



Missouri 400-Cow Dairy and 690-Cow Dairy Business Plans



Financial models of integrated modern dairy systems:

- Parallel parlor
- Sand bedded, tunnel ventilated freestall housing
- Passive sand and manure separation
- Irrigated forage production



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Missouri Dairy Plan – 400 and 690-Cow Dairies

Contents

INTRODUCTION	1
1. PRODUCTION AND OPERATION PLAN	5
1.1 Production assumptions	5
1.2 Capital investments	6
1.3 Markets and prices	9
1.4 Feed cost and management	10
1.5 Labor cost and management	12
1.6 Other operating costs	14
1.7 Land, crops and nutrient management	16
1.8 Organizational structure	18
2. FINANCIAL STATEMENTS AND ANALYSIS	19
2.1 Financial analysis for the 400-cow model	20
2.2 Financial analysis for the 690-cow model	27
2.3 Risk management	34
3. IMPLEMENTATION PLAN	39
3.1 Timelines	39
3.2 Site selection	40
3.3 Permits and regulations	42
3.4 Consultants	42

Introduction

This dairy farm business plan is intended to demonstrate one pathway for the next generation of Missouri's dairy farmers. This path involves next generation confinement housing solutions that can improve cow comfort and cooling while removing barriers to higher milk production.

Two dairy herd sizes (400- and 690-cow units) are modeled here to fit differences in farm equity levels and available land resources. Each plan uses an integrated systems approach to combine capital investments, operating costs, production plans, rations, forage systems, housing systems and manure systems. Each model serves as a complete template for starting a new greenfield dairy.

Currently operating dairies seldom start a greenfield dairy by designing a completely new dairy system. However, this strategy can be an option for dairy farms transitioning to the next generation – especially if milking and housing facilities are functionally obsolete, fully depreciated and poorly located for expansion. This report is designed to guide such farms in planning a completely new dairy. The templates in this report are also helpful for existing dairy producers evolving on-site in their current facilities as they examine possible technologies to use in a dairy's expansion path.

Each economic model evaluates profitability and cash flow potential for each different herd size. This can inform a dairy's production goals and allow producers to evaluate how various investment and performance levels impact financial measures. Financial statements show how various components of the dairy operation impact the operation's cash flow, income statement and the five-year budget. Fitting these financial statements together captures the dairy's business potential.

A comparison of key system components and financial indicators for each model is found in Exhibit A1. Each model assumes the dairy uses 100% equity financing, with no debt. Although unrealistic, this simplifying assumption allows lenders to quickly analyze the free cash flow to determine how much debt the operation could service.

Exhibit A1. Comparison of alternative Missouri dairy business sizes.

Component	400-cow model	690-cow model
Milking center	Double 10 rapid exit parallel parlor	
Housing system	Four-row tunnel ventilated freestall housing facility with sand bedding for cows (milking, dry and special needs)	
Manure handling system	Passive manure/sand separation with manure solids storage basins, earthen lagoon tied to center pivot irrigation systems	
Total capital investments	\$7,057,730	\$11,083,127
Total acreage <i>(includes crops, farmstead and waste acreage)</i>	533	919
Dairy jobs <i>(full-time equivalents)</i>	11.2	12.9
Net income <i>(five-year average)</i>	\$30,463	\$290,977
Net cash flow <i>(five-year average)</i>	\$196,421	\$514,157
Return on assets <i>(five-year average)</i>	0.4%	2.7%

The following key assumptions are included in these models:

- All heifers are raised on-site by the dairy operation.
- All corn silage, alfalfa hay and haylage needs are produced on owned, irrigated land operated by the dairy enterprise; however, planting and harvest are outsourced to custom hire operators.
- Land investments are based on the minimum acreage required to meet forage production needs plus twenty percent more acres to accommodate farmstead, feed storage, roads and unusable land typical to Missouri dairy farms.
- Freestalls with sand bedding in four-row, tunnel-ventilated cow housing barns are used for optimal cow comfort. Adequate bunk space and water troughs are provided. Head catches and manure flush systems are included for labor efficiency.
- Heifer housing includes individual hutches for small calves and a mono-slope heifer barn with a feed alley that can be scraped, a feed rail, and multiple bedded pack pens for precise grouping.
- Manure handling systems include recycled lagoon water towers flushing first to a sand separation lane and then to manure solids separation basins, where the liquid fraction weeps into an earthen lagoon.
- Capital investments are adjusted for each model based on the number of cows.

Well-managed larger dairy operations with tight standard operating procedures have a financial advantage over smaller-sized units. Larger dairies can spread initial investments and fixed costs over more cows thereby reducing their capital investment per cow, debt per cow and, ultimately, cost of production.

Well-managed smaller dairy operations succeed financially when family living withdrawals from the business are modest, capital investments are appropriate and debt levels are low. A dairy producer with a strong equity position, tight operating expense control and family labor committed to high production goals helps generates financial sustainability.

Exhibit A2. Dairy standard operating procedures (SOPs).



The future of the Missouri dairy industry depends on how well producers learn to use technology to intensify management on larger-scale operations. Larger operations employ more outside labor and expertise. The next generation of dairy managers will need to create and manage standard operating procedures (SOPs) to effectively use evolving technologies, equipment and intensified management systems.

While long common in manufacturing industries and other livestock sectors, SOPs on dairy farms were pioneered in this century by emerging larger-scale dairies. Simple but effective SOPs can be quickly developed and customized for a dairy farm by borrowing other farm SOPs while drawing on expertise from experienced dairy consultants or specialized veterinarians. SOPs are now common on most larger dairies. The SOPs help management hire labor effectively, develop personnel management skills, create and maintain a healthy and consistent cow environment, and ensure manure management systems are consistently operated to protect the environment. (Photo: Shutterstock)



1. Production and operation plan

1.1 Production assumptions

Milk production

Annual milk production estimates and estimated rolling herd average are depicted in Exhibit 1.1.1. Milk production levels are based on a herd of purchased Holstein cattle. Gradual improvement in milk production per cow is seen as the herd matures and improved systems implemented and refined. Only 2.5 percent of total milk production is not being sold and used to feed calves. Dairy producers can increase cash flow and improve the farm's profitability by focusing on improving milk production.

Exhibit 1.1.1. Milk production assumptions.

	Year 1	Year 2	Year 3	Year 4	Year 5
Daily milk production per cow, pounds	76.0	80.0	81.0	82.0	83.0
Rolling herd average, pounds of milk per 365 days	23,750	25,000	25,313	25,625	25,938

Turnover and reproduction

Cows will leave the herd based on involuntary factors (death, disease, problem breeders, etc.) and voluntary factors (low milk production). A 28.5 percent annual cull rate is assumed in the robotic dairy models. Annual death loss is estimated at 6 percent. Together, these represent 34.5 percent yearly herd turnover. Other assumptions include a calving interval of 12.8 months and a 56-day average days dry period for the herd. These calving intervals require tightly managed reproductive protocols and animal health SOPs. Heifers born on the farm would be raised as replacements or sold when heifer numbers exceed the number of replacements needed.

Assumptions

Cull rate: 28.5 percent

Death loss: 6 percent

Calving interval: 12.8 months

Average days dry: 56 days

1.2 Capital investments

Dairy investments are categorized as real estate, machinery and equipment, and livestock. Exhibits 1.2.1 and 1.2.2 detail investments for the 400- and 690-cow models.

Exhibit 1.2.1. Capital investments for the 400-cow model.

Item	Units	# of units	\$/unit	Cost
REAL ESTATE:				
Land	acre	533	\$3,530	\$1,879,932
Free stall (tunnel ventilation, loops with sand)	stall	364	\$2,750	\$1,001,000
Double 10 rapid exit parallel parlor	stall	20	\$25,000	\$500,000
Office, milk house, utilities, conf. room	square foot	2,500	\$50	\$125,000
Heifer barn (post-hutch to pre-calving)	head capacity	300	\$750	\$225,000
Sand separation apron and pad	cubic yard	233	\$200	\$46,667
Passive manure separation/storage basins	cubic foot	40,640	\$2	\$81,280
Anaerobic lagoon (365 days of storage)	cubic foot	3,029,525	\$0.123	\$372,632
Calf hutch dry manure and bedding storage (7 days of storage)	square foot	2,400	\$12	\$28,800
Dry manure/bedding storage (7 days of storage)	square foot	2,400	\$12	\$28,800
Hay and equipment storage	square foot	10,000	\$10	\$100,000
Silage pad base	cubic foot	43,560	\$2	\$87,120
Commodity shed	bays	5	\$15,000	\$75,000
Supplement bins	bins	5	\$15,000	\$75,000
Truck scale				\$50,000
Site preparation				\$60,000
All-weather driveway (gravel)				\$50,000
Wells and/or water impoundments, lines				\$110,000
Electric connection (three-phase power)				\$110,000
			SUBTOTAL	\$5,006,230
MACHINERY & EQUIPMENT:				
Bulk tank	gallons	4,000	\$14	\$56,000
Skid steer loader	each	2	\$35,000	\$70,000
Mixer wagon and automatic feed pushers				\$90,000
Tractor 1, 150 horsepower, used	each	1	\$150,000	\$150,000
Tractor 2, 100 horsepower, used	each	1	\$100,000	\$100,000
Tractor 3, 100 horsepower, used	each	1	\$50,000	\$50,000
Standby generator	each	1	\$12,000	\$12,000
Flush towers	each	6	\$12,000	\$72,000
Recycle pump & pipe	each	2	\$8,250	\$16,500
Liquid manure pump				\$10,000
Irrigation (160 acre - machine, generator and pad)	pivot	2	\$169,500	\$339,000
Solid manure spreader	each	1	\$45,000	\$45,000
Livestock chute with scale				\$3,500
Calf hutches	each	22	\$400	\$8,800

Exhibit 1.2.1 (continued). Capital investments for the 400-cow model.

