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Considering Farm Resources when Choosing a Feeding System

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Each dairy manager must constantly monitor their operation to insure that it has a long term operating plan in place that supports the lifestyle, retirement and profitability profile of the owners and operators. The dairy industry in the United States is going through a major transition as dairy operators’ implement the latest technologies that help decrease their investment per animal and increase labor efficiency.

The modern dairy technologies being implemented include freestall housing, milking systems with automatic cluster removal, TMR rations, drive-by feeding and automatic manure handling. Planning is an on-going dynamic process, which changes from time to time based on the new options being offered. For many of our existing operators, the next change they make may be much more extensive than previous changes and require substantially larger amounts of time and analysis. The size and impact of any decision made is so critical that the use of several consultants to insure the correct course is selected is imperative.

Every business has a plan that is being followed. It may or may not be written. It may be as simple as to continue doing what has been done in the past or an elaborate series of changes leading to a defined end result. If you have not updated your plan recently, it probably would be beneficial to take a close look at your business and the industry and determine if a change to your business plan is needed.

When you develop your business plan, you should define the different strategies which may be followed and then evaluate each option based on the family goals, financial position and existing resources. A feasibility analysis should be conducted to insure sufficient resources are available and that the strategy selected will lead to the financial and quality of life changes desired.

What dairy system is best for me?

Until recently most many dairy operations fit what I’ll call the Traditional Dairy System. This type of system included cows housed in stanchions or tie stall barns, milked with a bucket or pipeline system, manure removed by barn cleaners and feed stored in upright silos. The past few years we’ve seen more interest in grazing and freestall type dairy

systems. Each of these systems has different capital and labor requirements and lead to different lifestyles.

As these different systems are evaluated, an effort should be made to determine how effective each will be to utilize new and existing assets, plus the long range growth potential of the business based on that system. Making the wrong choice now could impose additional costs in that future. Remember to make this choice based on current objectives, but keep in mind the objectives future owners (family or non-family) may have and the effect any proposed changes may have on the long-term viability and value of the business.

How do we start the planning process?

The planning process for any existing operation should start with a thorough evaluation of the operation's current status. This evaluation should look at the operation's historical profitability; level of modernization; work environment; ability to supply family income, time off and retirement needs; plus the ability for it to support additional family members over time. The owner(s) must consider each of the following elements and how they fit their long-range goals:

- Dairy system type – traditional, grazing or large confinement
- Ownership structure – family, partnership, LLC, etc.
- Labor force – family labor and/or hired labor
- Enterprises – dairy, heifer, crop, etc.
- Herd size objective – support family needs, fully utilize assets, maximize returns, match forage supply, etc.

An inventory of the operation's assets is recommended to determine the amount and quality of assets currently controlled. How much cropland is owned, rented or available? What buildings exist, their condition and their future usefulness? Are existing facilities located on a site that lends itself to the expansion size dictated by your long-term plans? What amount of equipment is owned? What is the size, condition and applicability of this equipment for the modernized operation? How much livestock is owned? What labor and management skills does current family members and employees possess? What other capital resources are available to help finance the modernization contemplated?

A quick review of the operation's balance sheet can be used to determine its borrowing capacity. Lenders usually require owners to have a 35% to 50% equity position after expansion. This number varies because of the methods used to determine the current market value of existing assets, resale value of new assets and the credit worthiness of the owner. Understanding the approximate loan potential of the operation helps determine the size and speed that the operation can progress. If the borrowing capacity of the operation is insufficient, partnering with other dairy managers, crop farmers or investors may be feasible.

Planning a major modernization of a dairy requires looking at all aspects of the dairy: milking, housing, feeding and manure handling. The resources applied to each of these areas, at each phase of the operation's development, should be based on the importance of each toward optimizing the efficiency of the whole operation. When selecting a feeding system the operator must define the size and scale of the operation, at each phase of its development, which this feeding system must support.

Whenever a major expenditure is being considered, the manager needs to answer the following questions:

- How much money will the lender commit?
- How much debt will the owner(s) be comfortable with?
- How much financial improvement is expected?
- Is sufficient land and labor resources available at an economical price?
- Will improvements improve resale value of the operation?

How should I milk my cows?

Gently of course, but more so, using what type of system? There exists a wide range of options here with a wide range of associated costs. Switch milking an old facility has the lowest investment cost per cow, but requires substantial labor inputs and is not a very enjoyable approach for the long term. Using this method for a few months or years is often a way for dairy managers, with limited resources, to transition into a new type or size dairy system.

