown with grasses). These crops are extremely high in protein and should be viewed more as a concentrate than forage. Care must be taken not to overwhelm the animals with this high concentrate feed.

Warm season annuals are often but not always planted in rotation with cool season annuals. Once cool season crops are harvested in the early summer the warm season grasses can be seeded behind them. Warm season annuals include corn, millets, sorghum, sudangrass, or sorghumxsudangrass. These crops grow best under warm and drier climates or seasons. Most of these forages can be dual purpose crops being grazed or harvested as stored feed. Corn silage is generally only harvested for stored feed in the form of silage, high moisture corn, or shell corn. These warm season annuals can provide grazing during dry hot conditions when other crops can not prosper. These crops also produce significant biomass that can boost forage supplies in marginal years. Many farmers produce forage and can even provide grazing opportunities during times where cool season pasture growth is limited. Many farms produce corn as silage or grain to offset expensive purchases energy concentrates.

Lastly, there are annual legume crops that are generally grown for grain but sometimes forage including soybeans and peas. Soybeans and peas harvested as forage can provide a significant amount of protein. However, there are some challenges with harvesting and storing these crops as ensiled forage. It is good to consult with other farmers and your nutritionist when feeding forage soybeans or peas.

More commonly, these legumes are grown as a grain crop with the end use focused on protein supplement. Soybeans require a relatively long growing season and sometimes specialty equipment for roasting the beans. Peas do not require roasting before feeding but can be difficult to grow in humid climates. Peas grown in combination with other cereal grains are a popular method to growing a complete energy/protein grain.

Annual crops must be seeded each year and therefore require yearly tillage and planting. They require thoughtful rotation plans to produce high quality and yielding crops. Proper rotational design is also the most successful way to minimize weed, disease, and insect pressure. Lastly, rotations will aide in maintaining fertility for the current crop and crops to follow. Although there is no standard recipe for developing a rotation, they almost always include rotation of annual crops with perennial sod crops. The sods crops help improve soil health and fertility after several years of tillage during annual crop production. Applying sufficient manure/compost applications during the sod years will help build soil fertility for the annual crop years. The “plow-down” of a healthy diverse sod crop can provide sufficient fertility for a two-three year annual crop rotation. Working with local organic farmers to observe current rotations on their farms can help you develop a successful rotation at your own place.

It is obvious from the descriptions above that annual crops can benefit the dairy farm. However, annual cropping systems require more management and energy to maintain. Often times the cost:benefit must be determined before these crops are grown on traditionally sod-based farms. For example, growing annul crops requires more equipment specifically tillage implements and sometimes planters and harvesters. When annual forage crops are grown, such as cereal crops or warm season grasses, haying equipment can be used to harvest the crop. In the case of corn silage a chopper is needed to harvest and a special storage facility required. If a farmer produces grain crops they must also have a means to harvest (i.e. combine), store, and maybe even dry the feed. Annual crops sometimes require the use of mechanical weed control implements. All of this adds new management skills, labor, and expenses. Many farmers utilize annual crops successfully and looking towards them for mentorship will be important for your own success.