MACHINERY & EQUIPMENT (continued):				
Livestock trailer, used	each	1	\$17,500	\$17,500
Flatbed trailer and miscellaneous rolling stock				\$22,500
Pickup truck, used	each	1	\$20,000	\$20,000
Silage rake	each	1	\$15,000	\$15,000
Lawn-care equipment				\$2,500
High-pressure washer				\$500
Office equipment				\$1,500
Office furniture				\$2,000
			SUBTOTAL	\$1,104,300
LIVESTOCK:				
Dairy cows	head	400	\$1,600	\$640,000
Heifers	head	320	\$960	\$307,200
			SUBTOTAL	\$947,200
TOTAL INVESTMENTS				\$7,057,730
INVESTMENT PER COW				\$17,644

Exhibit 1.2.2. Capital investments for the 690-cow model.

Item	Units	# of Units	\$/Unit	Cost
REAL ESTATE:				
Land	acre	919	\$3,530	\$3,242,436
Free stall (tunnel ventilation, loops with sand)	stall	627	\$2,750	\$1,724,250
Double 10 rapid exit parallel parlor	stall	20	\$25,000	\$500,000
Office, milk house, utilities, conf. room	sq. ft.	2,500	\$50	\$125,000
Heifer barn (post-hutch to pre-calving)	head capacity	520	\$750	\$390,000
Sand separation apron and pad	cubic yard	311	\$200	\$62,222
Passive manure separation/storage basins	cubic feet	68,830	\$2	\$137,660
Anaerobic lagoon (365 days of storage)	cubic feet	4,937,389	\$0.123	\$607,299
Calf hutch dry manure and bedding storage (7 days of storage)	sq. ft.	3,600	\$12	\$43,200
Dry manure/bedding storage (7 days of storage)	sq. ft.	3,600	\$12	\$43,200
Hay and equipment storage	sq. ft.	10,000	\$10	\$100,000
Silage pad base	cubic feet	87,120	\$2	\$174,240
Commodity shed	bays	5	\$15,000	\$75,000
Supplement bins	bins	5	\$15,000	\$75,000
Truck scale				\$50,000
Site preparation				\$110,000
All-weather driveway (gravel)				\$50,000
Wells and/or water impoundments, lines				\$110,000
Electric connection (Three-phase power)				\$110,000
			SUBTOTAL	\$7,729,507

Exhibit 1.2.2 (continued). Capital investments for the 690-cow model.

MACHINERY & EQUIPMENT:				
Bulk tank	gallons	8,000	\$14	\$112,000
Skid steer loader	each	2	\$35,000	\$70,000
Mixer wagon and automatic feed pushers				\$140,000
Payloader	each	1	\$140,000	\$140,000
Tractor 1, 150 horsepower, used	each	1	\$150,000	\$150,000
Tractor 2, 100 horsepower, used	each	1	\$100,000	\$100,000
Tractor 3, 100 horsepower, used	each	1	\$50,000	\$50,000
Standby generator	each	1	\$12,000	\$12,000
Flush towers	each	8	\$12,000	\$96,000
Recycle pump & pipe	each	2	\$8,250	\$16,500
Liquid manure pump				\$10,000
Irrigation (160 acre - machine, generator and pad)	pivot	4	\$169,500	\$678,000
Solid manure spreader	each	1	\$45,000	\$45,000
Livestock chute with scale				\$3,500
Calf hutches	each	38	\$400	\$15,200
Livestock trailer, used	each	1	\$17,500	\$17,500
Flatbed trailer and miscellaneous rolling stock				\$22,500
Pickup truck, used	each	1	\$20,000	\$20,000
Silage rake	each	1	\$15,000	\$15,000
Lawn-care equipment				\$2,500
High-pressure washer				\$500
Office equipment				\$1,500
Office furniture				\$2,000
			SUBTOTAL	\$1,719,700
LIVESTOCK:				
Dairy cows	head	690	\$1,600	\$1,104,000
Heifers	head	552	\$960	\$529,920
			SUBTOTAL	\$1,633,920
TOTAL INVESTMENTS				\$11,083,127
INVESTMENT PER COW				\$16,063

1.3 Markets and prices

Milk pricing

A farm level milk price of \$18.25 per hundredweight (cwt) is used across all years in the financial projections. This is considered a realistic price level estimate and is based on a Class III milk price of \$16.50, plus a farm specific basis of \$1.50 per cwt and a \$0.25 per cwt cell count premium. This long-term basis is consistent with the basis observed on other Missouri dairy operations. Additional milk price premiums, although not included in this analysis, may be obtained from milk buyers.

Signing a marketing agreement with a financially secure marketing cooperative is critical to long term sustainability and profitability. Opportunities in the future may, or may not, exist to sell milk at a higher price into Southeast Order plants, Central Order plants, other milk cooperatives or directly to non-cooperative processors.

Beef pricing

Dairy herds produce approximately the same quantity of beef as beef herds by selling culls and young stock. Securing higher prices for cull cows, bulls and surplus heifers has become an important driver of dairy farm profitability. This economic model assumes selling three-day to seven-day old bull and surplus heifer calves for an average of \$200 per head. Pricing assumes a percentage of the cows are bred to beef sires (Angus, Limousin, etc.) to improve calf salability. Cull values, ranging from \$225 to \$850 per head, depend on animal size and age.

Calf and cull value assumptions, by age

Bull/heifer calves: \$200 per head
2-6 months: \$225 per head
6-12 months: \$485 per head
12-24 months: \$850 per head
Milking/dry cows: \$500 per head

Hauling costs

Milk hauling costs vary tremendously across Missouri depending on location, distance hauled, volume produced and pickup frequency. The 400-cow and 690-cow plans were designed for daily pickup with a transport trailer truck with a transportation rate of 50 cents per cwt. Hauling sustainability and cost are important considerations when deciding the location and ultimate scale of a dairy.

Milk assessments or other marketing costs

Several price deductions for marketing costs affect the net price received by dairy producers. Deductions in this analysis include:

- National milk promotion/checkoff: 15 cents per hundredweight of milk
- Cooperative capital retain: 20 cents per hundredweight of milk
- Cooperatives Working Together (CWT) assessment: 4 cents per hundredweight of milk

1.4 Feed cost and management

Feed is traditionally about 50 percent of milk production costs. A ration cost of \$0.11 per pound of dry matter fed is used in these models for the total mixed ration (TMR).

Controlling feed costs, shrink, and efficiency is the single biggest driver of dairy farm profitability. Rations developed for the dairy models use homegrown corn silage and alfalfa hay and haylage as the forage base. Additional feedstuffs, such as soybean meal, distillers dried grains, corn gluten feed, and premixes with vitamins, mineral, and energy supplements, are common feedstuffs readily available to Missouri producers.

The assumptions for dairy herd rations and cropping plans are presented in Exhibits 1.4.1 to 1.4.3.

Exhibit 1.4.1. Rations for the 400-cow and 690-cow dairy models.

	Lactating rations					Dry cow rations		Heifer rations	
	Year 1	Year 2	Year 3	Year 4	Average	Dry	Close Up	Growing	Bred
Pounds of milk per day	76	80	81	82					
Feedstuffs	<i>As fed, pounds per head per day</i>								
Corn silage (35 percent dry matter)	52.0	53.9	55.0	55.0	54.0	20	18	0	15
Alfalfa hay	5.0	5.3	5.3	5.3	5.2	0	0	2.5	0
Alfalfa haylage	24.0	24.9	26.0	27.0	25.5	0	0	0	0
Grass hay						15	9	0	12
Corn grain	10.5	10.3	12.5	12.5	11.5	3	2	5.2	2.8
Soybean meal (47.5 percent)	2.0	2.0	1.8	1.8	1.9	2	2	0.8	1.5
Distillers dried grains	3.0	3.1	2.0	2.0	2.5	0	0	0	1.5
Corn gluten feed (dry)	7.5	8.0	5.0	5.0	6.4	0	0	0	0
Vitamin, mineral & minor ingredients	3.7	3.8	5.5	5.5	4.6	0.33	3.1	1.1	0.3
Total pounds, as fed	107.7	111.2	113.0	114.1	111.5	40.3	34.1	9.5	33.0
Ration profile									
Dry matter intake (pounds per day)	55.0	56.6	57.0	57.4		25.1	20.6	8.5	21.3
Ration dry matter (percent)	51.0	50.9	50.4	50.3		62.3	60.6	89.0	64.5
Metabolizable energy balance (megacalories)	6.4	7.5	7.4	7.7		5.7	0.5		
Crude protein (percent)	17.3	17.5	17.5	17.5		12.1	15.6	16.5	13.1
Neutral Detergent Fiber Digestibility (percent)	30.6	30.9	29.9	30.0		48.7	42.7	18.9	47.4

Exhibit 1.4.2. 400-cow dairy cropping plan.