Most dairy managers who are changing their operations are choosing a flat barn or pit type parlor for milking. There are several variations of each of these parlor types and each has different costs and labor efficiencies associated with them. A few thousand dollars can often convert an existing stanchion barn into a back-out flat barn parlor, while a new pit parlor with all the whistles and bells can cost up to \$20,000 per milk stall. Always calculate the milking system investment per cow being considered and how the milking systems being evaluated will support the milking procedure you wish to use. Using an existing facility to house the milking system can be viable, but the long-term growth potential of the site is extremely critical.

For this paper I will assume that the modernization plan being contemplated will include some type of milking parlor, be it a flat barn parlor or a pit parlor. The selection of the size and type of parlor, plus the milking procedures to be deployed, will determine its capacity. The capacity of a milking parlor is normally defined in terms of the average number of cows milked per hour (cows/hour) or the number of times the parlor will be filled per hour (turns/hour). The capacity of the milking parlor determines the optimum pen size and maximum herd size for the operation. Current recommendations are that the maximum pen size allows all cows in a group to be milked in a 45-60 minute period (i.e. 75-100 cows/pen for a parlor with a 100 cow/hour capacity). This rule insures cows have sufficient time to eat and lay down and a reasonable amount of time standing in a holding area waiting to be milked. The parlor capacity also limits the herd size in that it determines the maximum number of animals, which can be milked in 18-21 hours per

day of parlor operation. Some time each day is reserved for set-up, clean up and maintenance of the milking facility.

How should I house my cows?

Freestall barns are the choice of most dairy managers. If you are considering anything else, I suggest you talk to consultants and others who have made such a move recently to insure it is the correct solution for you. Freestall barns give cows the freedom to access feed and water, to move around or lay down at their own discretion. These leads to increased activity, increased feed intake and often increased milk production.

Conversion of existing facilities and new facilities both can provide dry, comfortable places for the dairy cow. The key elements to consider in freestall barn design are: barn width, sidewall height, freestall design, waterers, bedding material type and how you plan to handle cows.

Both initial cost and annual cost of housing should be considered when making a buying decision. Cow comfort and the labor requirements associated with animal handling need to also be included. Always calculate the housing cost per cow (not per stall), based on assumed overstocking rates, when comparing costs to get an accurate comparison, then add any additional labor or treatment facility costs to arrive at the total annual cost per cow. Remember, barns being built today will probably be used for 10-20 more years. Maximizing cow comfort should be of paramount concern since several dairy herds currently produce in the 30,000 pounds of milk per cow per year range and this will increase substantially over time.

What factors need to be considered when selecting a feeding system?

Selecting a feeding system is not as simple as selecting the right TMR mixer. It starts with determining the herd feeding program and includes feed acquisition planning, cropping enterprise evaluation, plus feed storage, loading, mixing and delivery implications.

Defining the best feeding program for a herd will involve knowing the supply and costs of each ingredient. The feeding program for an operation may change between phases of its development because of the total needs of the herd and the local supply of individual forages. Feeding trials generally demonstrate similar milk production from cows fed diets based on either corn or alfalfa silage. Use of a single forage source may require better herd management or at least different operating procedures to prevent adverse effects on cow health or milk production. In the Midwest, use of at least 1/3 each of alfalfa and corn silage is recommended to reduce risk of crop loss, spread labor requirements and for better use of on-farm nutrients. As herd size increases the percentage of corn silage in the diet normally increases because of its yield, harvesting, packing and palatability advantages. Each dairy manager must look at the local economics to define the operation's feeding program, then plan acquisitions and storage requirements accordingly.

Feed storage for forage, grain and concentrates need to be determined. Forage, the largest component of dairy rations, can be stored in upright silos, horizontal silos (bunkers or trenches), stacks, silage bags or dry hay storage. Upright silos are the logical choice for small dairies but have limited value with large dairies because of the time required to fill and unload them. Bag storage can result in high feed quality, low feed wastage, low annual cost, but bag disposal and rodent damage must be considered. Bags are often the logical choice of expanding dairies during their transition phases because of their minimal capital expenditure and location and capacity flexibility. Flat silage stacks using dirt, crushed rock, blacktop or concrete bases provide satisfactory results if properly managed. Bunkers increase the capacity, improve packing ability and improve safety over silage stacks. They can result in less silage losses than stacks if stacks are improperly maintained. Grain and concentrates are normally stored in upright bins or flat-floored commodity storage areas. Bins with large augers can unload feed rapidly, minimize waste and lead to accurate loading because of their precise cut-off controls. The disadvantage with bins is that often the mix wagon must be taken to the bin for loading of the ingredient it contains. Flat grain and commodity storage allows quick loading of ingredients into mixers, but must be carefully managed to minimize feed shrinkage and to insure accurate amounts of each feed are included when loading mixers.

