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THIS GUIDE WAS DEVELOPED TO:

- HELP farmers compete, prosper, and create successful and fulfilling dairy operations.
- ENCOURAGE producers of different types, sizes, and philosophies to coexist and cooperate, recognizing that there is no single "perfect" production system.
- OFFER options that can provide market access to beginning and specialty dairy producers, regardless of size.
- BUILD upon the expertise and experience of noted authorities, including producers.
- SUPPORT dairy production in the Upper Midwest as a vital contribution to agriculture, communities, and the economy as a whole.
- SERVE as a resource for producers who want to evaluate different dairy options.

WHAT THIS GUIDE WILL HELP YOU DO:

- CLARIFY your dairying goals.
- UNDERSTAND the range of dairy options you have in the Upper Midwest.
- IDENTIFY options that fit your strengths, interests, and resources.
- ENCOURAGE further planning, discussion, and networking.
- PROVIDE contact information to research areas of interest on your own.

WHAT THIS GUIDE WILL <u>NOT</u> DO:

- COVER every system or combinations of these used in the Upper Midwest.
- PROVIDE state-of-the-art technical data.
- REPLACE the expertise and counsel of breeders, nutritionists, veterinarians, engineers, accountants, attorneys, extension agents, contractors, and consultants.
- GUARANTEE success, sustainability, or personal satisfaction.
- MAKE decisions for you.

HOW YOU CAN USE THIS GUIDE:

- SKIM the entire guide (to get an overview).
- START at the beginning and read straight through to the end.
- READ sections of greatest interest (to satisfy an immediate need or curiosity).
- PERSONALIZE your guide— highlight or circle important ideas.
- REFER to additional resources listed for more information that will help you make decisions.

INTRODUCTION

Whether you are a beginning farmer or a current dairy farmer thinking of making some changes to your operation — if you want think more about dairy systems that will best fit your goals and resources — this book is for you. We've talked to many dairy producers and other dairy experts in Minnesota, Wisconsin, and Michigan in order to present complete, unbiased, side-by-side comparisons of many dairying options.

This book is not intended to be a how-to dairy guide or manual. While there is no one-size-fits-all answer for dairy farmers seeking success as milk producers, there are many options that can be profitable and satisfying. This publication was created to provide information that will help producers explore the many choices available for today's dairy farms.

You may want to read the book from beginning to end, or you may want to skip around in it looking for sections that interest you the most. Throughout the book, you'll find profiles of real world dairy farmers in the Upper Midwest who are using the systems described in the book. These will give you an on-the-farm sense of the different production systems and people who use them.

We recommend that you begin by working through the self-assessment questions at the beginning of the book. They will help you evaluate:

- your skills, interests and values
- your current assets in buildings, livestock, and capital
- the kind of farming work you prefer
- your family's interests and goals

Keep your own strengths and interests in mind as you read about the different production systems described in this book. At the end of the book, a second set of questions will help you sort through the information that you've read and determine which systems appeal to you the most and might be good fits with your situation.

At the end of each chapter and at the end of the book, we've listed resources and contacts you can use for further information and research. These will be critical to help you take the next step in planning your dairy enterprise.

Think of this book as an *à la carte* menu. Help yourself to what interests or makes sense to you from any chapter. You hold the keys to a flourishing dairy operation. Reading this book is only the first step.

Photo courtesy of National Dairy Council.®

TAKE STOCK OF RESOURCES AND GOALS: PART 1

Your goals for your farm and for your own satisfaction are critical to the success of any production method you choose. Before you begin reading this book, answer the following questions to help stimulate your thoughts and ideas regarding the past and future of your farm and all those involved running it. Keep these questions in mind as you read about the different dairy production and management systems. At the end of this book you'll find another set of questions to help you further clarify what might fit you best.

WHAT DO YOU ENJOY DOING?	LIKE BEST									LIKE LEAST
Working alone	10	9	8	7	6	5	4	3	2	1
Supervising others	10	9	8	7	6	5	4	3	2	1
Delegating responsibilities	10	9	8	7	6	5	4	3	2	1
Using farming methods I know well	10	9	8	7	6	5	4	3	2	1
Learning about and incorporating new technology	10	9	8	7	6	5	4	3	2	1
Working on a seasonal basis	10	9	8	7	6	5	4	3	2	1
Keeping careful production records	10	9	8	7	6	5	4	3	2	1
Managing farm finances	10	9	8	7	6	5	4	3	2	1
Analyzing records	10	9	8	7	6	5	4	3	2	1
Making changes and improvements to the farm	10	9	8	7	6	5	4	3	2	1
Working with and managing animals	10	9	8	7	6	5	4	3	2	1
Milking dairy cows	10	9	8	7	6	5	4	3	2	1
Growing crops	10	9	8	7	6	5	4	3	2	1
Managing forage/silage/haylage storage	10	9	8	7	6	5	4	3	2	1
Working with machinery	10	9	8	7	6	5	4	3	2	1
Inside work	10	9	8	7	6	5	4	3	2	1
Outside work	10	9	8	7	6	5	4	3	2	1
Seasonal work	10	9	8	7	6	5	4	3	2	1
Steady, year-round work	10	9	8	7	6	5	4	3	2	1
Having time off for social activities and vacations	10	9	8	7	6	5	4	3	2	1

RANK THE ITEMS THAT, FOR YOU, DEFINE SUCCESS.

	MOST IMPORTANT									LEAST IMPORTANT
Paying off debt without falling behind	10	9	8	7	6	5	4	3	2	1
Being debt-free	10	9	8	7	6	5	4	3	2	1
Farming full-time	10	9	8	7	6	5	4	3	2	1
Farming part-time	10	9	8	7	6	5	4	3	2	1
Building a business that can support several families within my family	10	9	8	7	6	5	4	3	2	1
Taking time to rest, vacation and attend social activities	10	9	8	7	6	5	4	3	2	1
Being able to set money aside for down times and retirement	10	9	8	7	6	5	4	3	2	1
Having a surplus to share with others in need	10	9	8	7	6	5	4	3	2	1
Working together as a family on the farm	10	9	8	7	6	5	4	3	2	1
Generating 100% of my income from the farm	10	9	8	7	6	5	4	3	2	1
Continuing to farm on my family's farm	10	9	8	7	6	5	4	3	2	1
Expanding my dairy herd	10	9	8	7	6	5	4	3	2	1
Reducing my dairy herd	10	9	8	7	6	5	4	3	2	1

NOTES:

CHAPTER 1: TIE STALL HOUSING OVERVIEW

In the Midwest, red barns and blue silos are the traditional signs of a dairy farm.

Background

World War II is a historical landmark that provides a reference point for change in the dairy industry. At that time, mechanization became popular in many industries, and dairy was no exception. In the Upper Midwest, dairy farms were historically pasture-based. Winter brought snow cover, wind, and conditions that motivated many farmers to keep their herds in the barn. Most barns had stanchions separating each cow and cows were tied here during the winter.

In the 1950s, farmers began providing cows with a communal resting or "loose housing" area. This management method continued to grow in popularity, but most farms in Minnesota and Wisconsin did not move to this design because frequent bedding additions were necessary in order to keep the cows clean.

After the war, many farms moved to year-round confinement, using pasture only to feed replacement heifers and dry cows. Round-the-barn pipelines became available, moving milk quickly to the milk house. The tie stall barn was easily retrofitted with this technology. The tie stall system predominated in Minnesota and Wisconsin, partly due to tradition. Upright silos and silo unloaders became the mainstream solution to storing and delivering feed to the cows.

Housing and bedding

In a tie stall barn, each cow is housed in her own stall. In front of her, she has a manger for forage, silage, and grain. A water cup is situated between each pair of cows. The stall is designed to be spacious enough to allow the cow room to rise and to lie down. All cow care and milking is done at each cow's station. The building designs and internal layouts may vary, but the general theme is consistent: cows are cared for individually. Everything a cow needs is delivered to her.

Stalls separate cows, yet allow room for the cow to be milked. As the size of the typical Holstein cow has grown, stall sizes have had to increase as well. Many stalls use rubber mattresses blanketed with a layer of chopped organic material, which may be old hay, corn stalks, or newspapers. Others do not use a mattress under the bedding.

Bedding provides the cow a comfortable, warm, and dry place to rest. A cow's comfort is key to her productivity. Producers remove wet and soiled bedding and replace it with clean bedding material several times a day.

For complete information on new and refurbished milking centers, see Chapter 8, *Milking Center Options*.

CHAPTER 1: **TIE STALL HOUSING OVERVIEW**

A variety of shapes, sizes, and styles of silos can help tell the history of a dairy farm.