Feedstuff	Average tons fed per year	Waste & shrink (percent)	Total tonnage	Tons per acre	Acres needed
Corn silage (35 percent dry matter)	3,954	20.0%	4,745	24.0	198
Alfalfa hay	369	2.0%	404	5.0	81
Alfalfa haylage	1,574	5.0%	1,653	10.0	165
Grass hay	466	2.0%	475	3.0	158*
Corn grain	965	1.0%	975	4.5	217*
Soybean meal (47.5 percent protein)	202	0.5%	203		
Dried distillers grain	197	1.0%	199		
Corn gluten feed (dry)	394	1.0%	398		
Vitamins, minerals & minor ingredients	341	1.0%	345		
Total	8,488		9,395		819

*Note: Grass hay and corn grain may be purchased rather than produced on-farm. Model does not include acreage for grass hay or corn grain.

Exhibit 1.4.3. 690-cow dairy cropping plan.

Feedstuff	Average tons fed per year	Waste & shrink (percent)	Total tonnage	Tons per acre	Acres needed
Corn silage (35% dry matter)	6,821	20.0%	8,185	24.0	341
Alfalfa hay	683	2.0%	697	5.0	139
Alfalfa haylage	2,715	5.0%	2,851	10.0	285
Grass hay	803	2.0%	819	3.0	273*
Corn grain	1,664	1.0%	1,681	4.5	373*
Soybean meal (47.5% protein)	348	0.5%	349		
Dried distillers grain	339	1.0%	342		
Corn gluten feed (dry)	680	1.0%	686		
Vitamins, minerals & minor ingredients	588	1.0%	594		
Total	14,640		16,204		1,412

*Note: Grass hay and corn grain may be purchased rather than produced on-farm. Model does not include acreage for grass hay or corn grain.

1.5 Labor cost and management

Exhibit 1.5.1 presents a labor and management overview for the 400-cow and 690-cow dairy models. Each operation is run by a full-time farm manager. The primary farm manager oversees the business operation and makes major management decisions. This person oversees compliance with the established SOPs and completes all purchasing, contracts, payroll, personnel management and financial analyses. A salary for this position is assumed at \$50,000 annually for the 400-cow plan. For the 690-cow model, the farm manager salary is increased to \$75,000 per year and an additional herd manager will be hired at \$40,000.

Hired labor will complete business functions such as feeding, cattle/heifer/calf care, breeding, calving, equipment maintenance and manure management. These workers may be hired from outside or from within the operator's family. Outsourcing of forage crop planting and harvesting is used to keep labor costs low. Wage rates for full-time and part-time employees would begin at \$15.50 per hour. Total full-time employee equivalents (FTE) vary by operational size, ranging from 1.9 to 5.8 in the models. Benefits for all jobs include Social Security and Medicare. Paid vacation is estimated at 2 percent of total wages. Each dairy business is assumed to have workers compensation (5 percent of total wages) and unemployment insurance. Exhibits 1.5.2 and 1.5.3 present potential staffing plans and starting wage rates for each dairy model.

Like other resources, hired employees improve farm profitability only if they are essential, qualified and effectively managed. New employees should complement existing personnel rather than duplicate existing strengths. Planning before hiring will help the dairy find employees with skills and personal characteristics best meeting the needs of the business.

Exhibit 1.5.1. Annual labor overview.

	400-cow model	690-cow model
Total labor hours	20,384	26,728
Total full-time equivalents	9.8	12.9
Pound of milk per full-time equivalent (five-year average)	999,872	1,315,396
Total labor cost, including wages and benefits (five-year average)	391,485	552,004

Exhibit 1.5.2. Hourly labor positions and wage rates, 400-cow model.

Type of position	Number of employees	Starting wage rate	Hours per week
Shift #1	2 persons	\$15.50/hour	112
Shift #2	2 persons	\$15.50/hour	112
Shift #3	1 person	\$15.50/hour	56
Feeding/youngstock	1 person	\$15.50/hour	56

Exhibit 1.5.3 – Hourly labor positions and wage rates, 690-cow model.

Type of position	Number of employees	Starting wage rate	Hours per week
Shift #1	2 persons	\$15.50/hour	112
Shift #2	2 persons	\$15.50/hour	112
Shift #3	2 persons	\$15.50/hour	112
Feeding/youngstock	2 persons	\$15.50/hour	84

1.6 Other operating costs

Exhibit 1.6.1 details selected operating costs, beyond feed and labor, assumed in each dairy model. These expenses are the same in each model on a per-cow basis. A 2 percent annual rate of inflation is assumed for certain operating expenses.

Exhibit 1.6.1. Selected operating costs for each dairy model, per cow.

Cost category	400-cow model	690-cow model
Artificial insemination	\$55	\$55
Vet, med and hoof trimming	\$163	\$163
Farm supplies and bedding	\$128	\$128
Fuel and oil	\$58	\$58
Utilities	\$100	\$100
Farm insurance	\$40	\$40
Miscellaneous expenses	\$20	\$20

Other operating costs vary for each dairy model. Each cost, and how it was calculated for each model, is explained below.

- *Repairs – Buildings.* Estimated to be 1 percent of initial building capital investment.
- *Repairs – Machinery and equipment.* Repair cost for machinery and equipment is assumed at 2.5 percent of initial capital investment.
- *Farm taxes.* This includes real estate and personal property taxes. Taxes are estimated at 0.10 percent of total capital investments.
- *Legal and professional fees.* Annual first year estimates for the 400-cow, and 690-cow models are \$4,000 and \$5,000, respectively. For accounting and payroll, the dairy is assumed to use a cash basis computerized accounting system with a dairy specific chart of accounts and the ability to make accrual adjustments to produce accrual adjusted income statements. An accounting firm is hired for end of year tax planning and income tax preparation. A lawyer is used for legal discussions and related topics.
- *Custom hire.* Custom hire services are assumed for planting, harvest and forage hauling (corn silage, alfalfa haylage and alfalfa hay). Planting custom rates are assumed at \$17.25 per acre for corn silage (yearly) and \$15.67 for alfalfa (every four years). Chopping and hauling custom rates are assumed at \$9 per wet-basis ton for corn silage and alfalfa haylage. Alfalfa hay is assumed at \$35 per dry ton for cutting, raking and baling.

- *Depreciation.* Straight line depreciation is included for all buildings and equipment investments, with salvage value assumed at \$0. Building investments are depreciated over 15 years; machinery/equipment investments depreciated over 10 years.
- *Non-dairy farm supplies.* Corn silage inoculants, at a cost of \$2.25 per ton, are assumed to be used to enhance crop preservation.



1.7 Land, crops and nutrient management

Land required for each dairy operation is based on providing a suitable land base for forage crops, the farmstead and manure application. Exhibit 1.7.1 presents acreage needs for each robotic dairy model. Farmstead and unused land are estimated at 20 percent above the forage crop land base in each model. Unused land includes forests, rivers, streams and similar non-arable land types commonly found on most Missouri farms.

Exhibit 1.7.1. Land requirements by operation size.

Category	400-cow model	690-cow model
Corn silage crop	198	341
Alfalfa haylage crop	165	285
Alfalfa hay crop	81	139
Farmstead or unused land	89	154
Total acres	533	919

Corn and alfalfa will be raised on owned land to guarantee quality, lower feed costs, and ensure nutrient balancing. Forage acreage for each dairy size is represented in exhibit 1.7.1. Exhibit 1.7.2 details yield, market value and shrink assumptions for each crop. Corn silage and some alfalfa are produced under center pivot irrigation to mitigate weather risk and improve yields while decreasing total land investment.

Exhibit 1.7.2. Forage crop production and price assumptions.

Category	Unit	Corn silage	Alfalfa haylage	Alfalfa hay
Yield	wet tons per acre	24.0	10	5
Market value in the field	dollars per ton	\$37.50	\$98.00	\$190.50
Shrink added cost in ration	percent	20%	5%	2%

Crop enterprise production costs are estimated in Exhibit 1.7.3. Costs include seed, crop chemicals and fertilizer. Fertilizer expenses have been reduced to account for manure applications to forage crop acreage. Seed costs are assumed annually for corn silage and every four years for alfalfa.

Exhibit 1.7.3. Annual forage crop production costs, per acre.

Cost category	Corn silage	Alfalfa
Seed	\$84.56	\$11.63
Crop chemicals	\$40.00	\$20.00
Fertilizer and soil amendments	\$150.75	\$115.90
Manure credit - fertilizer value	(\$82.30)	(\$82.30)
Total cost per acre	\$193.01	\$65.23

Note: Alfalfa seed cost assumes planting crop every four years.

The manure handling system for the dairy models is designed to flush parlor wastewater and sand-laden manure to a sand separation concrete apron and collection pad. A passive manure separation storage basin allows gravity and time to settle manure solids out of the solution. The liquid portion of the manure eventually resides in an earthen lagoon impoundment with 365 days of storage available. Irrigation is used under center pivot systems to apply the liquid fraction of manure to crop acreage. The solid fraction of manure is applied to crop acreage with an owned solid manure spreader.

Book values of dairy manure nutrient content were used in these models to estimate manure excretion. Based on the book values and nutrient removal values for corn silage, the model dairy operations will have enough crop acreage to accommodate all manure applications. Farmers are encouraged to use their own manure test results to make more precise estimates.



