

Surviving the Integration of Management of a Dairy and Manure

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A simple definition of surviving is “the ability to continue to exist”. Many dairies are struggling to exist because they failed to understand or choose to ignore the importance of integrating the management of the dairy and manure operations. Integration is the process of combining or bringing together of operations. Manage is defined as “to be in charge of” or “to control”. Survival in the 21st century will require a unified effort of the management of the various components of a dairy’s operations in a cooperative effort. Integration will necessitate the working together of the nutritionists, veterinarians, crop consultants, manure contractors and others on the dairy. Following are some examples where integration of operations and management will be critical for survival.

Diet and Manure

Dairies recognize the diet is the main input in milk production. The traditional approach has been to formulate diets based on least cost rations. However, comprehensive nutrient management plans (CNMP) are developed based on the excreted manure and urine nutrients. Excess diet nutrients are excreted and impact the CNMP. Least cost diets often result in feeding additional nutrients above the National Research Council minimum recommendations. This increases the manure disposal cost as implemented nutrient management plans move from nitrogen to phosphorus or micro nutrient based land application. Figure 1 shows the potential impact on land requirements of a CNMP. A 1,000 cow dairy with a current nutrient plan utilizing an acre of land per 3 cows, requires about 330 acres of land for manure disposal. If the new plan requires an acre per 2 cows then the land base increases to 500 acres. If an acre per cow is necessary, then the land requirements increase to 1,000 acres. Large dairies within close proximity to each other will be competing for additional available land for manure disposal or be required to invest in technologies to remove nutrients from the manure. Either option will increase operational cost. Long term survival will require understanding the economical impact of least cost diets on the overall dairy finances. Producers need to work with their nutritionist to ensure least cost diets do not require 2 to 3 times as much crop land for

manure application as a diet that is formulated based on the National Research Council's dietary recommendations.

Be a Good Neighbor

Neighborly relationships must be an integral part of the dairy operation. Diaries are currently faced with the challenges being presented by implementation of nutrient management plans. However, the air quality challenges may be the next hurdle to jump as air emissions and particulate matter are another environmental focus. Minimizing the dust emissions from earthen lots will be critical. Balanced rations will minimize the excreted nitrogen and therefore reduce the volatile solids and reduce land requirements for manure disposals. Maintaining neighborly relationships will be critical as implementation of nutrient management plans may require access to additional cropland or longer transport distance for manure application. Eliminating and cleaning up manure spills or mud on public right-of-ways such as road may require additional levels of management to be implemented to ensure there are no adverse effects on the public.

Water

Water is required not only for the milk parlor and water troughs but also for the manure handling systems. Most manufacturers of solids separation equipment prefer the water in the lagoon(s) or holding ponds to be less than 3 % total solids. Table 1 illustrates the additional water required to maintain a desired solid content in a lagoon based on separator efficiency. This is water in addition to the urine. Additional water may come from the parlor wash water, extraneous drainage such as roof or driveway runoff, surface rainwater, etc. Approximately 204 gallons per day per cow (g/d/c) is required if there is no solid separation and the desired solids content is 1 %. Only 8 g/d/c is required if 60 % of the solids are removed and the acceptable solid contents is 5 %. Table 2 shows the volume entering a containment structure that annually must be pumped per 500 cows. There is a fine balance between integrating properly water conservation practices and ensuring adequate fresh water is added to the system. The tendency will be to reduce water usage as a nutrient management plan is implemented and manure nutrients are transported further distances. The total quantity of nutrients will be similar when water conservation practices are installed.

System Operation

Milk parlor employees understand the importance of following protocol and standard operating procedures. These become routine in the milk parlor or feed center. There are economic risks associated when protocols are not followed. Many dairies agreed in principle to follow the protocol and operational procedures during the design phase, however, once operational, the commitments often begin to dissipate. One way to reduce manure handling costs, particularly with custom applicators, is to lower the waste volume. For example, if a 1,000 cow dairy spends \$0.01 per gallon of material pumped and lowers the daily water added to the system by 10 g/d/c, then the annual savings is over \$36,000. This reduction affects the manure handling system if the water was an

integral part of the design process. However, the associated risk will potentially increase air quality problems (lagoon nutrient overload) or change the nutrient management plan. Nutrient overload results in potential increases in air emission problems since the anaerobic bacteria may not survive. These bacteria help breakdown the solids entering liquid containment.