Feeding

By the 1960s, many farms had erected upright silos to store forages. Some tie stall producers use carts to deliver feed to the cows. Others have an open lot where cows are released to eat silage conveyed directly from the silo into a feed bunk.

Some tie stall operations have invested in a feed mixer and feed their cows a total mixed ration (TMR). Others prefer to feed forage, grain, and supplements separately. Sometimes cows sort out what they like and leave behind less favored feed, so farmers may remove uneaten materials from previous feedings to encourage cows to eat a balanced diet.

Herd health and biosecurity

Cow comfort is at the forefront of any herd health plan, because dry, comfortable cows are less vulnerable to infection and disease. Because animals are housed indoors, farmers monitor and trim hoofs to maintain cow mobility, comfort, and milk yield. To ensure that the barn is properly ventilated, producers monitor the temperatures and humidity. Some older barns are retrofitted with fans or tunnel ventilation to help cool the herd in the summer heat.

Biosecurity also plays a role in health. Visitors may be required to put on plastic boots or wash their boots before entering a building.

Producers often incorporate a regular veterinarian visit to monitor herd health and reproductive problems. Vets check for pregnancy and health after calving, and administer vaccinations.

One advantage to tie stall production is the individual attention given to each cow. Monitoring each cow's health and comfort is simplified. Farmers report that they can assess body condition and well-being during milking and can individualize diets by feeding grain and supplements according to evaluation of production. If a cow is not consuming all of her feed, it may be an indication of health problems — such as ketosis, a displaced abomasum, or metritis — that need attention.

To prevent disease transmission from cows to calves, heifers and bull calves are typically taken from their mothers soon after calving and kept away from the rest of the herd. Using individual housing facilities for heifers adds to the cost of producing replacement animals, but hutches or pens isolate heifers, preventing contact with manure from other animals and nose-to-nose contact between heifers.

Some farms use self-contained nurseries with individual pens to house the calves (David Kammel, personal communication, 2004). In some cases, convertible housing is possible: dividing walls can be removed to allow for group housing of weaned heifers. Depending on the facility, costs associated with labor and labor efficiency may vary.

Calves are well adapted to grazing, with some supplemental grain, after five or six months. Although animals can be put out on pasture after they are weaned (usually between four to eight weeks of age), when they are this young

CHAPTER 1: **TIE STALL HOUSING OVERVIEW**

it is difficult for them to consume enough forage to grow at an acceptable rate. Typically, calves do better with 2 to 5 pounds of supplemental grain until they are 6 to 10 months old. Fenced pasture is the least expensive option for feeding and housing older replacement heifers (Dennis Johnson, personal communication, 2005; David Kammel, personal communication, 2004).

After freshening, a cow's nutrition and health must be carefully monitored to assure high productivity. Her comfort, body condition, and hoof health contribute to her ability to stand, eat, and produce milk. Occasionally, farmers monitor each animal's body temperature as a health indicator. Some farms conduct on-farm milk testing in order to monitor the somatic cell counts of individual cows. To avoid infections, farms incorporate careful sanitation of milking equipment. Tie stall farmers generally treat infections with antibiotics, but some bacterial strains have become resistant to antibiotics. Many tie stall farms keep closed herds and replace cull cows with heifers raised right on the farm. This practice minimizes exposure to foreign bacteria and viruses.

Genetics and breeding

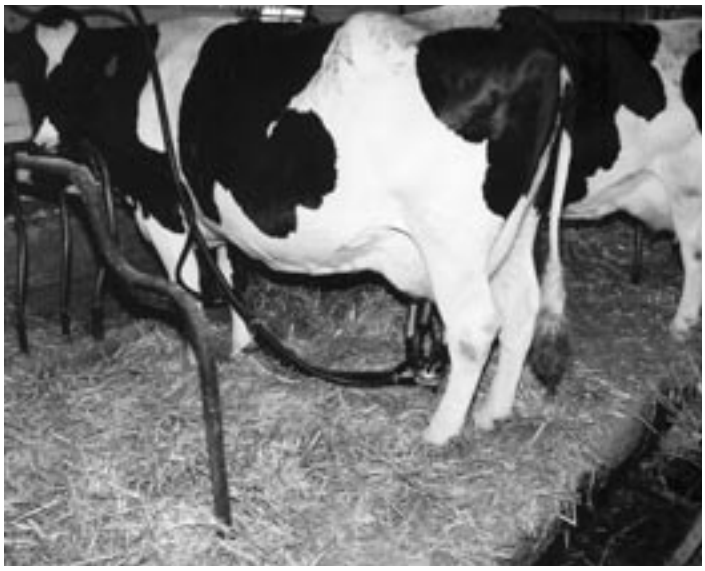
In a tie stall barn, most animals are bred using artificial insemination (AI). Holsteins are the predominant breed, partly because of tradition and partly because they produce the greatest volume of milk per cow. Other breeds include Jersey, Brown Swiss, Ayrshire, Guernsey, and Milking Shorthorn. With the use of a few popular AI sires, U.S. Holstein populations have become closely related and highly specialized. This lack of diversity may account for diminished fertility and increases in reproductive problems in recent years (Hansen, 2000; Dennis Johnson, personal communication, 2005). Estrus (heat) detection is difficult when animals are tied in the barn. Allowing animals to move around in a lot or paddock increases the ease of detecting when a cow comes into heat. Some operators use hormone injections to synchronize heat.

Milking

Operations with tie stall facilities usually do not have a separate milking parlor (see Chapter 8, *Milking Center Options*.) Instead, the barns feature a round-the-barn pipeline. At each milking, the cows are prepped for milking in their stalls. Farmers milk each cow with a milking machine attached to the pipeline that delivers milk to the milk house. On average, twenty to thirty cows can be milked in one hour.

Labor is not used efficiently in a tie stall barn and this milking system is nearly always a physical strain for those milking. The producer must bend repeatedly; first to dip the teats, then to clean the teats, then to attach the milker, again to detach the milker, and finally to post-dip teats. For a 60-cow herd, this means a minimum of 300 bends per milking. Some farms add automatic detachers to improve the milker's comfort and to provide consistency for the cows.

In addition, nothing separates the cow from the dairy producer, and this proximity can create a safety hazard. The cow may step on feet, kick the person milking her, or crush the milker against the stall sides. Most producers say they feel wear on their bodies as a result of the physical demands of this milking system.



In a tie stall setup, milking units come to each cow in her individual stall.

CHAPTER 1: TIE STALL HOUSING OVERVIEW

Performance and scale

Tie stall herds can exhibit a wide range in productivity, from 12,000 pounds per cow per year up to 30,000 pounds per cow per year for top producing farms. Management may be very traditional, with few production-boosting enhancements, or very intensive, capitalizing on easy individual access to each cow. In Minnesota, the culling rate is about 33 percent, according to FINBIN records[1] (UMN-CFFM). Herd management plays a role, impacting feed quality, herd health, cow comfort, and any of the numerous factors that can impact milk yields and influence somatic cell counts.

One advantage of the tie stall farm is the ability to retrofit older buildings and feed storage facilities. This strategy can mean lower debt loads, and may help some farms survive fluctuations in milk prices. Herd size varies greatly, from farms with as few as 10 cows to as many as 200, with the most typical size herd size between 60 and 90 cows (Dennis Johnson, personal communication, 2005). The larger herds usually milk in shifts, and are not common.

Manure management

Manure handling contributes to the high labor demands of this barn style. Most tie stall barns have a gutter cleaner consisting of a chain with a set of paddles. This equipment runs through a gutter positioned behind the cow, removing manure by dragging along the gutter. The gutters are positioned between the cows and alleys, and the alleys are scraped or swept by hand. Producers must be present to operate the system and remove the scraped waste from the barn. Some operations have a manure-holding facility, but many others spread the manure daily. Spreading may be possible even in winter, as long as the land is not too steeply sloped or too near sensitive areas where runoff may occur.

Manure testing to determine nutrient content and soil testing to determine nutrient needs are important to maximize the fertilizer value of manure. When spreading near tile inlets, care must be taken prevent nutrient leaching. Many farms that have earthen storage basins hire special haulers to spread manure.

Social and environmental concerns

Generally, since the herd size is relatively small in tie stall systems, odor issues are minimal. However, because daily manure spreading is often required, some neighbors might notice the smell. Earthen basins usually have a crust and only emit noticeable odors during agitation.

If you are considering adding or changing a facility, see the *Resources* section at the end of this book.

[1] FINBIN is a farm financial and production database that summarizes actual farm data from thousands of agricultural producers who use FINPACK, a comprehensive farm financial planning and analysis software system developed and supported by the Center for Farm Financial Management at the University of Minnesota. See www.finbin.umn.edu.