1.8 Organizational structure

Careful thought and consideration should be given to selecting a business entity that best reflects the goals and structure of a dairy. Tax implications, benefits and structure are important considerations. Two of the more common entities used in dairy operations are limited liability companies (LLC) and S corporations. Exhibit 1.8.1 provides an entity comparison chart. Seeking advice from an accountant or tax attorney is recommended to help decide the most suitable entity for a given situation.

Exhibit 1.8.1. Entity comparison chart.

	LLC	C Corp	B Corp	S Corp	Cooperative	Non-Profit	Sole Proprietor	General Partnership
Organizing document is required		✓	✓	✓	✓	✓		
Annual meetings are required		✓	✓	✓	✓	✓		
One owner is okay	✓	✓	✓	✓			✓	
Can sell or transfer entity to others	✓	✓	✓	✓	✓			
Personal liability is protected	✓	✓	✓	✓	✓	✓		
Owners can make a profit	✓	✓	✓	✓	✓		✓	✓
Can prioritize a social purpose over making profits	✓		✓	✓	✓	✓	✓	✓
Entity does not have to pay taxes (pass-through)	✓			✓			✓	✓
Potential self-employment tax savings				✓				
Potential to be tax exempt						✓		
Potential for donors to receive a tax deduction						✓		
Potential for favorable tax deductions on business entity's earnings					✓			

Source: Farmers' Guide to Business Structures (<https://farmcommons.org/>)

2. Financial statements and analysis

The following sections examine the financial feasibility of the 400-cow and 690-cow dairy models. The practical value and use of a detailed production plan can be measured in the ability of the plan to provide positive cash flow and a reasonable rate of return on investment.

Each financial analysis includes an examination of the cash flow, profit/loss, dairy enterprise, balance sheet and financial ratios. A sensitivity analysis is included to show adverse changes to milk price and production. Many dairy producers may not consider such information crucial to the investment decision, judging the investment to be acceptable if the business is projected to sufficiently cash flow and service debt. Additional analysis, however, is needed for two reasons: 1) to analyze the overall financial health of the business and its ability to service financial obligations (debt and expenses); and 2) to determine the financial return on new investments.

These models represent dairies using 100 percent equity financing (no debt). Although unrealistic, this simplifying assumption allows lenders to quickly analyze the operation's free cash flow to determine how much debt the dairy will support.

Various assumptions are made in each analysis. All replacement heifers are developed on-site at the operation. The land base includes enough purchased land for the operation's forage needs. Custom hire operators are used for planting and harvesting of forage crops. Center pivot irrigation systems are implemented for forage crop acreage. Lastly, the land base is sufficient to manage nutrients from all manure applications from the dairy enterprise.

Additional strategies could improve the financial position of each dairy model. Producers could consider outsourcing heifer development to reduce financial costs of raising replacements. Leases and manure easements or spreading arrangements with neighboring farms could secure land needed for crop acreage or manure application. Capital investment costs could be reduced with due diligence and careful planning and purchasing.

2.1 Financial analysis for the 400-cow model

The cash flow statement measures the cash position of the business over a specified period of time. It compares total cash inflow with total cash outflow. The difference is the net cash position of the business at the end of the period. Note that carryover cash from a previous period is not included in the cash flow statement.

Exhibit 2.1.1. Cash flow statement, 400-cow model.

	Year 1	Year 2	Year 3	Year 4	Year 5	Five-year average
CASH INFLOWS						
Farm cash receipts						
Milk sales	\$1,690,406	\$1,779,375	\$1,801,617	\$1,823,859	\$1,846,102	\$1,788,272
Livestock sales	\$115,258	\$115,258	\$115,258	\$115,258	\$115,258	\$115,258
Crop sales	\$0	\$0	\$0	\$0	\$0	\$0
Government payments	\$0	\$0	\$0	\$0	\$0	\$0
Other farm income	\$0	\$0	\$0	\$0	\$0	\$0
Patronage dividends	\$0	\$0	\$0	\$0	\$0	\$0
Sale of assets:						
Machinery	\$0	\$0	\$0	\$0	\$0	\$0
Real estate	\$0	\$0	\$0	\$0	\$0	\$0
Other	\$0	\$0	\$0	\$0	\$0	\$0
Money borrowed	\$0	\$0	\$0	\$0	\$0	\$0
Total	\$1,805,664	\$1,894,633	\$1,916,875	\$1,939,117	\$1,961,359	\$1,903,530
CASH OUTFLOWS						
Cash farm expenses						
Seed expenses	\$19,580	\$19,971	\$20,371	\$20,778	\$21,194	\$20,379
Fertilizer & chemicals	\$34,632	\$35,325	\$36,032	\$36,752	\$37,487	\$36,046
Purchased feedstuffs	\$562,200	\$584,038	\$589,537	\$595,037	\$600,537	\$586,270
Labor (includes benefits & Social Security)	\$376,136	\$383,658	\$391,331	\$399,158	\$407,141	\$391,485
Marketing 1/	\$81,510	\$85,800	\$86,873	\$87,945	\$89,018	\$86,229
Artificial insemination	\$22,000	\$22,000	\$22,000	\$22,000	\$22,000	\$22,000
Veterinary, medicine & hoof trimming	\$65,200	\$65,200	\$65,200	\$65,200	\$65,200	\$65,200
Farm supplies & bedding	\$61,877	\$63,114	\$64,377	\$65,664	\$66,977	\$64,402
Fuel & oil	\$23,304	\$23,304	\$23,304	\$23,304	\$23,304	\$23,304
Utilities	\$40,000	\$40,800	\$41,616	\$42,448	\$43,297	\$41,632

Exhibit 2.1.1. Cash flow statement, 600-cow model (continued).

	Year 1	Year 2	Year 3	Year 4	Year 5	Five-year average
CASH OUTFLOWS (continued)						
Repairs (buildings)	\$26,263	\$26,263	\$26,263	\$26,263	\$26,263	\$26,263
Repairs (machinery & equipment)	\$40,108	\$40,108	\$40,108	\$40,108	\$40,108	\$40,108
Rent	\$0	\$0	\$0	\$0	\$0	\$0
Farm taxes (real estate & personal property)	\$7,058	\$7,199	\$7,343	\$7,490	\$7,640	\$7,346
Farm insurance	\$16,000	\$16,320	\$16,646	\$16,979	\$17,319	\$16,653
Interest	\$0	\$0	\$0	\$0	\$0	\$0
Legal & professional fees	\$4,000	\$4,080	\$4,162	\$4,245	\$4,330	\$4,163
Custom hire	\$76,099	\$77,621	\$79,173	\$80,757	\$82,372	\$79,204
Car & truck costs	\$0	\$0	\$0	\$0	\$0	\$0
Contract heifer rearing	\$0	\$0	\$0	\$0	\$0	\$0
Other expenses	\$8,000	\$8,000	\$8,000	\$8,000	\$8,000	\$8,000
Miscellaneous	\$21,959	\$22,542	\$22,835	\$23,132	\$23,433	\$22,780
Total cash farm expenses	\$1,485,925	\$1,525,343	\$1,545,170	\$1,565,260	\$1,585,619	\$1,541,463
Capital purchases:						
Breeding livestock	\$0	\$3	\$0	\$0	\$0	\$1
Machinery & equipment	\$165,645	\$165,645	\$165,645	\$165,645	\$165,645	\$165,645
Buildings & land	\$0	\$0	\$0	\$0	\$0	\$0
Principal payments	\$0	\$0	\$0	\$0	\$0	\$0
Family living expenses	\$0	\$0	\$0	\$0	\$0	\$0
Personal draw	\$0	\$0	\$0	\$0	\$0	\$0
State & federal income taxes, self-employment taxes	\$0	\$0	\$0	\$0	\$0	\$0
Other	\$0	\$0	\$0	\$0	\$0	\$0
Total	\$1,651,570	\$1,690,991	\$1,710,815	\$1,730,905	\$1,751,264	\$1,707,109
NET CASH FLOW	\$154,094	\$203,642	\$206,060	\$208,212	\$210,096	\$196,421

1/ Includes milk hauling, state and federal promotion, coop/marketing fees and the cost of marketing beef.

The profit/loss statement provides a business analysis of the farm over a specified period of time. Similar to the cash flow statement, it also includes the value of inventory changes and depreciation charges to the business. Taking into account the value of inventory changes, called income adjustments in this table, attempts to convert the cash measure of income to an accrual-based measure.

Exhibit 2.1.2. Profit and loss statement, 400-cow model.