As with any system, there are interruptions due to weather or equipment failure. An emergency plan must be developed and ready for implementation if needed. This plan includes procedures for handling anticipated problems or interruptions including those in the manure management area. The emergency plan may require scraping and temporarily stock piling manure rather than overloading the system. Following recommended maintenance guidelines on each component help minimize system interruptions.

State and Federal Regulatory Governing Bodies

Individual states have governing bodies that administers the state and federal regulations concerning runoff control from confined feeding sites. The state agency professionals are responsible for enforcing the regulations and governing statues. The dairy industry is responsible for delivery a wholesome milk product that is safe to consume while the governing bodies are responsible for ensuring a water supply safe for drinking and recreational activities. There may be disagreement with interpretations of the regulations and evaluation of a site, the state agencies ultimately are seeking to protect the public. Generally, the guidelines established are the minimum standards. Government programs such as EQIP meet these minimum standards but may have additional requirements. Each time environmental responsibilities are ignored by a dairy there is the potential for additional regulations to be applied to the industry.

Summary

Dairy producers must control the manure nutrients generated at their facilities. Survival in the 21st century will require cooperation of the management of the each component on a dairy.

Table 1 The influence of separator efficiency on the gallons of clean water per cow that must be added daily in order to maintain a desired lagoon solids concentration.

Desired Solids Content in Recycled Water	Separator Efficiency (Percent Total Solids Removed/Moisture Content of Solids)		
	0	30/60*	60/80*
1 %	204	139	78
2 %	95	63	34
3 %	58	37	20
4 %	40	25	12
5 %	29	17	8

* The first number is the percent solid removed while the second number is the moisture content of the solids removed.

Table 2 Comparison of the quantity of material handled from a lagoon per 500 cows assuming 140 lbs of manure per day per cow and various separator efficiencies and desired solids content in the lagoon.

Desired Solids Content in Recycled Water	Separator Efficiency (Percent Total Solids Removed/Moisture Content of Solids)		
	0	30/60*	60/80*
Manure in Lagoon	3,100,000 gal	2,800,000 gal	1,900,000 gal
Material from Separator	0	310,000 gal	1,200,000 gal
1 %	40,500,000 gal	28,100,000 gal	16,100,00 gal
2 %	20,600,000 gal	14,200,000 gal	8,000,000 gal
3 %	13,900,000 gal	9,500,000 gal	5,500,000 gal
4 %	10,600,000 gal	7,300,000 gal	4,000,000 gal
5 %	8,600,000 gal	5,800,000 gal	3,300,000 gal

* The first number is the percent solid removed while the second number is the moisture content of the solids removed.

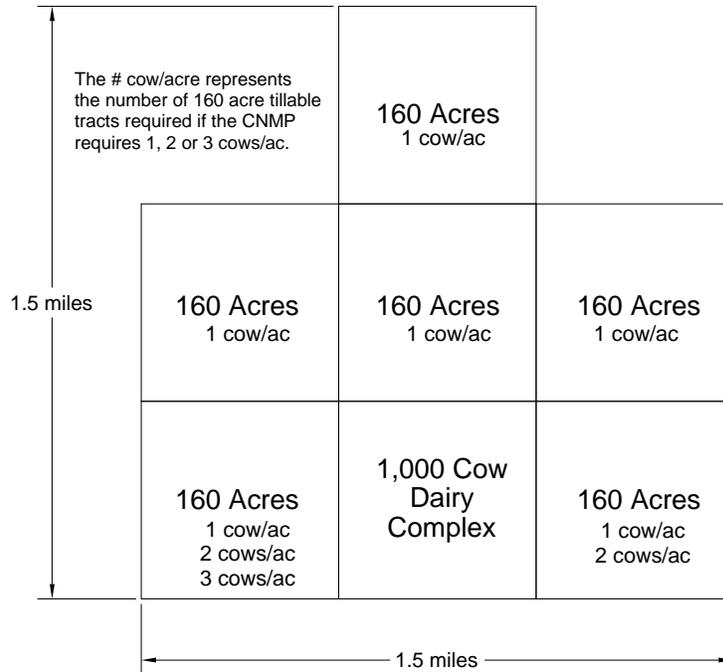


Figure 1 Impact of comprehensive nutrient management plan on land requirements if the land base requirements increase from 1 or 2 acres per cow to 3 acres per cow.