PLANNING A DAIRY EXPANSION

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Summary

Dairy farm size is increasing in all regions of the United States. In two of the largest dairy states, California and Wisconsin, mean herd sizes have increased 950% and 250%, respectively, since 1950. Dairy herds of 500 cows are common in all areas of the United States, and herds over 1,500 cows are common in the West and Southeast. Many dairy operations are considering expansion of existing facilities or construction of new facilities to increase efficiency or profitability. Before adding cows or facilities, dairy producers may want to answer the following questions: 1) How can I improve the efficiency of the present operation? 2) Can production per cow be increased? 3) Can the current herd be milked 3× per day? 4) Can I send the heifers to a contract raiser and expand the cow herd? 5) What are my financial goals? 6) Where do I want to be in 5 and 10 years? 7) What are the expectations of other family members? 8) Do I have adequate acreage to expand the herd and manage the waste? 9) Do I want to manage employees? 10) Do I want to deal with regulatory agencies?

(Key Words: Planning, Dairy, Expansion.)

Introduction

These are just a few of the questions that many producers agonize over when considering options for their dairy operation. This report will help you explore your options and make a decision that will benefit your dairy operation. All options must be considered to make a good decision. Expansion is a three-phase process involving 1) financial evaluation, 2) design, and 3) construction.

Financial Evaluation

Conducting a financial evaluation is extremely important to determine how realistic an expansion of the dairy operation would be. A Michigan study indicated that 68% of expanded farms experienced cash flow problems for 2 yr; of those, 34% had serious cash flow problems. Results from a second study evaluating productivity in New York dairy farms from 1989 to 1992 indicated that farms that expanded 30% had the highest increases in debt per cow and operating expenses per cow. This group of dairies also had the largest increases in net farm income, return on investment, and milk sold per worker.

Producers desiring to expand need to consider the amount of capital that is available for expansion, the return to the dairy expansion compared with use of equity for other investments, and the cash flow benefits from the expansion. Producers typically are required to contribute 30 to 40% of the expansion cost in some form of equity. They should determine the current cost of production per hundredweight and the marginal revenue per cow, as well as the income from the expanded herd to estimate the amount of debt the expanded herd might carry.

Designing a New Milking Center

Design-Build Concept

Many owners and managers who have made the decision to expand prefer to use the design-build concept or a design team. These concepts specify that management employs a dairy design consultant to develop a basic design and program plan to meet the client's needs. The design team consists of an agricultural engineer and supporting dairy management specialists, which could

include dairy extension faculty, nutritionists, milking equipment manufacturers, and veterinarians. This team approach is an efficient way to integrate desired management into physical facilities.

Parlor Performance

Performance of milking parlors has been evaluated by time and motion studies to measure steady-state throughput. This does not include time for cleaning the milking system, maintenance of equipment, effects of group changing, and milking the hospital string.

Parlor performance in the U.S. ranged from 25 to 401 cows per hour. Throughput ranged from 84 to 401 cows per hour in parallel parlors and from 60 to 205 cows per hour in herringbone parlors. Performance within a parlor type or size may vary because of construction, milking frequency, detachers, premilking hygiene, and number of operators. The effects of these factors on parlor performance in both remodeled and new facilities are listed below:

- Data collected in parallel milking parlors indicate that milking cows 3× per day versus 2× per day increases throughput by 8 to 10%.
- The use of detachers does not increase throughput with the same number of operators. The use of predip milking hygiene reduces parlor performance by 15 to 20%.
- The average number of cows milked per operator hour decreases as the number of operators increases from 1 to 4.
- Steady-state throughput is 10 to 12% higher in new parlors than in renovated parlors.
- Parlor performance may be decreased by increased milk production per cow.

Sizing the Milking Parlor

The milking parlor should be large enough to allow management the flexibility to incorporate premilking hygiene routines. Many large dairies will maximize the number of cows that can be milked through a parlor. In this situation, milking parlors should be sized so that all cows can be milked once in 8 hr when milking 2× per day, once in 6.5 hr when milking 3× per day, and once in 5 hr when milking 4× per day. Using these criteria, the milking parlor will be sized to accommodate cleaning and maintenance. In smaller dairies or diverse operations when the time allowed for milking is limited (6 to 10 hr/day), reducing the number of hours the parlor is used will reduce the return on investment.

Milking parlors need to be designed so that one group can be milked in 30 to 60 min, depending on milking frequency. Observations on commercial dairy farms indicate that a group of cows should be milked in 60 min when milking 2× per day, 45 min when milking 3× per day, and 30 minutes when milking 4× per day to minimize the time cows stand on concrete and the time cows are kept away from feed and to ensure comfortable housing. Group size should be divisible by the number of stalls on one side of the milking parlor to maximize parlor efficiency by having as many stalls as possible per cycle. Typically, size of the milking parlor should be based on the assumption that the parlor can be turned over 4.5 times per hour. The number of cows that will be milked per hour can be calculated using the following formula:

Total no. of stalls × turns per hour =
cows milked per hour (CPH)

The number of milking cows can be calculated using the formula below:

no. of milking cows = CPH × shift length (hours)

Holding Pens

Holding pens should be designed to allow 15 square ft per cow and to hold at least one group of cows. Many producers oversize them by 25% to allow the second group to be moved into the

holding pen while the first group is still being milked.