	Year 1	Year 2	Year 3	Year 4	Year 5	Five-year average
GROSS REVENUE						
Milk sales	\$1,690,406	\$1,779,375	\$1,801,617	\$1,823,859	\$1,846,102	\$1,788,272
Calves & heifers sold	\$58,258	\$58,258	\$58,258	\$58,258	\$58,258	\$58,258
Other farm income 2/	\$0	\$0	\$0	\$0	\$0	\$0
Total revenue	\$1,748,664	\$1,837,633	\$1,859,875	\$1,882,117	\$1,904,359	\$1,846,530
OPERATING EXPENSES:						
PURCHASED FEED						
Feedstuffs	\$562,200	\$584,038	\$589,537	\$595,037	\$600,537	\$586,270
Less feed for heifers	(\$180,527)	(\$180,366)	(\$180,366)	(\$180,366)	(\$180,366)	(\$180,399)
Total feed	\$381,672	\$403,671	\$409,171	\$414,671	\$420,171	\$405,871
HERD REPLACEMENT COSTS						
Depreciation (dairy cows)	\$84,903	\$84,904	\$84,903	\$84,903	\$84,903	\$84,904
Loss on sale of cows	\$47,398	\$47,399	\$47,398	\$47,398	\$47,398	\$47,398
OTHER OPERATING EXPENSES						
Seed expenses	\$19,580	\$19,971	\$20,371	\$20,778	\$21,194	\$20,379
Fertilizer & chemicals	\$34,632	\$35,325	\$36,032	\$36,752	\$37,487	\$36,046
Hired labor (includes benefits, Social Security)	\$376,136	\$383,658	\$391,331	\$399,158	\$407,141	\$391,485
Marketing 1/	\$81,510	\$85,800	\$86,873	\$87,945	\$89,018	\$86,229
Artificial insemination	\$22,000	\$22,000	\$22,000	\$22,000	\$22,000	\$22,000
Veterinary, medicine, hoof trimming	\$65,200	\$65,200	\$65,200	\$65,200	\$65,200	\$65,200
Supplies & bedding	\$61,877	\$63,114	\$64,377	\$65,664	\$66,977	\$64,402
Fuel & oil	\$23,304	\$23,304	\$23,304	\$23,304	\$23,304	\$23,304
Utilities	\$40,000	\$40,800	\$41,616	\$42,448	\$43,297	\$41,632
Repairs (buildings)	\$26,263	\$26,263	\$26,263	\$26,263	\$26,263	\$26,263
Repairs (machinery & equipment)	\$40,108	\$40,108	\$40,108	\$40,108	\$40,108	\$40,108
Farm taxes (real estate & personal property)	\$7,058	\$7,199	\$7,343	\$7,490	\$7,640	\$7,346
Farm insurance	\$16,000	\$16,320	\$16,646	\$16,979	\$17,319	\$16,653
Legal & professional fees	\$4,000	\$4,080	\$4,162	\$4,245	\$4,330	\$4,163
Custom hire	\$76,099	\$77,621	\$79,173	\$80,757	\$82,372	\$79,204
Car & truck costs	\$0	\$0	\$0	\$0	\$0	\$0
Other expenses	\$8,000	\$8,000	\$8,000	\$8,000	\$8,000	\$8,000
Miscellaneous	\$21,959	\$22,542	\$22,835	\$23,132	\$23,433	\$22,780
Depreciation (buildings & equipment)	\$335,517	\$335,517	\$335,517	\$335,517	\$335,517	\$335,517
Less other expenses for raising heifers	(\$12,825)	(\$12,814)	(\$12,814)	(\$12,814)	(\$12,814)	(\$12,816)
Total other operating expenses	\$1,246,417	\$1,264,008	\$1,278,335	\$1,292,925	\$1,307,784	\$1,277,894
TOTAL OPERATING EXPENSES	\$1,760,390	\$1,799,982	\$1,819,807	\$1,839,897	\$1,860,256	\$1,816,067
INCOME BEFORE FINANCING COSTS	(\$11,726)	\$37,651	\$40,068	\$42,220	\$44,103	\$30,463
Interest and rent expense	\$0	\$0	\$0	\$0	\$0	\$0
NET INCOME (LOSS)	(\$11,726)	\$37,651	\$40,068	\$42,220	\$44,103	\$30,463

1/ Includes milk hauling, state and federal promotion, coop/marketing fees and the cost of marketing beef.

2/ Other farm income is assumed at zero here but could include crop sales, government payments, patronage, dividends, etc.

Exhibit 2.1.3. Dairy enterprise, 400-cow model.

	Herd	Per cow	Per hundred pounds of milk produced	Percent
INCOME FROM OPERATIONS:				
Milk sales	\$1,788,272	\$4,471	\$18.25	97.1%
Sales of young stock & calves	\$53,058	\$133	\$0.54	2.9%
Other farm income	\$0	\$0	\$0.00	0.0%
Patronage dividend	\$0	\$0	\$0.00	0.0%
Total gross receipts	\$1,841,330	\$4,603	\$18.79	100.0%
OPERATING EXPENSES:				
Feed:				
Feedstuffs	\$1,003,153	\$2,508	\$10.24	51.2%
Less feed for heifers	(\$180,399)	(\$451)	(\$1.84)	(9.2%)
Total feed	\$822,754	\$2,057	\$8.40	42.0%
Herd replacement costs:				
Depreciation (dairy cows)	\$84,904	\$212	\$0.87	4.3%
Loss on sale of cows	\$47,398	\$118	\$0.48	2.4%
Total herd replacement costs	\$132,302	\$331	\$1.35	6.8%
Other operating expenses:				
Labor (includes benefits & Social Security)	\$344,507	\$861	\$3.52	17.6%
Marketing 1/	\$86,229	\$216	\$0.88	4.4%
Artificial insemination	\$22,000	\$55	\$0.22	1.1%
Veterinary, medicine & hoof trimming	\$65,200	\$163	\$0.67	3.3%
Supplies & bedding	\$53,289	\$133	\$0.54	2.7%
Fuel & oil	\$23,304	\$58	\$0.24	1.2%
Utilities	\$41,632	\$104	\$0.42	2.1%
Repairs (buildings)	\$26,263	\$66	\$0.27	1.3%
Repairs (machinery & equipment)	\$38,102	\$95	\$0.39	1.9%
Rent	\$0	\$0	\$0.00	0.0%
Farm taxes (real estate & personal property)	\$4,848	\$12	\$0.05	0.2%
Farm insurance	\$14,988	\$37	\$0.15	0.8%
Legal & professional fees	\$3,747	\$9	\$0.04	0.2%
Custom hire	\$0	\$0	\$0.00	0.0%
Car & truck costs	\$0	\$0	\$0.00	0.0%
Other	\$7,600	\$19	\$0.08	0.4%
Interest	\$0	\$0	\$0.00	0.0%
Depreciation	\$285,189	\$713	\$2.91	14.6%
Less other expenses for raising heifers	(\$12,816)	(\$32)	(\$0.13)	(0.7%)
Total other operating expenses	\$1,004,082	\$2,510	\$10.25	51.3%
TOTAL OPERATING EXPENSES	\$1,959,138	\$4,898	\$19.99	100.0%
NET INCOME FROM OPERATIONS	(\$117,808)	(\$295)	(\$1.20)	

1/ Includes milk hauling, state and federal promotion, coop/marketing fees and the cost of marketing beef.

The balance sheet provides a picture of the business at a particular point in time. It compares assets with liabilities in order to determine equity in the business. Market value basis is used in this analysis since it provides a more realistic view of returns on investment and more closely resembles the approach an investor would use.

Exhibit 2.1.4. Balance sheet, 400-cow model.

	Beginning	Ending	Ending	Ending	Ending	Ending
	Year 1	Year 1	Year 2	Year 3	Year 4	Year 5
ASSETS						
Current assets:						
Cash	\$10,000	\$10,000	\$35,588	\$36,032	\$36,477	\$36,922
Other current assets	\$71,703	\$136,540	\$338,081	\$342,307	\$346,533	\$350,759
Total current assets	\$81,703	\$146,540	\$373,669	\$378,340	\$383,010	\$387,681
Non-current assets:						
Dairy herd	\$600,000	\$600,000	\$921,545	\$921,544	\$921,544	\$921,544
Farm & equipment						
Land	\$1,879,932	\$1,879,932	\$1,879,932	\$1,879,932	\$1,879,932	\$1,879,932
Nonfarm real estate	\$0	\$0	\$0	\$0	\$0	\$0
Buildings	\$2,626,298	\$2,451,212	\$2,276,125	\$2,101,039	\$1,925,952	\$1,750,865
Equipment, autos & trucks	\$1,604,300	\$1,609,515	\$1,614,730	\$1,619,945	\$1,625,160	\$1,630,375
Total	\$6,110,530	\$5,940,659	\$5,770,787	\$5,600,916	\$5,431,044	\$5,261,173
Other assets:						
Investment in co-ops	\$0	\$12,509	\$25,676	\$39,008	\$52,505	\$66,166
Other (notes receivable, etc.)	\$0	\$0	\$0	\$0	\$0	\$0
Total other assets	\$0	\$12,509	\$25,676	\$39,008	\$52,505	\$66,166
Total non-current assets	\$6,710,530	\$6,553,168	\$6,718,008	\$6,561,468	\$6,405,093	\$6,248,883
Total assets	\$6,792,233	\$6,699,708	\$7,091,677	\$6,939,808	\$6,788,104	\$6,636,564
LIABILITIES						
Current liabilities:	\$0	\$76,068	\$80,072	\$81,073	\$82,074	\$83,075
Long-term liabilities:	\$0	\$0	\$0	\$0	\$0	\$0
Total liabilities	\$0	\$76,068	\$80,072	\$81,073	\$82,074	\$83,075
EQUITY						
Owners equity:		\$0	\$0	\$0	\$0	\$0
Capital contributions		\$0	\$0	\$0	\$0	\$0
Owner withdrawals		\$0	\$0	\$0	\$0	\$0
Total owner equity		\$6,635,366	\$6,973,954	\$6,818,667	\$6,663,810	\$6,509,386
Retained earnings		(\$11,726)	\$37,651	\$40,068	\$42,220	\$44,103
Net income		\$6,623,640	\$7,011,605	\$6,858,735	\$6,706,030	\$6,553,490
Total equity		\$0	\$0	\$0	\$0	\$0
Total liabilities and equity		\$6,699,708	\$7,091,677	\$6,939,808	\$6,788,104	\$6,636,564

Exhibit 2.1.5. Financial ratios, 400-cow model.

