National FFA Convention - Dairy Cattle Housing and Facilities Scenario
October 2018

Scenario

You received a call from Felecia and Francis Arneson, owners of FFA Family Dairy, located in the Southeastern US. The Arnesons are in the process of expanding the farm as their daughter, Faith, has been working on the farm for several years after graduating from college and would like to become a partner in the dairy operation. The Arnesons have called you to get your advice on helping with the expansion and addressing some challenges they are currently seeing with housing for their dairy herd as they work towards the full expansion and increasing cow numbers.

Herd Overview

FFA Family Dairy had been milking about 500 Holstein dairy cows, but they are currently increasing cow numbers as they hope to increase the size of their milking herd to 1200 lactating cows over the next year. They have been breeding all of their heifers and many of their lactating cows to sexed semen for the past 3 years in anticipation of the expansion. Additional labor needed to handle this expansion is available on this farm as another enterprise is being scaled back. At this time, they are up to 800 cows and heifers milked daily. The farm currently has a rolling herd average of 28,200 lbs of milk. Prior to the start of this expansion, the herd averaged 3.9% milk fat and 3.15% protein with a SCC of 180,000 cells/ml. However, daily milk production has been falling over the past 6 months and cows are now down 6 lbs of milk per day compared to a year ago after taking into account the current number of days in milk. In addition, milk fat is down to 3.7% even though the ration and particle size of the TMR are very similar. Somatic cell count has increased to 240,000 cells/ml.

Right now, cows are milked 3 times a day in a double-12 parallel milking parlor. It takes cows 15 minutes to enter, complete the milking process, and exit the parlor. The plan is to build both a new parlor for milking the entire herd and a new free stall barn to accommodate the increased number of cows for the expansion. The current facility has plenty of land surrounding it on all four sides to accommodate the expansion of facilities.

Figure 1. Automatic feed pusher that pushes up feed every hour for 22 hrs per day.

FFA Family Dairy is feeding one TMR ration to all lactating cows except for the fresh cows that are receiving a TMR formulated especially for their nutritional needs. The rations were properly balanced by a nutritionist to meet the nutrient needs of the fresh cows and lactating cows and are accurately mixed and fed twice a day at 6:00

am and 6:00 pm. Feed is pushed up every hour for 22 hrs daily using an automatic feed pusher and nutrition is not a concern for the dairy at this time.

Heat detection is done using an activity-monitoring technology. In addition to helping detect cows in heat, this technology measures the amount of time cows spend resting in the free stalls. Lying times have decreased by 1.5 hours within the past 6 months.

The milking herd is housed in two 4-row free stall barns (Figure 2).

Pen 1: 96 stalls – High production cows - 2nd lactation and greater
Pen 2: 96 stalls – High production/Mid-lactation cows - 2nd lactation and greater
Pen 3: 96 stalls – Early lactation & breeding cows - 1st lactation
Pen 4: 96 stalls – Late lactation cows - 1st lactation
Pen 5: 96 stalls – Late lactation cows - 2nd lactation and greater
Pen 6: 36 stalls – Fresh cows - 1st lactation and greater
Pen 7: 36 stalls – Close up dry cows and heifers
Pen 8: 96 stalls – Mid-lactation cows - 1st lactation and greater (previously far-off dry cows and springing heifers)