Exit Lanes

Exit lane width is dependent on the number of stalls on one side of the milking parlor. In parlors with 15 stalls or fewer per side, a clear width of 3 ft is acceptable. For parlors containing more than 15 stalls per side, a clear exit lane width of 5 to 6 ft is preferable.

Operator Pits

Operator pits are typically 8 ft wide between curbs. The cow platform is 38 to 40 inches above the floor of the operator pit. Provisions should be made to allow for floor mat thickness, if mats are to be used. The curb of the cow platform typically overhangs the operator pit wall by 9 inches. Normally, the operator pit and cow platform should have a 1% slope to the rear of the milking parlor. Operator pits typically have 2 inches of side slope from the center of the pit to the pit walls.

Constructing the Milking Parlor Shell

Several options are available for constructing the shell of the milking parlor. If no future expansion is planned, the building can be constructed with no room for expansion. This often is done in situations in which acreage is not sufficient for expansion. When long-term plans include expansion, the shell can be constructed with room to add a second parlor or add stalls to the existing parlor. If a second parlor is to be added at a later date, usually the two parlors would share a common equipment and milk storage facility. If additional stalls will be added to a parlor, space should be left in the front of the parlor to reduce cow entry time. The holding pen should be sized for the total number of cows that will be milked after the expansion. The milking facility should be ventilated properly to maintain employee and cow comfort. Office, meeting room, break room, and rest room facilities should be incorporated to meet the needs of management.

Renovating a Parlor

Another option is to renovate an existing milking parlor, provided acreage is sufficient for additional pens and waste management needs. If an existing milking parlor is to be updated to include these activities, appropriate measures must be taken to ensure that the waste management system can handle any expected increase in waste water flows. Storage ponds must be evaluated to ensure that adequate waste water storage is available. Finally, the acreage available for manure and effluent application must be evaluated to determine how many cows can be accommodated in the facility.

Often, a herringbone parlor is converted to a parallel or parabone parlor to increase the number of stalls without increasing building size. The distance between the front of the stalls to the wall of the parlor should be a minimum of 6 ft to take advantage of rapid exit stalls. If a standard exit is used, the number of cows milked per hour will be reduced by the number of stalls on one side of the parlor. Often, exit lane width is too narrow, slowing down cow exit from the parlor. The holding pen usually needs to be expanded when a parlor is remodeled. The refrigeration system and milk storage may need to be increased to compensate for additional milk production. The vacuum system also may need to be upgraded.

Selecting Cow Housing

Selecting the type of housing is an important decision that should be made with the lactating cow in mind. Several of the new large dairies in southwest Kansas have built drylot facilities versus freestalls. The climate in northeast Kansas does not allow the option of building a drylot facility to house lactating dairy cows. However, various configurations of freestall barns will work. My preference is to build a 2-row or 4-row freestall barn. I would be concerned about the level of heat stress and the limited feeding area in 6-row freestall barns. Producers building 6-row barns may want to seriously consider mechanically ventilating them. It is essential that freestall barns are ventilated properly and the stall dimensions are correct. Figure 1 shows the recommended dimensions for freestalls. Freestall housing should be constructed to pro-

vide good natural ventilation. Sidewalls should be 12 to 14 ft high to increase the volume of air in the housing area. The sidewalls should be able to open a minimum of 50% and preferably 75 to 100%. Fresh air should be introduced at the cow's level. Curtains on the sides of freestall barns allow management greater flexibility in controlling the environment around the cow. Because warm air rises, steeper sloped roofs provide upward flow of warm air. Roof slopes for freestall housing should range from 4/12 to 6/12. Roofs with slopes less than 4/12 may have condensation and higher internal temperatures in the summer. Providing openings in addition to alley doors on the end walls will improve summer ventilation. Gable buildings should have a continuous ridge opening to allow warm air to escape. The ridge opening should be 2 inches for each 10 ft of building width. Naturally ventilated buildings should have a minimum of 50 ft between structures.

In the Midwest, freestall barns typically are oriented east to west to take advantage of sun angles and provide afternoon shade. Producers who orient barns north to south will have to construct an overhang on the west side adequate to shade stalls in the afternoon. Freestall barns should be located as close to the milking center as possible without restricting ventilation. The goal is to reduce the distance cows have to walk to and from the milking parlor. Field observations indicate that distance from the gate of the housing area to the gate of the holding pen should be a maximum of 1200 ft for 2× milking, 900 ft for 3× milking, and 700 ft for 4× milking.