	Year 1	Year 2	Year 3	Year 4	Year 5
Liquidity					
1. Current ratio	1.93	4.67	4.67	4.67	4.67
2. Working capital	\$70,472	\$293,597	\$297,267	\$300,937	\$304,607
Solvency					
3. Debt/asset ratio	1.1%	1.1%	1.2%	1.2%	1.3%
4. Equity/asset ratio	98.9%	98.9%	98.8%	98.8%	98.7%
5. Debt/equity ratio	1.15%	1.14%	1.18%	1.22%	1.27%
Profitability					
6. Rate of return on assets	(0.2%)	0.5%	0.6%	0.6%	0.7%
7. Rate of return on equity	(0.2%)	0.5%	0.6%	0.6%	0.7%
8. Operating profit margin ratio	(0.7%)	2.0%	2.2%	2.2%	2.3%
Financial Efficiency					
9. Asset turnover ratio	25.9%	26.6%	26.5%	27.4%	28.4%
10. Operational ratios					
a. Operating expense ratio	76.6%	75.1%	75.2%	75.4%	75.6%
b. Depreciation expense ratio	24.0%	22.9%	22.6%	22.3%	22.1%
c. Interest expense ratio	0.0%	0.0%	0.0%	0.0%	0.0%
d. Net farm income from operations ratio	(0.7%)	2.0%	2.2%	2.2%	2.3%
DuPont Identities					
11. Profit margin	(0.7%)	2.0%	2.2%	2.2%	2.3%
12. Asset turnover	0.3	0.3	0.3	0.3	0.3
13. Financial leverage	1.0	1.0	1.0	1.0	1.0
14. Return on equity	(0.2%)	0.5%	0.6%	0.6%	0.7%
Dairy Profitability Ratios					
15. Total assets per cow	\$16,865	\$17,239	\$17,539	\$17,160	\$16,781
16. Total debt per cow	\$190	\$200	\$203	\$205	\$208
17. Assets per hundredweight of milk produced	\$72	\$73	\$70	\$68	\$66
18. Gross milk margin	52.8%	53.9%	54.1%	54.4%	54.7%
19. Net milk margin 1/	(9.7%)	(6.3%)	(5.8%)	(5.4%)	(5.0%)
20. Feed cost 1/	45.8%	44.8%	44.5%	44.3%	44.1%
21. Hired labor 1/	19.0%	18.4%	18.6%	18.7%	18.9%
22. Milk marketing costs 1/	4.7%	4.7%	4.7%	4.7%	4.7%
23. Herd replacement costs 1/	7.6%	7.2%	7.1%	7.0%	7.0%

1/ From the dairy enterprise as a percent of sales.

A sensitivity analysis measures how changing market and financial conditions may impact the financial feasibility of a business plan. The dairy must be able to financially survive short-term changes in milk and feed prices, milk production levels and other financial variables. Additionally, changing the level of initial capital invested may also impact the financial picture. The following results show these changes in market conditions and capital efficiency.

Exhibit 2.1.6. Milk production sensitivity, 400-cow model, five-year averages.

	Pounds (lbs) of milk per cow per day						
	Decrease 6.0 lbs	Decrease 4.0 lbs	Decrease 2.0 lbs	80 lbs per day (five-year average)	Increase 2.0 lbs	Increase 4.0 lbs	Increase 6.0 lbs
Net cash flow	\$69,499	\$111,806	\$154,114	\$196,421	\$238,728	\$281,035	\$323,342
Net income	(\$96,459)	(\$54,151)	(\$11,844)	\$30,463	\$72,770	\$115,077	\$157,385
Rate of return on assets	(1.4%)	(0.8%)	(0.2%)	0.4%	1.1%	1.7%	2.3%
Operating expenses per hundredweight of milk (excluding depreciation)	\$18.39	\$17.93	\$17.50	\$17.08	\$16.69	\$16.32	\$15.96

Exhibit 2.1.7. Milk price sensitivity, 400-cow model, five-year averages.

	Milk prices						
	Decrease \$3	Decrease \$2	Decrease \$1	Base price \$18.25	Increase \$1	Increase \$2	Increase \$3
Net cash flow	(\$97,542)	\$446	\$98,433	\$196,421	\$294,408	\$392,396	\$490,383
Net income	(\$263,499)	(\$165,512)	(\$67,524)	\$30,463	\$128,451	\$226,438	\$324,426
Rate of return on assets	(3.9%)	(2.4%)	(1.0%)	0.4%	1.9%	3.3%	4.7%

Exhibit 2.1.8. Capital efficiency sensitivity, 400-cow model, five-year averages.

	Initial capital invested per cow				
	Decrease \$5,000	Decrease \$2,500	Base investment	Increase \$2,500	Increase \$5,000
Total assets per cow	\$12,534	\$14,825	\$17,117	\$19,409	\$21,700
Total assets per hundredweight of milk	\$51	\$61	\$70	\$79	\$88
Asset turnover ratio	36.8%	31.1%	27.0%	23.8%	21.3%
Rate of return on assets	2.2%	1.2%	0.4%	(0.1%)	(0.6%)

2.2 Financial analysis for the 690-cow model

The cash flow statement measures the cash position of the business over a specified period of time. It compares total cash inflow with total cash outflow. The difference is the net cash position of the business at the end of the period. Note that carryover cash from a previous period is not included in the cash flow statement.

Exhibit 2.2.1. Cash flow statement, 690-cow model.

	Year 1	Year 2	Year 3	Year 4	Year 5	Five-year average
CASH INFLOWS						
Farm cash receipts						
Milk sales	\$2,915,951	\$3,069,422	\$3,107,790	\$3,146,157	\$3,184,525	\$3,084,769
Livestock sales	\$198,600	\$198,600	\$198,600	\$198,600	\$198,600	\$198,600
Crop sales	\$0	\$0	\$0	\$0	\$0	\$0
Government payments	\$0	\$0	\$0	\$0	\$0	\$0
Other farm income	\$0	\$0	\$0	\$0	\$0	\$0
Patronage dividends	\$0	\$0	\$0	\$0	\$0	\$0
Sale of assets:						
Machinery	\$0	\$0	\$0	\$0	\$0	\$0
Real estate	\$0	\$0	\$0	\$0	\$0	\$0
Other	\$0	\$0	\$0	\$0	\$0	\$0
Money borrowed	\$0	\$0	\$0	\$0	\$0	\$0
Total	\$3,114,551	\$3,268,022	\$3,306,389	\$3,344,757	\$3,383,125	\$3,283,369
CASH OUTFLOWS						
Cash farm expenses						
Seed expenses	\$33,772	\$34,448	\$35,137	\$35,839	\$36,556	\$35,150
Fertilizer & chemicals	\$59,734	\$60,929	\$62,147	\$63,390	\$64,658	\$62,172
Purchased feedstuffs	\$969,373	\$1,007,564	\$1,017,051	\$1,026,538	\$1,036,025	\$1,011,310
Labor (includes benefits & Social Security)	\$530,361	\$540,968	\$551,787	\$562,823	\$574,079	\$552,004
Marketing 1/	\$140,605	\$148,005	\$149,855	\$151,705	\$153,555	\$148,745
Artificial insemination	\$37,950	\$37,950	\$37,950	\$37,950	\$37,950	\$37,950
Veterinary, medicine & hoof trimming	\$112,470	\$112,470	\$112,470	\$112,470	\$112,470	\$112,470
Farm supplies & bedding	\$106,736	\$108,871	\$111,048	\$113,269	\$115,535	\$111,092
Fuel & oil	\$40,199	\$40,199	\$40,199	\$40,199	\$40,199	\$40,199
Utilities	\$69,000	\$70,380	\$71,788	\$73,223	\$74,688	\$71,816

Exhibit 2.1.1. Cash flow statement, 690-cow model (continued).