CHAPTER 1: **TIE STALL HOUSING OVERVIEW**

TABLE 1: ***Cost of production for tie stall farms (per cow), Minnesota, 2002-2004***

	BOTTOM 40% OF OPERATIONS (in terms of net return)	TOP 40% OF OPERATIONS (in terms of net return)
Total number of farms reporting	**105**	**106**
Feed and bedding	**$1,093.76**	**$1,093.05**
Labor and custom hire	**$164.96**	**$142.60**
Hauling and marketing	**$78.16**	**$79.81**
Health and breeding	**$124.79**	**$130.23**
Total direct costs	**$1,663.46**	**$1,625.83**
Average number of cows	**52.8**	**67**
Detailed reports available at: http://www.finbin.umn.edu/output/52726.htm and http://www.finbin.umn.edu/output/52729.htm		

Source: University of Minnesota Center for Farm Financial Management FINBIN

Note: Costs of production for tie stall, free stall, and grazing systems are compared in a summary table at the end of Chapter 4 (Table 9). Note that these records do not necessarily predict results on any one farm or in all areas for all farmers.

To find current cost of production records for your state, contact:

Michigan
Department of Agricultural Economics
Michigan State University
Christopher Wolf (517) 353-3974 wolfch@msu.edu or
Stephen Harsh (517) 353-4518 harsh@msu.edu

Minnesota
Center for Farm Financial Management
University of Minnesota
(612) 625-1964 or (800) 234-1111
cffm@cffm.agecon.umn.edu

Wisconsin
Center for Dairy Profitability
University of Wisconsin
Bruce Jones (608) 265-8508 bljones1@wisc.edu

CHAPTER 1: TIE STALL HOUSING OVERVIEW

TABLE 2: ***Capital start-up investment cost estimates for a tie stall system***

ADDED TIE STALLS	**$2,500 to $3,000 per stall**
HEIFER HOUSING	**$145/calf to $675/calf**

Source: Holmes et al., 2003; David Kammel, personal communication, 2004

Resource people

The following people contributed information for this chapter. You will find complete contact information in the *Resources* section the end of this book.

Ken and Chad Bohn, tie stall dairy, Litchfield, MN

Dave Combs, professor of dairy science nutrition (dairy nutrition, forage utilization, and grazing systems for dairy cattle), University of Wisconsin

Joe Conlin, dairy herd health consultant, Shoreview, MN

John Fetrow, professor of veterinary medicine, University of Minnesota

Paul Fritsche, tie stall dairy, New Ulm, MN

Linus and Vern Goebel, conventional dairy, Albany, MN

Les Hansen, professor of dairy cattle genetics, University of Minnesota

Brian Holmes, professor (biological systems engineering) and extension specialist, University of Wisconsin

Kevin Janni, professor and extension engineer — livestock housing systems, University of Minnesota

Dennis Johnson, professor and dairy specialist, University of Minnesota

David W. Kammel, professor and extension specialist, University of Wisconsin

Jim Linn, professor and extension dairy nutritionist, University of Minnesota

Jim Salfer, dairy extension educator, University of Minnesota Extension Service

Harold Stanislawski, former livestock business advisor, Minnesota Department of Agriculture

Conventional Tie Stall Dairy with Direct Market Business

Bruce and Cheryl Mohn
Lakeville, Minnesota

Bruce and Cheryl Mohn sport their UdderTech "holsters."

Background

Bruce and Cheryl Mohn of Lakeville, Minnesota, operate what seems on the surface to be a conventional dairy farm family enterprise. They enjoy working together and playing together. As they've adapted to the changeable nature of agriculture, they've made some interesting choices for the sake of the farm and family.

Bruce's Norwegian ancestors roamed a bit before finally settling in New Market Township at the present site of the Mohn family farm. Bruce's great grandfather built the first house and horse barn on the original 80 acres. Grandfather Lars bought the farm in 1901 and, in 1921, constructed the dairy barn that is still used today. Bruce's father, Sydney, bought it from Lars in 1951 and milked until the late 1970s. Bruce bought the farm in 1991.

In 1981, Bruce and Cheryl realized Sydney had a nice facility for milking, and wanted to see it put to use. They decided to restart the operation. They moved a mobile home onto the farm, fixed up the barn, and bought a dairy herd of 45 cows.

Bruce rented 160 acres to add to Sydney's 145 acres, 110 of which were tillable. Sydney helped finance the initial investment of cows, which Bruce paid back in bull calves over ten years. Bruce and Cheryl also secured financing from a bank. They began working in their tie stall and stanchion barn, adding some new stanchions and a new barn cleaner in 1993. Just like many farmers of the early '80s, they were highly leveraged.

Reinvesting in the farm

Back in the mid- to late '90s the Mohns hired a high school student to feed their cows. "We were hand feeding with wheelbarrows," Bruce remembered. In 1998, the couple decided to purchase a portable mixer and feeding cart.

Initially, Bruce thought the mixer and cart would make the jobs easier and less time consuming. The benefit hasn't been in saved time, however. "I used to send the feed down an auger into the feed bunk," Bruce said. "In a matter of minutes, the cows were eating." Mixing means that feeding chores take a bit longer, yet the feeding is more organized. Bruce mixes a batch in the morning, and feeds it outside. While the cows are eating, he mixes the next batch for later in the day.

"I couldn't imagine feeding all the cows one mixture," said Bruce. "But the way I have my ration set up, it works." He said he immediately noticed a 6 pound per cow per day boost in milk production, as well as less ketosis.

Bruce feeds a total mixed ration (TMR) and long-stemmed hay in the morning. The daily TMR consists of corn silage, haylage, and alfalfa hay along with grain mix and cottonseed purchased from the local elevator. Bruce sells some of the hay raised on the farm and uses the proceeds to purchase better quality hay for his herd.

He has used long plastic bagging to store silage and oatlage since the early '80s. "The bags are highest quality method, hands down," Bruce said. While the silage, oatlage, and high moisture shelled corn are all stored in bags, the Mohns use two upright silos to store haylage. The silos, 16 ft by 45 ft and 18 ft by 60 ft, make haylage unloading easier. "I find that the haylage is a lot easier to get out of the silo," said Bruce.

FARM PROFILE: **TIE STALL OPERATION**

Housing and cow comfort

While they still milk in a tie stall barn, the Mohns have made some changes to the building to improve the comfort of the cows and the people in the building. They own 60 Holstein cows (with 50 milking at any one time), plus about 160 young stock. They raise all heifers in groups and raise the bulls for steers.

The cows are housed in a combination of tie stalls and stanchions. They spend roughly six hours outside each day for feeding and exercise. In 1999, the Mohns added stall mats to improve cow comfort. They cover the mats with wheat straw they purchase from a neighbor.

In 2000, the Mohns decided to improve on noisy hanging fans by adding tunnel ventilation. According to Bruce, the new system moves 20,000 cubic feet of air per minute through the barn and has improved ventilation. Even better, it's quieter.

Diversifying

The couple's education eventually helped them find ways for the business to evolve and grow. Both Bruce and Cheryl graduated from Lakeville High School. Bruce then studied sales and marketing at the University of Minnesota–Waseca. After Cheryl attended the University of Wisconsin–Stout, she and Bruce were married in 1980.

The farm is located just fifteen minutes from the suburban ring, and less than a half hour's drive from downtown Minneapolis. Like many farmers, their location limits options for growth. "We're part of the seven-county metro area," noted Cheryl. If they wanted to increase herd size, they would need to sell the farm and buy a new farm in a less populous area.

Because they always aimed to reinvest in their farm, in 1994, Cheryl started a business offering dairy-related tools and clothing by mail order. Cheryl's off-farm income initially went to support this business, called Udder Tech. The business provided an ideal solution to grow. The combined income from the dairy and the Udder Tech business provides the farm with an income equivalent to that of a much larger herd.

Balancing a full-time farm, a full-time business, and raising a family is a big challenge. Cheryl's heart is centered on her family first. "I could work 18-hour days to make this grow faster, but we have kids and I have to live too." To balance this, she subcontracts the sewing to local people who can sew at home.

This year, Udder Tech income is matching their farm income. They expect the Udder Tech business to become the primary breadwinner in the future.

Family mentoring and help

As the new farm business began to mature, the couple found their relationship with Bruce's parents helped the farm pass to the new generation. A separation between Sydney's dairy and their own allowed them the freedom to begin without pressure.

"My dad helped a lot with labor. We did a lot of sharing of equipment," Bruce noted, saying that without this help, he doubts whether he and Cheryl could have gotten started. Sydney helped with planting and tending the crops and taught the fledging farmer management skills.