Water Availability

You should remember that high producing dairy cows can consume between 30 to 50 gallons of water per day. Water should be provided to cows leaving the milking parlor. In parlors that are double 25's or smaller, one trough 8 ft long is usually sufficient. In freestall housing, water should be located at all crossovers, allowing one waterer or 2 ft of tank perimeter for 10 to 20 cows.

Number of Crossovers

Crossovers should be provided every 60 to 80 ft, or a row of 15 to 20 stalls. Crossovers are typically 10 to 12 ft wide. Oftentimes, producers reduce the number of crossovers in freestall barns to reduce construction costs. This is not a good alternative from a cow's point of view. Reducing the number of crossovers limits the cow's access to feed and water. It also reduces the total length available to construct the feedline. Very few producers stock freestall barns at one cow per stall. The tendency is to overstock freestall facilities. Therefore, cows suffer when the number of crossovers is reduced.

Groups of Cows

Typically, large dairies would have eight strings or groups of milking cows. They also would include pens for slow milking cows, mastitis cows, fresh cows, dry cows, and springers. The slow milking pen should have capacity for 2% of the milking cows. The fresh pen and mastitis pen should each have the capacity for 1% of the milking cows. A minimum of two dry cow pens and one pen for springers usually is constructed.

Construction

Construction of a new facility or remodeling of an existing facility is a time-consuming process. In general, a minimum of 4 to 6 months is needed to construct a new facility. Because managers want to generate income as soon as possible, cows often are ready to calve before the milking center is complete. Adequate time should be allowed for construction delays because of weather and other uncontrollable variables.

Dairy producers remodeling an existing barn need to consider how cows will be milked during renovation. Options include: leasing an alternative facility; constructing temporary facilities; moving cows to another dairy during the construction; or remodeling one side of the parlor, while milking cows on the other. Everything possible should be done to minimize stress on the cows during this process and prevent losses in milk production.

Increasing Cow Numbers

Producers should strive to increase lactating cow numbers as soon as the facilities are completed. Realistic goals should be set to purchase the cows and move them into the new facility. Establishing milk flow as soon as possible is desirable; however, many producers have struggled with heifers calving before the new facility is complete. Producers should work with their veterinarian to minimize the risk of bringing infectious diseases into the herd. Purchasing heifers versus cows will minimize the risk of inheriting another herd's mastitis problem.

Producers who aggressively purchase heifers often underestimate the facilities and labor required when a large number of animals calve in a short period of time.

Summary

Expansion is a drawn out and sometimes tedious process. However, dairy expansions have been rewarding for many producers. Evaluating all your options is important. The guidelines in this report are benchmarks to help you get started and may have to be modified when applied to your dairy operation. Good luck in your future plans!

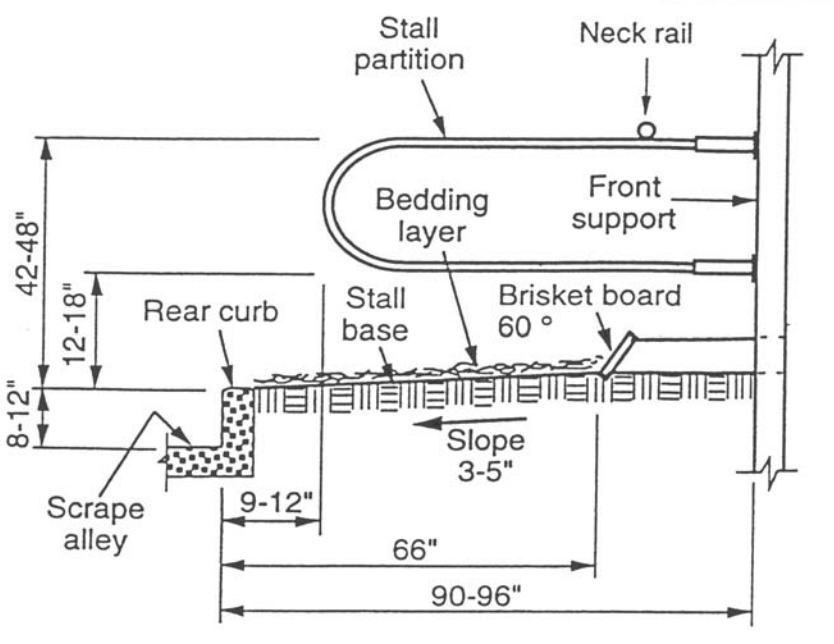

Figure 1. Freestall Components and Dimensions.

Source: Dan McFarland, Extension Engineer, and Robert Graves, Professor, Department of Agricultural and Biological Engineering, The Pennsylvania State University, University Park