	Year 1	Year 2	Year 3	Year 4	Year 5	Five-year average
CASH OUTFLOWS (continued)						
Repairs (buildings)	\$39,871	\$39,871	\$39,871	\$39,871	\$39,871	\$39,871
Repairs (machinery & equipment)	\$55,493	\$55,493	\$55,493	\$55,493	\$55,493	\$55,493
Rent	\$0	\$0	\$0	\$0	\$0	\$0
Farm taxes (real estate & personal property)	\$11,083	\$11,305	\$11,531	\$11,762	\$11,997	\$11,535
Farm insurance	\$27,600	\$28,152	\$28,715	\$29,289	\$29,875	\$28,726
Interest	\$0	\$0	\$0	\$0	\$0	\$0
Legal & professional fees	\$5,000	\$5,100	\$5,202	\$5,306	\$5,412	\$5,204
Custom hire	\$131,251	\$133,876	\$136,553	\$139,284	\$142,070	\$136,607
Car & truck costs	\$0	\$0	\$0	\$0	\$0	\$0
Contract heifer rearing	\$0	\$0	\$0	\$0	\$0	\$0
Other expenses	\$13,800	\$13,800	\$13,800	\$13,800	\$13,800	\$13,800
Miscellaneous	\$35,764	\$36,741	\$37,209	\$37,683	\$38,164	\$37,112
Total cash farm expenses	\$2,420,062	\$2,486,121	\$2,517,806	\$2,549,896	\$2,582,397	\$2,511,256
Capital purchases:						
Breeding livestock	\$0	\$0	\$0	\$0	\$0	\$0
Machinery & equipment	\$257,955	\$257,955	\$257,955	\$257,955	\$257,955	\$257,955
Buildings & land	\$0	\$0	\$0	\$0	\$0	\$0
Principal payments	\$0	\$0	\$0	\$0	\$0	\$0
Family living expenses	\$0	\$0	\$0	\$0	\$0	\$0
Personal draw	\$0	\$0	\$0	\$0	\$0	\$0
State & federal income taxes, self-employment taxes	\$0	\$0	\$0	\$0	\$0	\$0
Other	\$0	\$0	\$0	\$0	\$0	\$0
Total	\$2,678,017	\$2,744,076	\$2,775,761	\$2,807,851	\$2,840,352	\$2,769,211
NET CASH FLOW	\$436,534	\$523,947	\$530,628	\$536,906	\$542,773	\$514,157

1/ Includes milk hauling, state and federal promotion, coop/marketing fees and the cost of marketing beef.

The profit/loss statement provides a business analysis of the farm over a specified period of time. Similar to the cash flow statement, it also includes the value of inventory changes and depreciation charges to the business. Taking into account the value of inventory changes, called income adjustments in this table, attempts to convert the cash measure of income to an accrual-based measure.

Exhibit 2.2.2. Profit and loss statement, 690-cow model.

	Year 1	Year 2	Year 3	Year 4	Year 5	Five-year average
GROSS REVENUE						
Milk sales	\$2,915,951	\$3,069,422	\$3,107,790	\$3,146,157	\$3,184,525	\$3,084,769
Calves & heifers sold	\$100,275	\$100,275	\$100,275	\$100,275	\$100,275	\$100,275
Other farm income 2/	\$0	\$0	\$0	\$0	\$0	\$0
Total revenue	\$3,016,226	\$3,169,697	\$3,208,064	\$3,246,432	\$3,284,800	\$3,185,044
OPERATING EXPENSES						
PURCHASED FEED						
Feedstuffs	\$969,373	\$1,007,564	\$1,017,051	\$1,026,538	\$1,036,025	\$1,011,310
Less feed for heifers	(\$310,889)	(\$311,132)	(\$311,132)	(\$311,132)	(\$311,132)	(\$311,083)
Total feed	\$658,484	\$696,432	\$705,919	\$715,407	\$724,894	\$700,227
HERD REPLACEMENT COSTS						
Depreciation (dairy cows)	\$146,458	\$146,459	\$146,458	\$146,458	\$146,458	\$146,458
Loss on sale of cows	\$81,761	\$81,763	\$81,761	\$81,761	\$81,761	\$81,761
OTHER OPERATING EXPENSES						
Seed expenses	\$33,772	\$34,448	\$35,137	\$35,839	\$36,556	\$35,150
Fertilizer & chemicals	\$59,734	\$60,929	\$62,147	\$63,390	\$64,658	\$62,172
Hired labor (includes benefits, Social Security)	\$530,361	\$540,968	\$551,787	\$562,823	\$574,079	\$552,004
Marketing 1/	\$140,605	\$148,005	\$149,855	\$151,705	\$153,555	\$148,745
Artificial insemination	\$37,950	\$37,950	\$37,950	\$37,950	\$37,950	\$37,950
Veterinary, medicine, hoof trimming	\$112,470	\$112,470	\$112,470	\$112,470	\$112,470	\$112,470
Supplies & bedding	\$106,736	\$108,871	\$111,048	\$113,269	\$115,535	\$111,092
Fuel & oil	\$40,199	\$40,199	\$40,199	\$40,199	\$40,199	\$40,199
Utilities	\$69,000	\$70,380	\$71,788	\$73,223	\$74,688	\$71,816
Repairs (buildings)	\$39,871	\$39,871	\$39,871	\$39,871	\$39,871	\$39,871
Repairs (machinery & equipment)	\$55,493	\$55,493	\$55,493	\$55,493	\$55,493	\$55,493
Farm taxes (real estate & personal property)	\$11,083	\$11,305	\$11,531	\$11,762	\$11,997	\$11,535
Farm insurance	\$27,600	\$28,152	\$28,715	\$29,289	\$29,875	\$28,726
Legal & professional fees	\$5,000	\$5,100	\$5,202	\$5,306	\$5,412	\$5,204
Custom hire	\$131,251	\$133,876	\$136,553	\$139,284	\$142,070	\$136,607
Car & truck costs	\$0	\$0	\$0	\$0	\$0	\$0
Other expenses	\$13,800	\$13,800	\$13,800	\$13,800	\$13,800	\$13,800
Miscellaneous	\$35,764	\$36,741	\$37,209	\$37,683	\$38,164	\$37,112
Depreciation (buildings & equipment)	\$487,775	\$487,775	\$487,775	\$487,775	\$487,775	\$487,775
Less other expenses for raising heifers	(\$22,089)	(\$22,105)	(\$22,105)	(\$22,105)	(\$22,105)	(\$22,101)
Total other operating expenses	\$1,916,375	\$1,944,226	\$1,966,425	\$1,989,028	\$2,012,042	\$1,965,619
TOTAL OPERATING EXPENSES	\$2,803,078	\$2,868,880	\$2,900,564	\$2,932,654	\$2,965,155	\$2,894,066
INCOME BEFORE FINANCING COSTS	\$213,147	\$300,816	\$307,500	\$313,778	\$319,645	\$290,977
Interest and rent expense	\$0	\$0	\$0	\$0	\$0	\$0
NET INCOME (LOSS)	\$213,147	\$300,816	\$307,500	\$313,778	\$319,645	\$290,977

1/ Includes milk hauling, state and federal promotion, coop/marketing fees and the cost of marketing beef.

2/ Other farm income is assumed at zero here but could include crop sales, government payments, patronage, dividends, etc.

Exhibit 2.2.3. Dairy enterprise, 690-cow model.

	Herd	Per cow	Per hundred pounds of milk produced	Percent
INCOME FROM OPERATIONS:				
Milk sales	\$3,084,769	\$4,471	\$18.25	97.1%
Sales of young stock & calves	\$91,525	\$133	\$0.54	2.9%
Other farm income	\$0	\$0	\$0.00	0.0%
Patronage dividend	\$0	\$0	\$0.00	0.0%
Total gross receipts	\$3,176,294	\$4,603	\$18.79	100.0%
OPERATING EXPENSES:				
Feed:				
Feedstuffs	\$1,730,334	\$2,508	\$10.24	54.5%
Less feed for heifers	(\$311,083)	(\$451)	(\$1.84)	(9.8%)
Total feed	\$1,419,251	\$2,057	\$8.40	44.7%
Herd replacement costs:				
Depreciation (dairy cows)	\$146,458	\$212	\$0.87	4.6%
Loss on sale of cows	\$81,761	\$118	\$0.48	2.6%
Total herd replacement costs	\$228,220	\$331	\$1.35	7.2%
Other operating expenses:				
Labor (includes benefits & Social Security)	\$485,763	\$704	\$2.87	15.3%
Marketing 1/	\$148,745	\$216	\$0.88	4.7%
Artificial insemination	\$37,950	\$55	\$0.22	1.2%
Veterinary, medicine & hoof trimming	\$112,470	\$163	\$0.67	3.5%
Supplies & bedding	\$91,924	\$133	\$0.54	2.9%
Fuel & oil	\$40,199	\$58	\$0.24	1.3%
Utilities	\$71,816	\$104	\$0.42	2.3%
Repairs (buildings)	\$39,871	\$58	\$0.24	1.3%
Repairs (machinery & equipment)	\$52,718	\$76	\$0.31	1.7%
Rent	\$0	\$0	\$0.00	0.0%
Farm taxes (real estate & personal property)	\$7,613	\$11	\$0.05	0.2%
Farm insurance	\$25,854	\$37	\$0.15	0.8%
Legal & professional fees	\$4,684	\$7	\$0.03	0.1%
Custom hire	\$0	\$0	\$0.00	0.0%
Car & truck costs	\$0	\$0	\$0.00	0.0%
Other	\$13,110	\$19	\$0.08	0.4%
Interest	\$0	\$0	\$0.00	0.0%
Depreciation	\$414,609	\$601	\$2.45	13.1%
Less other expenses for raising heifers	(\$22,101)	(\$32)	(\$0.13)	-0.7%
Total other operating expenses	\$1,525,224	\$2,210	\$9.02	48.1%
TOTAL OPERATING EXPENSES	\$3,172,695	\$4,598	\$18.77	100.0%
NET INCOME FROM OPERATIONS	\$3,599	\$5	\$0.02	

1/ Includes milk hauling, state and federal promotion, coop/marketing fees and the cost of marketing beef.

The balance sheet provides a picture of the business at a particular point in time. It compares assets with liabilities in order to determine equity in the business. Market value basis is used in this analysis since it provides a more realistic view of returns on investment and more closely resembles the approach an investor would use.