While growing up, Bruce always preferred to spend time on the tractor doing the tillage. This holds true today. "If my dad had thought I was interested in milking, he would have held on. He would've helped me build a parlor," Bruce said. Yet Bruce never showed an interest in milking cows, and his father did not expand the dairy in hopes that this would change.

Farm management

Currently, Cheryl or their hired help do the milking, which is done twice each day. Bruce isn't interested in the animal husbandry part of dairy farming, and focuses instead on the crop and mechanical aspects of the farm.

The couple doesn't spend much time in recordkeeping, and wishes they did more. They do take the time to figure out what causes stress. Then they address those issues. For instance, they have four different sized stanchions so different sized cows need to be sorted to appropriate locations. Bruce said he would like to put up a free stall system, so they wouldn't have to tie up cows anymore.

FARM PROFILE: **TIE STALL OPERATION**

Herd health and production

The Mohns' production is about 80 pounds per cow per day with a 25,000 pound rolling herd average — almost 10,000 pounds more milk than when they started 1981. Their somatic cell count (SCC) average is about 125,000.

"For animal health, I've been fairly lucky," Bruce said. He attributes some of his luck to a good facility, bedding, and TMR feeding. He uses Posilac® (a synthetic growth hormone that stimulates milk production) on some of his cows, but not on the majority of them. He breeds solely with artificial insemination.

Family future

Bruce and Cheryl want their children to attend college, so they haven't been encouraging the kids to become partners in the farm or Udder Tech just yet. Bruce said he believes that anytime between the ages of 24 to 30 is an appropriate time to turn a farm over to a son or daughter. So far the farm has been big enough to provide and income for one family, but not big enough for a second.

The Mohns do not presently own enough land to expand their dairy, so enterprise diversification is important. "We're happy with the size dairy we have," Bruce said, noting that he feels his farm is among the better managed in the dairy industry. The farm has found another option available for increasing income. "We're thinking a little more diversified than the generation before us," said Cheryl.

CHAPTER 2: FREE STALL HOUSING OVERVIEW

Background

By the middle of the twentieth century, many publications and most of the information provided to dairy farmers recommended housing herds in barns with a bedded pack, which is a single area of bedding where all animals rest. This "new" housing style meant moving the animals out of the tie stall barns that were then in use and adding a separate milking parlor to a farm's facilities. Farmers who adopted the bedded pack discovered quickly that the method required a great deal of labor and investment in bedding. In some cases, poor management led to dirty, damp, or overcrowded conditions.

Health problems surfaced even in the cleanest of these housing environments. Since bedding was scattered around the barn, cows could easily track manure across the pack. They rested wherever they found a comfortable spot, and often picked up bacteria from manure. Sometimes, bacteria produced infections, including contagious forms of mastitis. Researchers and agricultural engineers responded by searching for another housing design with herd health in mind. Out of this process, the free stall barn was born.

Free stall design

Free stall barns allow cows to enter their rest areas in the same headfirst position every time. The reasoning behind the concept was simple: Keep the manure behind the resting area, where it is least likely to come in contact with the teats and cause infection. Many farms across the country converted their barns to free stall units, although many dairies in Minnesota and Wisconsin stayed with tie stall facilities.

Another factor that encouraged the move to this new free stall system was lack of labor. Until the 1950s, most dairy herds were pastured seasonally and housed in stanchion or tie stall barns during the winter season. Shortages in labor forced a change in the management of dairy herds across the country. The free stall arrangement was less labor intensive and offered important advantages for operators as well as cows.

During the past 60 years, several factors have helped shape the free stall barn and numerous advances in technology have been well suited to the free stall system. The importance of herd comfort and health, the benefits of reducing labor requirements per cow, and larger herd sizes all helped shape the free stall barn. Group handling has allowed ease in delivering feed. Parlors have enabled producers to milk in greater comfort and safety, have shortened milking time, and have helped farms maximize labor efficiency.

The free stall environment also allows dairy producers to control variables related to the animals' health and productivity, to streamline processes, and to become more automated. With good management, cows can achieve consistently high levels of milk output.

Some free stall buildings feature a center alley for delivering feed.

For complete information on new and refurbished milking centers, see Chapter 8, *Milking Center Options*.

Housing and bedding

In a modern free stall barn, there are enough stalls for each cow to have her own resting spot, although the cows may not choose the same stall day after day. Often, farmers choose to group animals in sections. For example: cows that are expected to calve soon; cows at the same stage of lactation; cows at the same level of production; or cows of a similar age. The groupings allow specialized feeding for the animals' specific nutritional requirements. In terms of layout, some buildings feature a wide center alley for delivering feed, either along the alley or to internal bunks. While the layouts and investment levels vary, free stall barns all improve labor efficiency and cow comfort when compared with tie stall facilities (Holmes et al., 2003).

Many freestall operations bed with sand, which is soft for the cows and prevents the buildup of organisms that cause mastitis.

Free stalls are less restrictive than the typical tie stall, and allow the cow a comfortable, warm, and dry place to rest. Soiled bedding is regularly removed and replenished with dry bedding. Floors are usually solid concrete, with the exception of slatted concrete floors that allow waste to fall through to a manure pit beneath the building. For herd health reasons, many free stall facilities use sand as bedding. Others use a rubber mattress that has been covered with organic material such as crop straw, shredded newspapers, or sawdust. Sand is not usually used in barns with slatted floors. Recently, there has been a movement toward roomier stalls that enhance cow comfort.

Buildings usually have retractible curtains along the sides. These are closed for adequate protection from wind in the winter and open for ventilation in the summer. Some buildings have tunnel ventilation, and a growing number use additional fans or sprinklers to keep cows comfortable in the summer.

Long plastic bags like these provide economical storage for silage with minimal spoilage.

Feeding

Cows in free stall operations most often eat a total mixed ration (TMR). A large portion of this ration is a combination of forage, haylage, hay, and corn silage. The rest of the ration is comprised of a protein source and vitamin/mineral supplements. Regardless of whether they are homegrown or purchased, a wide variety of grains and grasses may be successfully included in the ration. Often, feed companies provide a nutritional analysis of a farm's ration(s) and make recommendations for improvement.

Tracking moisture content, dry matter intake, and feed quality is also important in a free stall

operation that wants to maximize productivity. Capital investment on many larger operations is significant: therefore, output must be maximized (Jones, 2000).

For silage, rectangular bunkers built of concrete walls or packed piles are the most frequent choice for new farms, because they are less costly than upright silos and allow for more volume as well as rapid filling and feeding without the need for a silo unloader. On many older free stall farms, however, upright silos may still be used. Long, plastic bags can be used to store silage. Sheds may be used for storage of feed ingredients. The ration is generally mixed, hauled to the barn, and fed from bunks or feeding floors. Some barns have center alley feeding, where feed is placed along the edges of a drive-through lane.

Animal health and biosecurity

Herd health management and biosecurity are of critical importance in free stall operations, especially when expanding herd size. High productivity is highly dependent on herd health and combining animals from a variety of sources in a large herd expansion presents higher risks of disease epidemics (Dennis Johnson, personal communication, 2005). Veterinarian visits to check for pregnancy, reproductive, and general health problems are frequent. Heifer health is monitored in these visits, as well.

Because there may be numerous employees on a free stall farm, internal biosecurity measures are followed by employees and family who are routinely in buildings. A second set of guidelines may apply to consultants and visitors. The goal of these measures is to prevent outside infectious agents from entering the herd, and to prevent internal infection from spreading within the herd. New animals added to the herd also present a biosecurity challenge and may be isolated or quarantined for a period of time before being introduced into the herd (Joe Conlin, personal communication, 2004).

Whether the farm raises its own heifers or uses a custom heifer raiser may depend on a number of factors. If a farm has the facilities, labor, and necessary skill to raise healthy replacements, the calves may be raised on-site. Cost effectiveness drives this decision, which may change depending on the prices of milk, grain, and heifers. For more information about heifer production, see Chapter 6, *Custom Heifer Raising*.

Typically, nutrition and health are carefully monitored to maintain a healthy herd. Because each cow must travel to get feed and water, her health and mobility contribute to her ability to consume an adequate amount of her ration and water each day. In addition, producers who own free stall farms may closely monitor condition score, body temperature, somatic cell counts, and rumen condition to ensure high health throughout lactation.

A synthetic hormone called recombinant bovine somatotropin (rBST), is administered to cows in many free stall dairies with the goal of boosting performance. This hormone typically increases productivity from 10 to 12 percent. Injections are usually given to select cows starting nine weeks after calving and continuing until the cow is dried off (John Fetrow, personal communication, 2004; Dennis Johnson, personal communication, 2005).