The number and size of feed storage units is determined by the total capacity needed by the operation at each phase of its growth. Individual units should be sized to insure a proper removal rate based on herd size and feeding rate. Multiple silos increase handling and management flexibility.

Total mixed rations (TMR's), where all forages, grains and supplements are mixed together into a homogeneous mixture prior to feeding, are used on most modern dairy operations. They allow separate groups of animals to be feed according to their nutrient requirements. Implementing TMR feeding normally will increase feed intake, reduce digestive upsets and improve the intake of products having a low palatability. It is advisable to incorporate TMR feeding systems into any modernization plans. Housing which restricts animal grouping and the high capital cost of TMR mixers may preclude their use in some smaller operations.

When selecting a TMR mixer, the dairy manager may select a mobile unit, which is used to deliver the feed to feed bunks, or stationary units, which require conveyor systems to deliver the feed mixture to the animals. Mobile mixers provide more flexibility, allowing feed ingredients to be loaded from different locations and animals to be feed at remote sites. Animal intake levels and how frequently they are fed determine the batch size for any group of animals. The mixer purchased should be sized such that the largest batch of feed is 60-70% of the mixers rated capacity. Mounting a mobile mixer on a truck is recommended if animals at remote locations are to be feed with the unit. There are many different types of TMR mixers on the market (auger, tumble, reel, ribbon, etc.). Each type has different advantages and disadvantages that the dairy manager must consider when making a buying decision.

What other things should I be considering?

The three major decision areas mentioned above represent only a portion of the areas which must be considered by the dairy manager when making a major investment in a new or existing dairy. Other major areas to be considered include manure management, labor management, replacement animal acquisition and bio-security. Often the operator must also decide if continuing with a diversified operation including cows, heifers and crops is appropriate or if specialization with a single enterprise is more appropriate given the operation's status.

For managers planning to modernize an existing operation, it should be remembered that direction is more important than speed. Often several small phased in changes can lead to the same end result without the risk and trauma associated with larger changes. It is imperative that the decision maker(s) understand where the dairy industry is going and what the owner(s) goals are. Opinions should be solicited from other people and a list of possible strategies developed before any action is taken. Each strategy should be evaluated while keeping in mind the long-term goals and current financial situation of the operation.

An example of how this decision process works.

The Smith Family dairy farm currently own 100 milk cows, 90 heifers and 300 acres of land. Cows are housed in a tie-stall barn, milked with a pipeline milker, and manure hauled daily. Their feeding program is based on hay and corn silage which is stored overhead in the barn and in two tower silos. Two families operate the dairy and together they have four children ages 5-9. One brother enjoys the dairy herd management chores and the other enjoys the crop and heifer raising aspects of the operation. Both wives are involved with the dairy, one having record keeping and the other calf raising responsibilities.

As these families review their operation they realize they need to change their operation to keep up with the industry and to replace crop equipment and feed storage facilities which are no longer functional.

A quick look at their balance sheet shows that they are in good financial status with equity of \$783,000.

Land - 300 acres @\$1500	\$450,000
Buildings	\$100,000
Equipment	\$100,000
Livestock - 100 Cows @\$1200	\$120,000
- 90 Heifers@\$ 700	\$ 63,000
Investment Capital - savings	<u>\$ 50,000</u>

Current Assets	\$883,000
Current Liabilities	<u>\$100,000</u>
Equity	\$783,000

Working with their lender they have determined they can borrow between \$650,000 and \$1,400,000 assuming they need to own 35-50% of the assets after expansion. At their family planning meeting they agree that they are willing to borrow up to \$1,000,000 to make the improvements needed to become a long-term viable operation.

Working with a local consultant they evaluated the feasibility of different herd sizes and facility types. They did the analysis keeping the dairy, heifer and crop enterprises separate to determine the feasibility of keeping all three enterprises as they expand. They agreed on a long-term plan to develop a 750-cow herd. This would be done in two phases with the first phase having 315 head of milking cows. Since the heifer operation historically operated at a break-even level and with the shortage of cropland to support the expanded dairy, it was agreed to sell the operation's heifers and buy all replacement animals. Since their cropping equipment needed to be replaced and they would need additional feed they agreed to 1) sell existing cropping equipment; 2) purchase new haylage harvesting equipment; and 3) hire a custom operator to plant crops and harvest corn silage. They arranged with a neighbor to rent additional land for alfalfa and to buy corn in the field that would be harvested as corn silage.