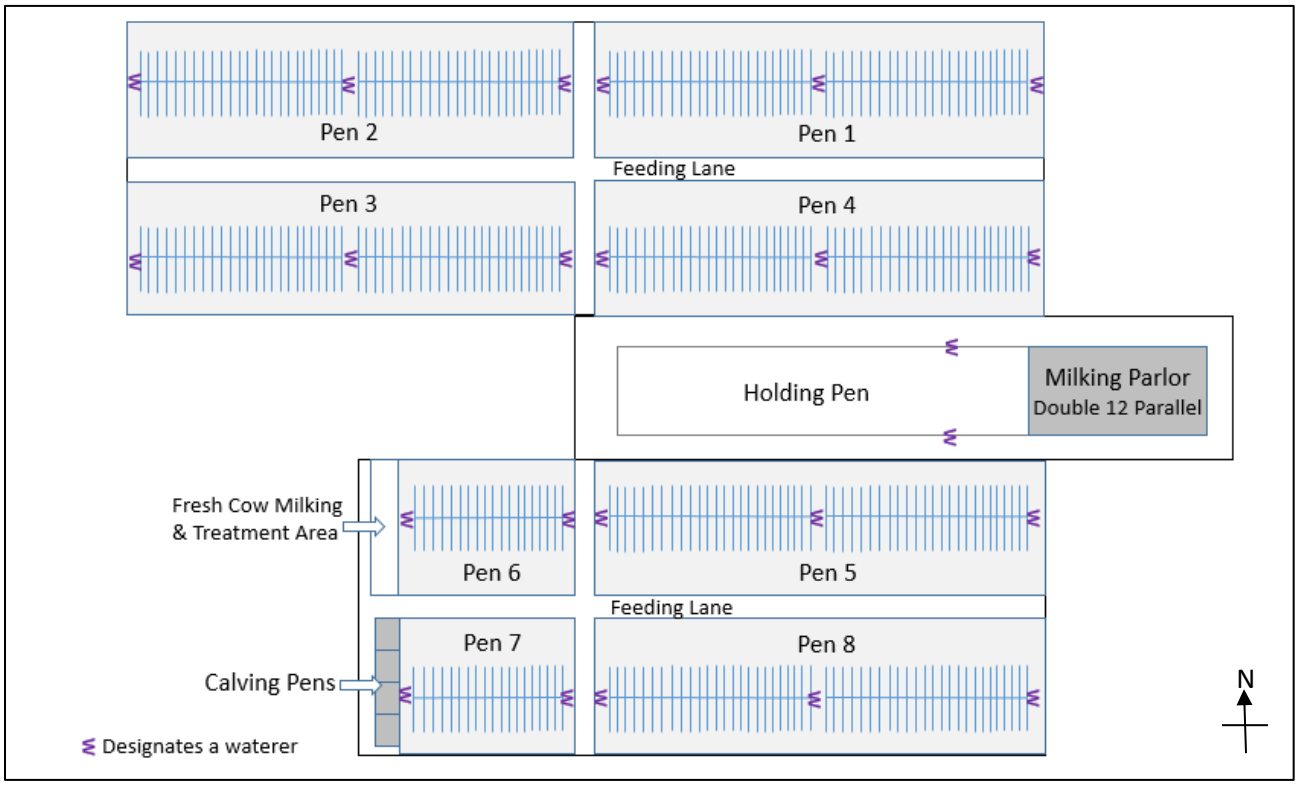

Figure 2. Diagram of the barns, holding pen, and milking parlor. (Drawing is not to scale)

The stalls in the free stall barns have mattresses bedded with wood shavings. New bedding is added 2 times per week (Figure 3). The stalls are correctly sized for Holsteins according to the latest university recommendations.

Figure 3. Picture of the stalls in the free stall barn in the high cow group (Pen 1).

Each group of cows housed within a pen are brought to the parlor together and are returned to the pen after the last cow is milked.

The free stall barns are all equipped with fans (over each row of free stalls and at the feedbunk) and soakers (at the feedbunk) that are on automatic timers and are programmed to go on at the appropriate temperature-humidity index (THI) according to the most current university recommendations. Fans and soakers in the holding pen are also on the same programmed schedule.

The springing heifers and all dry cows had previously been housed in the free stall barn. Because of the need for extra barn space, both pens for the far-off dry cows (from dry off to 21 days prior to calving) and springing heifers have been switched to housing for the lactating cows. The springers and far-off dry cows are now being housed in a pasture that has a feed bunk along a dirt lane on one side of the pasture. No shade or housing structures are provided in the pasture or over the feed lane and bunk.

Figure 4. View of the current dry cow and heifer pasture.

In addition to an overall evaluation of the current farm program, Felecia has a few specific questions for you:

- What would you recommend they build for a new milking parlor? What type of parlor should they put in and how many stalls should it be? Where would the new parlor be located?

- What factors are important to consider when determining the sizing and placement of a new free stall barn(s)? How many cows do you recommend for each pen in the new free stall barn and how many stalls should be in each pen?
    - How many cows should the holding pen be built to accommodate?

- What explanations do you have as to why milk production has fallen over the past year?

ANSWERS

Answers to the Questions:

Parlor

Different styles of parlors could be built to accommodate the expansion and replace the existing parlor.

- Parallel/Parabone/Herringbone Parlor – The parlor would need to be a minimum of a double-20 in order to the milk cows 3 times a day and allow time for cleaning. A parallel parlor would reduce walking time for the cows and the workers as compared to a parabone or herringbone parlor. A parallel parlor would also reduce the challenges of transitioning to a new facility as that is what the cows are currently used to. Building a traditional parlor would also allow for the old barn to continue to be used as the pen sizes would still be reasonable for milking groups.
- Automatic milking units/Robots – If robots were installed, a minimum of 20 robots would be needed to milk the 1200 cows. Remodeling the old free stall barns to make sure they could still be used could potentially be a challenge.
- Rotary parlor – This herd is on the small side for a rotary parlor. Only about a 40-cow rotary would be needed for milking the cows. With the small rotary parlor, there would be a lot of labor needed for milking the 1200 cows. Having robotics on the rotary parlor to reduce labor needed for milking would be possible.