Breeding and genetics

Reproductive performance must be carefully monitored and managed to maintain milk production. Heat detection aids can be used to monitor the cows' interaction in the barn, helping producers identify animals ready for breeding. Cows are usually inseminated about 55 days after calving, and are milked until roughly two months prior to calving (Joe Conlin, personal communication, 2004). In an effort to synchronize the breeding of cows, some operations use hormone injections to stimulate ovulation. This kind of grouping can streamline feeding, housing, and cow care.

Per cow milk yields have more than doubled in the last 40 years, due largely to genetics. However, these increases are associated with declining ability to reproduce, increasing incidence of health problems, and declining longevity, all indicative of a substantial decline in the adaptability and welfare of modern dairy cows. Calving intervals have increased from 13 to 15 months as fertility has declined, while involuntary cow losses have increased on average. The ability of a cow to produce large amounts of milk has increased more rapidly than has her ability to adapt to very high levels of production (Oltenacu, 2005).

Each cow must maintain good body condition without fattening too much during gestation and without becoming too thin in early lactation. Diet management is key to keeping the cow fit for calving and milk production. Some operations ship heifers to custom heifer raisers who raise the animals until they calve at roughly 24 months of age. The cost of raising these animals offsite tends to vary and trends up and down with milk prices. For more information, see Chapter 6, *Custom Heifer Raising*.

Many of the dairy herds in the upper Midwest are genetically related to one of two Holstein bulls. Sire evaluation systems have been modified recently to address the longevity and reproductive health concerns associated with close relationships and inbreeding (Hansen, 2000; Dennis Johnson, personal communication, 2005). Many producers are introducing genetic variety into their herds.

Performance

A dairy cow in a well-managed free stall barn can be expected to have three to four lactations, although on the average farm the productive life of a cow may be lower. In the best managed herds, a cow may have a much longer productive life. Health issues and reproductive performance are the top reasons for culling, or removing an animal from a herd.

Comfortable, healthy, properly fed cows can yield more than 20,000 pounds of milk each year, with the best farms yielding up to 30,000 pounds. The higher-yielding farms participating in the University of Minnesota's Farm Business Management Education Program averaged almost 22,000 pounds per year. The culling rate for these herds was 27.7 percent. Volume and low overhead may help farm profitability when prices drop (Jones, 2000).

Scale

Free stall operations can range tremendously in size and scale depending on the area and the facility used to house the animals. In Michigan, nearly half of the free stall operations have fewer than 100 cows, and some have fewer than 40 (Wolf et al., 2000). Dairy farms may use remodeled bedded pack barns as free stall barns or may build new facilities. Operations housed in remodeled facilities range in size, from few as 100 cows to as many as 500 head or more. Larger operations may have several thousand cows. It is very important to match milking center design with herd size (see Chapter 8, *Milking Center Options*). Because of the debt typically carried by dairy operations with new facilities, these enterprises must use their buildings at capacity to maximize return (Jones, 2000).

Employees

Depending on scale, many operations require employees who can assist with the tasks of feeding, milking, removing waste from the barn, and tending to the cows' and replacement heifers' needs. On average, a dairy requires one person working full time for every 50 to 60 cows. Crop production is a common component of free stall dairies, and demands more human resources.

Dairy farmers who previously managed only cows will recognize that in a larger free stall system they must now manage people instead (see accompanying farm profile, *What Big Dairy Farms Do Best*, about Webster Ridge Dairy, a 700-cow operation in Michigan). Often, farmers who expand find that although they thought they knew what would be involved with managing employees, the reality of the situation is not what they expected.

Hiring good workers and training them well is crucial. Farms seek to provide a competitive salary and benefits package. In Michigan, in particular, the automotive industry competes with all others for trainable employees, although dairies with reputations as good places to work find plenty of qualified applicants. To help retain employees, owners need to clearly communicate their goals and expectations (Grusenmeyer, 1999).

Manure and wastewater management

In buildings that don't have slatted floors, manure is scraped daily. The materials are pushed from the building to an earthen storage basin designed to hold manure until it can be applied to land. Most basins are clay lined. In areas where a clay-lined basin does not provide adequate protection against seepage, a concrete-lined basin must be built (Holmes et al., 2003).

Some facilities store manure beneath the barn. When producers must eventually empty the storage unit, they can use the manure as a fertilizer and soil amendment for their own farm, or can make arrangements for the waste to be transported to another farm. Manure and soil testing help farmers make the best use of the nutrients. If sand bedding is used, the sand must be removed from the basin using a dragline bucket. Pumping primarily removes the manure and liquids.

In facilities without slatted floors, manure is scraped and hauled daily.

A lined manure storage basin at one Minnesota dairy.

Environmental and social considerations

Producers must be sensitive to their neighbors and to the natural setting of any new or expanded facility. Local and state laws must be considered before building on a site. In addition, there are local and state setback recommendations for the number of cows and the facility to be built (Jacobson et al., 2002). Manure storage facilities must be constructed to provide adequate capacity for the number of animals in the operation. In addition, water from cleaning the milking parlor must be treated (septic system and/or vegetative filter strips) and disposed of if it is not diverted into the manure storage basin. Any farm with 1,000 or more animal units (about 715 cows) must have a National Pollutant Discharge Elimination System Permit and a manure management plan (Matt Drewitz, personal communication, 2005; Sheffield and Paschold, 2003). Each state also has its own requirements which must be considered before construction or expansion.

Neighbors may at times complain about dust, flies, and odor. Agitation of manure holding facilities, in particular, can cause a dramatic increase in odor. When organic materials are used as bedding, the storage facility usually forms a crust, which keeps odors to a minimum. If sand is used, a crust will not form, so some producers blow straw onto the surface in order to form a crust that will help with odor abatement. Setback models based on operation size have been developed, and the potential for odor should be considered as a facility is designed (Jacobson et al., 2002).

Farm neighbors sometimes express concerns about the impact of an enterprise on groundwater or wildlife. State dairy producer associations work with producers to encourage wildlife and natural resource stewardship. These groups also encourage producers to work cooperatively with neighbors, listen to their concerns, and foster good relations within the community itself. This might include talking to neighbors before spreading manure, for example, in order to convey an atmosphere of openness and accommodation.

Most producers view manure as a valuable resource and seek to be environmental stewards. Some dairies compost their manure. A number of dairies that have several hundred cows or more have incorporated methane digesters that generate electricity from the methane gas produced by manure in the basin.

TABLE 3: ***Cost of production for free stall farms (per cow), Minnesota, 2002-2004***

	BOTTOM 40% OF OPERATIONS (in terms of net return)	TOP 40% OF OPERATIONS (in terms of net return)
Total number of farms reporting	**117**	**118**
Feed and bedding	**$1,153.20**	**$1,204.88**
Labor and custom hire	**$444.16**	**$271.49**
Hauling and marketing	**$73.82**	**$73.56**
Health and breeding	**$141.22**	**$141.63**
Total direct costs	**$1,772.20**	**$1,826.09**
Average number of cows	**233.4**	**160.2**
Detailed reports available at: http://www.finbin.umn.edu/output/52756.htm and http://www.finbin.umn.edu/output/52757.htm		

Source: University of Minnesota Center for Farm Financial Management FINBIN

Note: Costs of production for tie stall, free stall, and grazing systems are compared in a summary table at the end of Chapter 4 (Table 9). Note that these records do not necessarily predict results on any one farm or in all areas for all farmers.

To find current cost of production records for your state, contact:

Michigan
Department of Agricultural Economics
Michigan State University
Christopher Wolf (517) 353-3974 wolfch@msu.edu or
Stephen Harsh (517) 353-4518 harsh@msu.edu

Minnesota
Center for Farm Financial Management
University of Minnesota
(612) 625-1964 or (800) 234-1111
cffm@cffm.agecon.umn.edu

Wisconsin
Center for Dairy Profitability
University of Wisconsin
Bruce Jones (608) 265-8508 bljones1@wisc.edu

TABLE 4: ***Capital start-up investment estimates for a free stall system***

BUNKER SILO	**$75/linear foot for side walls, $1.32/square foot for pad**
NEW FREE STALL BARN	**$676/cow up to $1,573/cow**
HEIFER HOUSING	**$145/calf to $675/calf**
EARTHEN MANURE STORAGE for 400 cows for 1 year	**$76,400**

Source: Holmes et al., 2003

If you are considering adding or changing a facility, see the *Resources* section at the end of this book.

Resource people

The following people contributed information for this chapter. You will find complete contact information in the *Resources* section the end of this book.