As they evaluated their existing feed storage they realized that only one of their feed storage structures would fit the new operation. This 20' x 50' tower silo was in good repair and located on the site where it could continue to be used. The following forage storage analysis showed their plan for feed storage based on the feeding program they developed with their nutritionist. This table shows the different sizes of forage storage that would be added at each stage of the expansion and includes the possibility of expanding later to 1200 head.

Storage Unit	Capacity ton DM	% of Capacity Needed -----			
		100 Head 500 ton	300 Head 1500 ton	600 Head 3000 ton	1200 Head 6000 ton
20' x 50' Tower	130	26%	9%	4%	2%
120' x 20' x 10'	1800	386%	129%	64%	32%
120' x 20' x 10'	1800	746%	249%	124%	62%
120' x 30' x 12'	3000	1346%	449%	224%	112%

To determine the forage needs for a 315-cow herd, the following cropland need analysis was developed. Based on these values, about 800 acres of cropland would be needed.

	Tons Needed <u>As-fed</u>	Tons Needed <u>DM</u>	Yield Ton <u>/acre</u>	Acres Needed <u>w/Loss</u>
Hay	902	767	4	192
Haylage	3122	1405	4	351
C.Silage	4080	1428	6	238
Total	8104	3600		781

To determine which type of feed storage to invest in they used the following values from current literature.

	Construction Cost	Equipment Cost	Total Inv Cost
Bag Stone Pad	\$27,280	\$27,075	\$54,355
Bunker 8' Sidewalls	\$121,428	\$11,025	\$132,453

Using all the values collected during the planning phase the owners narrowed the choices down to the following three strategies:

Strategy I - buy 215 additional cows, build a 284 stall freestall barn, build a new parlor, add long-term manure storage and build bunker forage feed storage.

	Cost Estimate	Cumulative \$
215 Cows	\$258,000	\$258,000
284 Stall FS	\$340,800	\$598,800
New Parlor	\$240,000	\$838,800
Manure Storage	\$150,000	\$988,800
Feeding System	\$132,453	\$1,121,253
Excavation/Roads	\$100,000	\$1,221,253

Strategy II – similar to Strategy I except convert the existing dairy barn and install a pit parlor, plus builds temporary manure storage.

	Cost Estimate	Cumulative \$
215 Cows	\$258,000	\$258,000
284 Stall FS	\$340,800	\$598,800
Parlor in Barn	<u>\$100,000</u>	\$698,800
Manure Storage	<u>\$ 50,000</u>	\$748,800
Feeding System	\$132,453	\$881,253
Excavation/Roads	<u>\$ 50,000</u>	\$931,253

Strategy III – similar to Strategy II except purchase a silage bagger and use bag storage initially.

	Cost Estimate	Cumulative \$
215 Cows	\$258,000	\$258,000
284 Stall FS	\$340,800	\$598,800
Parlor in Barn	\$100,000	\$698,800
Manure Storage	\$ 50,000	\$748,800
Feeding System	<u>\$ 54,355</u>	\$803,155
Excavation/Roads	\$ 50,000	\$850,155

As the family reviewed these options they realized Strategy one was not feasible because of the total price, but both of the other strategies were feasible. As they reviewed these options they decided to accept strategy III, because they felt it gave them more flexibility and kept some cash reserves in case they encountered cost overruns and/or additional start-up costs.

Conclusion

Whenever a major change to a dairy operation is being planned it is recommended the management team:

- devote an extended amount of time and effort researching different options (often a two year process);
- involve several outside sources of information (consultants, other producers, etc.); and
- conduct a thorough financial analysis of each option to insure the best decision is made for the long term viability of the business.

It is important to remember there is no one ‘right’ system for all dairies. The operation’s current status and availability of resources must be considered. Different subsystems must be evaluated and combined with the goal of optimizing the whole operation, not necessarily optimizing each component. Use of current assets should be considered, but be cautious not to over value their merit in the upgraded system. Whatever is purchased should be fully utilized if at all possible. A parlor used a few hours per day may be

unwise use of capital resources. When selecting a feeding system, like other components of the dairy system, it is important to consider both the initial and on-going operating costs whenever possible.

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