The parlor could be placed to the north of the current lactation free stall barn and an additional free stall barn(s) could be built to the north of that. Changing the placement of the parlor also allows the construction of the new facility to occur while milking in old parlor.

Barns & Pens

Although there would be some options as to where to build the new barns and facilities, building them north of the current location would be the most likely choice as the current lactation barn could be easily connected to the new parlor.

- Factors that should be considered in sizing and locating the barns/pens:
  - The groups of cows (dry cows, fresh cows, high cows, 1st versus later lactation cows, etc.) that will need to be housed in the facilities
  - All cows should have a stall, feed space, and water available at all times
    - 24 inches of feed space for lactating cows and 30 inches of feed space for transition cows (fresh and close-up dry cows) should be available
  - The size and type of parlor will determine the size of the pens
    - Cows should be out of their pen for no more than 3 hours per day for milking.
  - Movement of cows between the parlor, holding pen, and between pens should be considered.
  - Barns should be oriented east/west to minimize sun exposure within the barn and take advantage of prevailing winds.
  - The cost of building

- The amount of labor it will take to manage cows in the facilities (including moving cows to/from the parlor, moving cows between pens, handling cows for daily management such as shots or treatments, etc.)

  - Example - The north barn has 384 stalls, thus an additional 816 stalls would be needed to provide stalls for 1200 lactating cows. If only a double 20 parlor is built, the pens should only be sized to house 160 cows to reduce the time out of the pen to 1 hour at each milking (3x milking). This means that at least 6 pens would need to be built for all of the cows to have their own stall and to be able to be milked in the recommended amount of time.

Assuming that the farm would like to have the dry cows and springing heifers in a cooled barn to prevent heat stress as is recommended, the entire, current south barn would be needed to accommodate the dry cows and springing heifers. This would leave the north barn with the potential to still be used for lactating cows.

The size of the holding pen will be somewhat dependent on the milking system and the size of the parlor. The holding pen should be built to accommodate enough cows to ensure that all of the cows will be able to be milked in one hour, which is the recommended maximum amount of time that cows should be in the holding pen per milking if cows are being milked 3 times a day. For an example, if the parlor is a double 20 with 4 turns per hour, the holding pen should be built to accommodate at least 160 cows as this is the number of cows that would be able to be milked per hour.

<u>Reduction in milk</u>

Because of the expansion, cows are now <u>overcrowded</u> in the pens as there are only enough stalls for approximately 612 milking cows (6 pens with 96 stalls each and one pen with 36 stalls for fresh cows; close-up pen houses cows before calving and are not milking cows) with a current overstocking density of 1.31 (not 1.24) cows per stall. This overcrowding has likely led to the following issues:

- Reduced lying times for the cows due to limited stall space.
- Reduced eating times for cows due to limited space at the feed bunk. This is likely to have a much greater negative impact on close up dry cows and fresh cows.
  - The change in eating time has resulted in greater sorting of the TMR at the bunk. This has led to a reduction in the milk fat of the cows.
- The overcrowding, including the reduced lying and eating times, will increase stress levels in the cows. The additional stress can reduce the cow's abillity to fight infections and could be contributing to the higher SCC counts.
- Fresh cow pen contains a mixture of first and later lactation cows and is also overstocked.
- In addition, the close-up pen is overstocked.
- The herd contains a higher percentage of first-lactation cows which generally give less milk.

Increasing SCC:

Figure 3 shows that the stalls do not have adequate bedding on the mattresses resulting in dirty cows with potential for increased hock lesions. The lack of bedding could also be contributing to the increased SCC.

The dirt feed lane and muddy conditions could also potentially lead to increased mastitis cases and higher SCC counts in heifers and cows at freshening.

Additional Reasons for Reduced Milk Production:

Since the move to the outside pasture lot, the dry cows and heifers have not had any cooling or way to minimize heat stress. Current research data has found cows experiencing heat stress during the dry period have an average reduction in milk production of 8-10 lbs throughout their next lactation. This negative impact has been found to carry on to the daughters born to the cows that experienced heat stress during their lactation and they will also experience an average reduction of 10 lbs/day of milk compared to herdmates that were cooled. At a minimum, a shade structure should be provided for the dry cows and heifers. Ideally, there should be space in the free stall barns to house this group of cows to allow them to be cooled with fans and soakers throughout their dry period.