David K. Beede, professor of dairy management and nutrition, Michigan State University

William Bickert, professor (Department of Biosystems and Agricultural Engineering), Michigan State University

Herb Bucholtz, research and extension in dairy cattle nutrition and feeding, Michigan State University

Dave Combs, professor of dairy science nutrition (dairy nutrition, forage utilization, and grazing systems for dairy cattle), University of Wisconsin

Joe Conlin, dairy herd health consultant, Shoreview, MN

Dennis Cooper, professor and extension dairy specialist (dairy nutrition, grazing, dairy farm human resource management), University of Wisconsin – River Falls

Matt Drewitz, water quality specialist, Minnesota Department of Agriculture.

John Fetrow, professor of dairy production medicine, University of Minnesota

Les Hansen, professor of dairy cattle genetics, University of Minnesota

Dennis and Marcia Haubenschild, free stall dairy producers, Princeton, MN

Dennis Johnson, professor and dairy specialist, University of Minnesota

Bruce Jones, professor and farm management specialist, University of Wisconsin–Madison

Art Kerfeld, free stall dairy producer, Princeton, MN

Jim Linn, professor and extension dairy nutritionist, University of Minnesota

Ranee May, dairy pilot plant manager, University of Wisconsin–River Falls

Christopher Wolf, associate professor of agricultural economics, Michigan State University

What Big Dairy Farms Do Best

Larry and Cathy Webster
Wayne and Margie Webster
Webster Ridge Dairy
Elsie, Michigan

The growth of large dairy farms is a story of the transformation of chores into paying jobs.

Today, it is still possible to construct a profitable dairy farm as a single-family operation. On this kind of farm, dad, mom, and kids carry out the scores of tasks that need to be done every day to handle the 75 cows a family income requires. There will be some specialization, but most will be jacks-of-all-trades. Exhausting, yes. But it can be done, and it can be rewarding.

Webster Ridge Dairy is located near Elsie, in central Michigan. Larry Webster grew up on the farm. As a boy, he and his dad, Glenn, switch-milked 45 cows in stanchions. Now the Webster family milks 750.

In a series of expansions that began in the 1960s, the Websters added hired labor. Because Glenn's health was poor, Larry began to transform the farm with hired labor after he entered the operation as a partner.

Larry's son Wayne joined the partnership in 1991. By then, the farm had grown to 300 cows and several employees. Yet it was still organized according to the old family model. And it didn't work well anymore.

"We had maxed out the old double-8 parlor and we were terribly labor inefficient," Larry said. The Websters became so frustrated that they considered getting out of the dairy business. Instead, in 1995 they attacked the labor problem by getting bigger still, expanding to 600 cows but not expanding the labor force.

This move converted chores to jobs. "It allowed people to specialize in what they were doing," Larry said.

The next step was finding people who wanted to do the jobs, especially milking. About three years after expanding, they had a terrible labor year that again

Webster Ridge Dairy is located near the town of Elsie, in central Michigan.

drove them to consider quitting the dairy business. "That year, we hired 54 people to milk cows. At the end of the year, none of them were with us," Larry said.

They decided to hire milkers that had moved to the area from Mexico. And, as so many large dairies have found, it worked, despite communications problems that can occur when languages and cultures are not the same. "We've had extremely good luck with them," Larry said.

New work force

Dairy farmers have always had trouble finding willing milkers. It's tedious, repetitive work. As parlors became more expensive, dairies wanted to use them more intensively. Webster Ridge is a good example. The double-16 parlor has a throughput of just over 100 cows an hour. Milking 750 cows three times a day means 7.5 hours of milking and a half-hour for cleanup and shift change.

The milkers the Websters have hired are mostly relatives of each other and come from one small area of Mexico. They moved to the U.S. to make money and support family back home. Usually, "family" means not just immediate family, but extended family as well.

"They are not here with their families," Larry noted. "They send money home. They may be paying to send a brother or sister to school, or build a home for their parents, or saving up to buy land in Mexico. They identify themselves as Mexicans and plan to return to Mexico and a better life their earnings here will create. They plan to work here seven or eight years, and they are saving to go home."

These plans create a work ethic in which the jobs are very important. The milker group is self-disciplining, which helps Larry and Wayne, who speak very little Spanish. "If one of the milkers isn't doing his job, they address the problem," Larry said. The milkers arrange to find a replacement employee. If someone is sick, the employees take up the slack and cover for one another or find a replacement. They also teach each other proper milking techniques. In sum, according to Larry, they are reliable. "Most want to work more hours than we will let them," he said.

In addition they value equality among themselves, so "we try to show each one how his job is part of the whole farm, and that one job is not better or worse than another," Larry said.

Webster Ridge is located about 30 miles north of Michigan's capital city, Lansing, in a concentrated dairy area. "There are about 70 young guys from one small area in Mexico working on dairies in this area," Larry said. They have formed teams and play soccer year-round — indoors in Lansing in the winter, outdoors the rest of the year.

They get raises based on skills and length of employment, notes Larry. In addition, they are provided free housing, including electricity and heat, and free meat and milk.

The nine milkers work in shifts of three. Each has other tasks besides milking, so they each work about 10 hours in a shift. Cows are grouped. When the highest producing cows are milking, throughput is slower and one person does it all. When groups of lower producers come in, two people milk. The others help by pushing cows into the parlor from the holding pen and scraping manure from barns while cows are in the holding pen.

Cows in groups

Having a large herd allows a dairy to manage cows in meaningful groups. "You can sort forever," Wayne said. "We try to keep cows in six even-sized groups. Not only does this work well in the parlor where we can match manpower to production, it works in other ways, too."

Cows are sorted weekly into six groups that each receives a customized ration:

- Two-year-old heifers in their first lactation.
- Highest producers.
- Cows in mid-lactation that are pregnant.
- Mid-lactation group — not pregnant (and intensive efforts are underway to change that.)
- Fresh cows and high-producing two-year-olds.
- Low producers.

The Webster Ridge herd is mostly registered, and some are on the show circuit. Most of the breeding is done artificially, but bulls have a place, too. "We use bulls in some groups," Wayne said. "We keep one in the pen with pregnant cows in case a cow isn't, in fact, pregnant." One bull stays with the late lactation group for the same reason. Another is in the mid-lactation group for cows that are difficult to breed.

Getting cows bred seems to be a major problem in herds that shoot for high production. The Websters' rolling herd average is about 26,300 pounds of milk per cow per year. In high production herds like these, fertility — rated according to first-service conception — runs about 35 percent. The Websters concentrate on getting cows bred, and say that grouping them by stage of lactation and pregnancy status helps.

Webster Ridge uses an estrus synchronization program (Ovsynch) so cows come into heat and are bred in groups, and any cow not breeding is evident. "Usually we breed 10 to 12 cows a day, but with synchronized estrus, it can be more," Wayne said. "One day we bred 61."

"About a quarter of the cows we cull go for infertility reasons," Wayne said. "We have no room for luxury culling." They have had some problems in recent years. First was an outbreak of Leptospirosis, finally solved by a new and effective vaccination program. The second was an "outbreak" of bull calves. "We reached a low of 17 percent heifer calves one year," he said.

FARM PROFILE: **FREE STALL OPERATION**

Many other jobs

Wayne said the big change in the way they organized their business was learning to delegate. "When you get big, you don't have the hands-on and the opportunity to do things your way. And you have to accept that," he said.

A key person on the farm to whom things are delegated is herdsman Glenn Tucker. "He knows cows," Wayne said. The modern parlor is highly computerized and lots of data flows into the adjacent office where Wayne and Glenn scan computer screens.

Each parlor stall has a computer unit and all cows carry transponders that identify them to the system at milking time. Milk weight is taken as each cow is milked, and the weight is compared to what the cow should give based on her individual lactation curve. A departure could mean she is ill, is off-feed, or is in heat — any one of which warrants closer individual attention from the herdsman or the one primary helper who works with him.

The Websters use rBST, a growth hormone, to stimulate milk production. About one-third of the cows receive injections every two weeks. The Websters see a milk production increase of between 6 and 12 pounds a day, and say that this hormone can extend high production longer. They find this to be a great benefit when cows don't get pregnant easily.

Odd jobs

Employees are assigned to a variety of jobs. For example, Pablo and Pam are the calf feeders and handle all calves up to six months of age. A calf barn has replaced calf hutches. "Calf hutches are great for calves but not great for people," Wayne said. Tending to calves in cold or rainy weather isn't fun.

Another employee, Mark, handles all other feed. He has six rations to prepare and distribute to feed bunks for the cow groups, plus rations for heifers in age group pens in the heifer barn and for dry cows.

Brad and Dennis deal with machinery — driving tractors and trucks, manning the farm shop, and fixing everything from field equipment to broken cattle gates.

One other employee scrapes free stall barn alleys and hauls manure. Webster Ridge uses daily haul as much as weather permits, but also has a large manure pit they empty once or twice a year.

Thirty years ago, the Websters were among the first to use sand as bedding for free stalls. Most Michigan dairies do now because it can minimize mastitis. The downside is that it takes six 30-ton loads of sand each week to bed the six free stall cow barns and all that sand has to be hauled away as part of the manure.

Milkers at Webster Ridge prep cows and attach milking units in the double-16 parlor.

FARM PROFILE: **FREE STALL OPERATION**

Producing the feed

Larry and Wayne do much of the field work, but some is also contracted. They farm 1,400 acres, all devoted to corn for silage and alfalfa for haylage. They purchase dry hay in large square bales and feed high moisture corn purchased at harvest time. In the past, they hired outside farms to plant and spray their corn but did their own chopping. Recently, they've been doing more of the field operations themselves, finding they can manage their crops more effectively that way.

They have a large self-propelled Claas six-row corn chopper and a 16-foot New Holland haybine rotary disk mower-conditioner for alfalfa. Forage harvest draws in trucks and drivers as the forage is chopped, hauled, dumped, and packed into huge piles on concrete slabs.

The piles are covered with plastic weighted down with used car tires cut into thirds — two sidewalls and a center. They look like large versions of those flying disks kids play with, and they don't hold rainwater where mosquitoes may breed.

Facility layout

The layout of facilities at Webster Ridge is designed for environmental protection. Milk cow housing — three 200-cow free stall barns — and the milking parlor are ringed around three sides of a 4.5-million-gallon concrete manure pit. All the manure from the barns and parlor is scraped to the pit, and all clean water from roofs and unpaved areas flows away from the buildings.

"We have enough manure storage for about seven months," Wayne said. "In years of rainfall, as we've had in 2004, we can pump off liquid and haul it away. But what we prefer to do is clean it out completely in the spring before crops are planted and again in the fall when wheat and corn ground open up after harvest."

Because they bed with sand, which wears equipment and is hard to pump, the pit must be pumped and then cleaned with front-end loaders. A ramp on the open south end of the pit allows easy access for cleanout.

Another complex of buildings includes calf housing for calves being individually fed with milk replacer and several buildings called "transition barns" for heifers designated as future herd replacements. They are housed indoors, in free stalls with sand bedding, and fed outside along fencelines.

In the final barn, the heifers are bred artificially and then moved to barns farther away to await calving and subsequent incorporation into the milking herd.

The heifer barns and lots are scraped about once a week to remove manure, which is pushed over a drop-off into a pit, from which it is hauled away as a solid. This pit is not designed for long-term storage, but as a short-term holding area.

The other barn is the old, pre-expansion milking area. Nearly 200 milking cows are housed there, and must take a quarter-mile walk three times a day to the milking parlor.

The feed storage area is also compactly designed and set up to avoid environmental contamination. A large asphalt-paved area is used for pile storage of corn silage and haylage. A commodity barn with six large stalls holds commodities like soybean oil meal, fuzzy cottonseed, or distillers dried grains, which go into ration formulation.

The person mixing feed has recipes for each group of cows and heifers. Using a front-end load and mixer wagon equipped with a scale, he mixes ingredients by weight, stirring them into a uniform mixture on-the-go during the drive to the feeding alleys and fencelines.

Keeping the books

For many years, Larry managed the farm and his wife, Cathy, did all the bookkeeping. Now their son Wayne, who has a university degree in accounting, is gradually taking over the financial records.

Wayne married Margie Green, a dairy farmer's daughter from nearby Green Meadows Farm. For years, Green Meadows was Michigan's largest dairy farm, milking 2,000 cows when the norm was 50. That farm now milks more than 4,000 and remains one of Michigan's largest. It also maintains a herd of show animals.

Margie brought her experience with a registered show herd to Webster Ridge, and today she keeps the registration papers, works with calves and heifers, and is guiding their two children along the same path of showing top quality registered animals.

FARM PROFILE: **FREE STALL OPERATION**

For many years, Webster Ridge expanded by adding on here and there, gradually increasing cows. But the last expansion in 1995 was the big one that dramatically altered the form of the business.

"Debt load is a big factor in cost of production and a huge source of risk when milk prices are low," Larry said. Before the expansion, they had 80 percent owner equity. After it, they had 20 percent. They've rebounded to 68 percent equity now and don't feel quite as vulnerable.

The farm is now sized right and runs smoothly. They want to take one more step, converting it to a Limited Liability Corporation (LLC). That switch would make the farm like a corporate entity, not responsible for debts of individuals, but having important tax features of a partnership that allow income to flow through to the partners.

Wayne Webster and his dad visit in the farm office.

Since this profile was written, Webster Ridge Dairy entered a sad and difficult time of transition. Wayne Webster was killed on the evening of July 31, 2005 when the pickup truck he was driving was struck by a drunk driver only four miles from home. The family partnership continues, with Larry, Cathy, and Margie all working together to manage the farm and looking toward the future when Wayne and Margie's boys — Kelvin and Justin — may want to join the family partnership too.

"All Wayne ever wanted to do was farm," said his mom, Cathy. "He was a really caring individual — the one who made everybody feel good. You can't replace that spirit."

CHAPTER 3: ADDITIONAL HOUSING ALTERNATIVES

Modernizing a dairy operation doesn't have to cost your children their inheritance. Many dairy farms in the upper Midwest are housed in facilities that are aging or outdated. Some farms have the option of updating or remodeling their buildings for a lower capital investment than would be required for a new unit. Regardless of the farm type, if the buildings are structurally sound, it may be possible to make any of the following changes, or some combination of them.

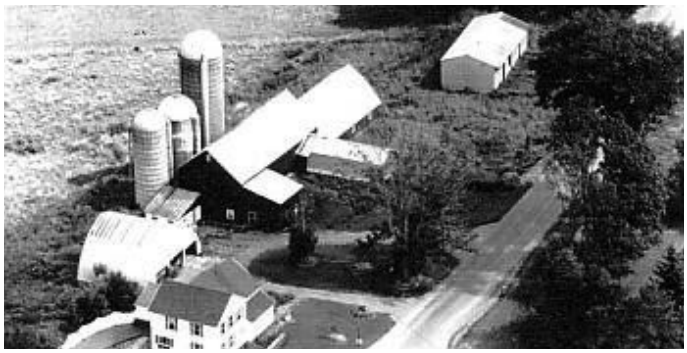


Photo courtesy of Dennis Johnson.

Many old dairy barns have scars and bumps where they were enlarged in order to add a few cows at a time.

Dairy farmers in tie stalls have historically opted for modernizing in steps. Many old dairy barns have scars and bumps where they were enlarged in order to add a few cows at a time. Improvements may have included things like adding a round-the-barn pipeline after years of bucket dumping, motorized feed carts, or bunk feeders. Some farms may have added an earthen basin, lagoon, or minipit so they can avoid daily spreading. Improved and controlled lighting boosts productivity, and mechanical ventilation helps preserve animal health and comfort.

Yet in a tie stall setup, labor efficiency is difficult to improve. Adding additional tie stalls can cost $2,500 to $3,000 per stall and will do nothing to achieve higher labor efficiency (David Kammel, personal communication, 2004). Plus, many new technologies for estrus detection and milking do not work in a tie stall setting. For this reason, many farmers housing their animals in tie stall barns would like to modernize their dairy facilities (Janni, 2002). In doing so, a farmer may make a farm more inviting to children who could someday take over the family dairy.

Feed storage

Wherever upright silos are used, silo unloaders are necessary, and these need frequent maintenance and repairs. Some farms opt for other methods of feed storage, which may include bagging haylage and silage in long plastic tubes. Bagging materials are purchased annually, and an initial investment is needed for bagger attachment (Holmes et al., 2003). Other producers may elect to build bunker silos. Well-packed silage piles are less expensive than bunker silos, and require only flooring. These covered piles provide silage for winter use.

Piles covered by plastic and weighted with old tires provide silage for winter use.

Milking in shifts

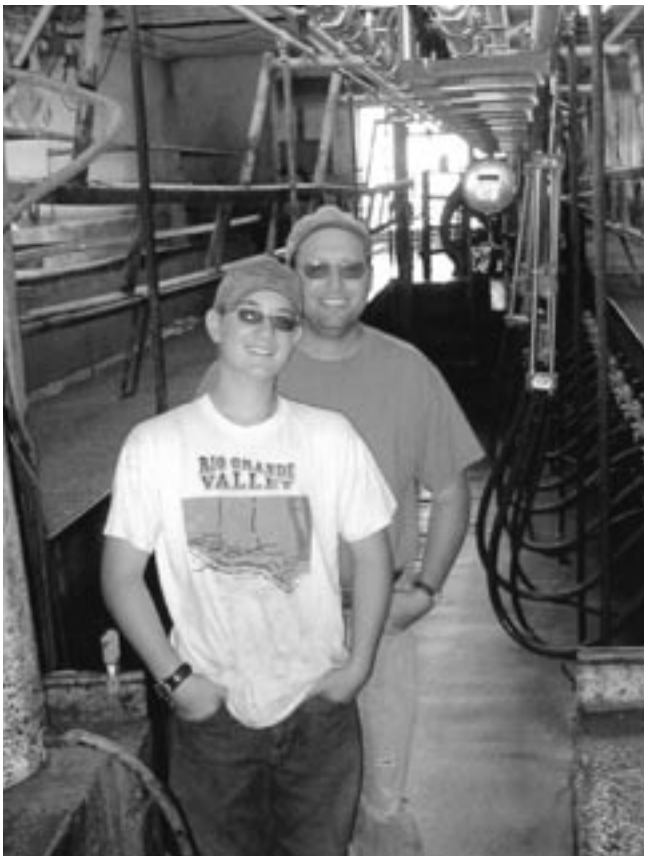
Some farmers with cows in tie stalls increase their herd size and use the existing barn without any modifications. To milk animals, the farmers turn out the first set of cows after they've been milked and bring in the second set of animals (kept outdoors on pasture or on bedded packs sheltered from the wind during the winter months). Other farmers add a small free stall barn and switch cows between free stall barn and the tie stall barn, where they are milked. This strategy allows expansion at low cost, but also increases labor demands. It does not improve milking ease or efficiency.

For complete information on new and refurbished milking centers, see Chapter 8, *Milking Center Options*.

Remodeled parlors

Improved efficiency, safety, and comfort for milking do not require a new milking parlor. Some dairy producers opt for lower-cost modernization and management changes (Haugen, 2001; Haugen, 2005). The cost can be calculated as low capital cost or low annual cost. Farmers on this path may be more comfortable taking smaller steps in modernization. In the process, the owner can prepare the farm future expansion and/or modernization. Often, the tie stall barn is converted into a low-cost remodeled swing parlor that improves the comfort and speed of the milking process (see Chapter 8, *Milking Center Options*). Remodeling can result in quicker completion of milking chores — often twice as fast. The cost of a remodeled parlor can be as low as $25,000 (Holmes et al., 2003). When a farmer can provide part of the labor in remodeling, the cost can be even lower (Haugen, 2001).

This operation modernized by adding a pit parlor, which improved labor efficiency and milker safety.



Dan Vosberg and his son, Derek, retrofitted an old tie stall barn with a New Zealand-style swing parlor. Read more about the Vosbergs in Chapter 4 and more about swing parlors in Chapter 8.

More costly parlors are also an option. These incorporate varying degrees of technology and generally improve the speed and performance of milking. Regardless of whether or not a producer expands, herd management can be improved by reducing the demands of the tie stall milking method (Holmes et al., 2003). Producers often consider the possibility of adding cows to the herd when choosing a new milking facility. As farms consider modernizing, they generally plan a system that allows for flexibility and change should someone in the family want to join in the dairy business or should the farm add cows. Some older dairy farmers benefit from upgrading facilities as an investment in their own retirement, whether or not a family member is waiting in the wings (Reneau, 2002). An economic evaluation that considers fixed costs per cow is important in planning for a new or revamped milking center.

Small-scale free stall

Farmers planning for future expansion may decide to build a new free stall barn, but continue to milk in the tie stall barn. Although the options range in size and scope, profitability is generally enhanced by low-cost investments in modernization (Holmes et al., 2003). Cow comfort, ease of labor and other factors come into play when selecting a design for a new barn. Staged

growth allows for the producer to adapt to managing to a new system before jumping into a larger scale system that would require hiring and managing employees. In addition, a smaller-scale expansion reduces the amount of money a producer must borrow. Sometimes, an existing building can be converted into a free stall barn for significantly less money than new construction requires.

Bedded pack and composting bedded pack barns

For farmers considering a bedded pack barn or a composting barn, a number of building design options exist, including hoop structures or greenhouse barns. In a bedded pack barn, bedding is added as needed to keep cows clean and dry. Large amounts of bedding (25 to 30 pounds per animal per day) are required.

Low-cost building can work well for bedded pack and composting barns.

In a composting bedded pack barn, by contrast, sawdust or wood shavings are used for bedding (80 ft^2 per cow) and typically stirred with a skidsteer twice a day (Janni, 2004; Dennis Johnson, personal communication, 2005; Reneau, 2004). Maintaining a dry, comfortable pack requires proper management, including twice daily stirring, sufficient bedding, and plenty of ventilation (Janni, 2004).

Photo courtesy of Dennis Johnson.

At the West Central Research and Outreach Center in Morris, MN, the herd spends the entire year on an outdoor bedded pack in the lea of a windbreak.

Fresh bedding must to be added occasionally, depending on the moisture content of the bedding and the humidity of the season. In Minnesota, these barns are typically cleaned in the fall, after corn silage harvest, and the composted manure applied to land (Janni, 2004).

These systems may result in cost savings for some operations. The building design is less costly than a free stall type building because no stalls need to be built. The barn may later be retrofitted to include free stalls if a producer decides the bedded pack or composting system is not working. In addition, no manure holding facility is required for bedded pack or composting systems. On-farm tests indicate that the bedding conserves nitrogen and may be applied directly to cropland as a fertilizer (Fulhage and Pfost, 1993).

Outdoor bedded pack

The lowest cost alternative to a tie stall barn is to house cows outside, providing them with a bedded pack to rest on and a windbreak for shelter in the winter. Some farms opt for an inexpensive shelter for winter protection. Grazing feeds the herd during parts of the year and can reduce feed costs significantly. Outdoor bedded packs can require half as much bedding as indoor packs (Johnson, 2005).

Other options

A few farms have decided to focus their labor and capital investments on only feeding, managing, and milking cows. These farms outsource all other needs and usually have only a few acres. Bred heifers, feed, and all other inputs are purchased, while all outputs — including calves, milk, and manure — are sold. Sometimes, the owners are dairy producers who aren't interested in crop farming. Cows are the primary investment, and bankers are likely to lend the money needed to buy bred heifers. These types of operations typically lease their facilities, reducing the need for major capital investment.

Whenever farms consider making physical, production, or management changes, the owners, workers on the farm, and the cows all have to adapt. Some of the cows may not adapt well to the changes — whether it's finding feed in a new place, competing with other animals for access to feed, a new milking routine, or a different type of stall. Increased culling rates are common in herds switching to modernized free stall facilities and can result in a period of reduced milk production (Dennis Johnson, personal communication, 2005; Weigel et al., 2003).

TABLE 5: ***Capital start-up investment cost estimates***

BALE BAGGER ATTACHMENT	**$30,700**
ASPHALT BASE FOR PILED SILAGE	**$1.54/square foot**
BUNKER SILO	**$75/linear foot for side walls, $1.32/square foot for base**
REMODELED MILKING CENTER	**$1,600-$20,000 per milking stall**
NEW FREE STALL BARN	**$676/cow up to $1,573/cow**
HEIFER HOUSING	**$145/calf to $675/calf**
EARTHEN MANURE STORAGE for 100 cows for 1 year	**$39,155**

Source: Holmes et al., 2003; Kammel, 2001

If you are considering adding or changing a facility, see the *Resources* section at the end of this book.

Resource people

The following people contributed information for this chapter. You will find complete contact information in the *Resources* section the end of this book.

William Bickert, professor (Department of Biosystems and Agricultural Engineering), Michigan State University

Vance Haugen, grazier and county agent, University of Wisconsin Extension

Brian Holmes, professor (biological systems engineering) and extension specialist, University of Wisconsin

Kevin Janni, professor and extension engineer — livestock housing systems, University of Minnesota

Dennis Johnson, professor and dairy specialist, University of Minnesota

David W. Kammel, professor and extension specialist, University of Wisconsin

Thomas Portner, free stall dairy (bedded pack), Sleepy Eye, MN

Doug Reinemann, professor (milking machine and rural energy issues), University of Wisconsin

Jeffrey K. Reneau, professor of dairy management, University of Minnesota

Jim Salfer, dairy extension educator, University of Minnesota Extension Service