Exhibit 2.2.4. Balance sheet, 690-cow model.

	Beginning	Ending	Ending	Ending	Ending	Ending
	Year 1	Year 1	Year 2	Year 3	Year 4	Year 5
ASSETS						
Current assets:						
Cash	\$10,000	\$10,000	\$61,388	\$62,156	\$62,923	\$63,691
Other current assets	\$123,687	\$235,532	\$583,190	\$590,480	\$597,770	\$605,060
Total current assets	\$133,687	\$245,532	\$644,579	\$652,636	\$660,693	\$668,750
Non-current assets:						
Dairy herd	\$1,035,000	\$1,035,000	\$1,589,664	\$1,589,664	\$1,589,664	\$1,589,664
Farm & equipment						
Land	\$3,242,436	\$3,242,436	\$3,242,436	\$3,242,436	\$3,242,436	\$3,242,436
Nonfarm real estate	\$0	\$0	\$0	\$0	\$0	\$0
Buildings	\$3,987,071	\$3,721,266	\$3,455,462	\$3,189,657	\$2,923,852	\$2,658,047
Equipment, autos & trucks	\$2,219,700	\$2,255,685	\$2,291,670	\$2,327,655	\$2,363,640	\$2,399,625
Total	\$9,449,207	\$9,219,388	\$8,989,568	\$8,759,748	\$8,529,928	\$8,300,109
Other assets:						
Investment in co-ops	\$0	\$21,578	\$44,292	\$67,289	\$90,571	\$114,136
Other (notes receivable, etc.)	\$0	\$0	\$0	\$0	\$0	\$0
Total other assets	\$0	\$21,578	\$44,292	\$67,289	\$90,571	\$114,136
Total non-current assets	\$10,484,207	\$10,275,966	\$10,623,524	\$10,416,701	\$10,210,163	\$10,003,909
Total assets	\$10,617,894	\$10,521,497	\$11,268,102	\$11,069,337	\$10,870,856	\$10,672,659
LIABILITIES						
Current liabilities:	\$0	\$131,218	\$138,124	\$139,851	\$141,577	\$143,304
Long-term liabilities:	\$0	\$0	\$0	\$0	\$0	\$0
Total liabilities	\$0	\$131,218	\$138,124	\$139,851	\$141,577	\$143,304
EQUITY						
Owners equity:						
Capital contributions		\$0	\$0	\$0	\$0	\$0
Owner withdrawals		\$0	\$0	\$0	\$0	\$0
Total owner equity		\$0	\$0	\$0	\$0	\$0
Retained earnings		\$10,177,132	\$10,829,162	\$10,621,986	\$10,415,501	\$10,209,711
Net income		\$213,147	\$300,816	\$307,500	\$313,778	\$319,645
Total equity		\$10,390,280	\$11,129,978	\$10,929,487	\$10,729,279	\$10,529,355
Total liabilities and equity		\$10,521,497	\$11,268,102	\$11,069,337	\$10,870,856	\$10,672,659

Exhibit 2.2.5. Financial ratios, 690-cow model.

	Year 1	Year 2	Year 3	Year 4	Year 5
Liquidity					
1. Current ratio	1.87	4.67	4.67	4.67	4.67
2. Working capital	\$114,314	\$506,455	\$512,785	\$519,116	\$525,447
Solvency					
3. Debt/asset ratio	1.2%	1.2%	1.3%	1.3%	1.3%
4. Equity/asset ratio	98.8%	98.8%	98.7%	98.7%	98.7%
5. Debt/equity ratio	1.26%	1.24%	1.28%	1.32%	1.36%
Profitability					
6. Rate of return on assets	2.0%	2.8%	2.8%	2.9%	3.0%
7. Rate of return on equity	2.1%	2.7%	2.8%	2.9%	3.0%
8. Operating profit margin ratio	7.1%	9.5%	9.6%	9.7%	9.7%
Financial Efficiency					
9. Asset turnover ratio	28.5%	29.1%	28.7%	29.6%	30.5%
10. Operational ratios					
a. Operating expense ratio	71.9%	70.5%	70.6%	70.8%	71.0%
b. Depreciation expense ratio	21.0%	20.0%	19.8%	19.5%	19.3%
c. Interest expense ratio	0.0%	0.0%	0.0%	0.0%	0.0%
d. Net farm income from operations ratio	7.1%	9.5%	9.6%	9.7%	9.7%
DuPont Identities					
11. Profit margin	7.1%	9.5%	9.6%	9.7%	9.7%
12. Asset turnover	0.3	0.3	0.3	0.3	0.3
13. Financial leverage	1.0	1.0	1.0	1.0	1.0
14. Return on equity	2.1%	2.7%	2.8%	2.9%	3.0%
Dairy Profitability Ratios					
15. Total assets per cow	\$15,318	\$15,790	\$16,187	\$15,899	\$15,611
16. Total debt per cow	\$190	\$200	\$203	\$205	\$208
17. Assets per hundredweight of milk produced	\$66	\$67	\$65	\$63	\$61
18. Gross milk margin	52.8%	53.9%	54.1%	54.4%	54.7%
19. Net milk margin 1/	(2.9%)	0.2%	0.6%	1.0%	1.4%
20. Feed cost 1/	45.8%	44.8%	44.5%	44.3%	44.1%
21. Hired labor 1/	15.5%	15.1%	15.2%	15.3%	15.4%
22. Milk marketing costs 1/	4.7%	4.7%	4.7%	4.7%	4.7%
23. Herd replacement costs 1/	7.6%	7.2%	7.1%	7.0%	7.0%

1/ From the dairy enterprise as a percent of sales.

A sensitivity analysis measures how changing market and financial conditions may impact the financial feasibility of a business plan. The dairy must be able to financially survive short-term changes in milk and feed prices, milk production levels and other financial variables. Additionally, changing the level of initial capital invested may also impact the financial picture. The following results show these changes in market conditions and capital efficiency.

Exhibit 2.2.6. Milk production sensitivity, 690-cow model, five-year averages.

	Pounds (lbs) of milk per cow per day						
	Decrease 6.0 lbs	Decrease 4.0 lbs	Decrease 2.0 lbs	80 lbs per day (five-year average)	Increase 2.0 lbs	Increase 4.0 lbs	Increase 6.0 lbs
Net cash flow	\$295,218	\$368,198	\$441,177	\$514,157	\$587,137	\$660,117	\$733,097
Net income	\$72,038	\$145,018	\$217,997	\$290,977	\$363,957	\$436,937	\$509,917
Rate of return on assets	0.7%	1.3%	2.0%	2.7%	3.3%	4.0%	4.7%
Operating expenses per hundredweight of milk (excluding depreciation)	\$17.56	\$17.13	\$16.71	\$16.32	\$15.94	\$15.59	\$15.25

Exhibit 2.2.7. Milk price sensitivity, 690-cow model, five-year averages.

	Milk prices						
	Decrease \$3	Decrease \$2	Decrease \$1	Base price \$18.25	Increase \$1	Increase \$2	Increase \$3
Net cash flow	\$7,072	\$176,101	\$345,129	\$514,157	\$683,186	\$852,214	\$1,021,243
Net income	(\$216,108)	(\$47,079)	\$121,949	\$290,977	\$460,006	\$629,034	\$798,063
Rate of return on assets	(2.0%)	(0.4%)	1.1%	2.7%	4.2%	5.7%	7.3%

Exhibit 2.2.8. Capital efficiency sensitivity, 690-cow model, five-year averages.

	Initial capital invested per cow				
	Decrease \$5,000	Decrease \$2,500	Base investment	Increase \$2,500	Increase \$5,000
Total assets per cow	\$11,178	\$13,469	\$15,761	\$18,053	\$20,344
Total assets per hundredweight of milk	\$46	\$55	\$64	\$74	\$83
Asset turnover ratio	41.3%	34.3%	29.3%	25.6%	22.7%
Rate of return on assets	5.5%	3.9%	2.7%	1.8%	1.1%

2.3 Risk management

Farmers face many risks that generally fit into one or more of these categories: production, marketing/price, financial and legal/institutional. Risk management is an important aspect of the dairy farming business. The uncertainties of weather, yields, prices, government policies, global markets, and other factors can cause wide swings in farm income. Risk management involves choosing among alternatives that reduce the financial effects of such uncertainties. The following sections explain key risks and management strategies that farmers should consider when making decisions for their dairy.

Milk production risk

Monitoring the quantity of milk shipped on a daily basis and tracking it over time can provide quick insight into whether the “milk production system” is producing within the target range and if any upward or downward trend is occurring. If a lot of scatter (lots of highs and lows) is occurring in daily milk production, evaluating the daily activities can determine whether activities are not occurring properly on some days and need to be adjusted. Cows will produce at a higher level if they experience less change in their daily routine. Significant daily scatter over time will most likely result in lower average production levels that may adversely affect the operation’s financial position.

Average days in milk should remain constant for a continuous freshening herd. A slow upward trend in the average number of days in milk may be an indication of a reproduction problem that may not exhibit itself until a number of months after the problem started.

Freestall conditions will be inspected on a weekly basis to evaluate whether daily maintenance is adequate. A number of production problems can result from poor stall maintenance occurring over an extended period of time. Taking a few pictures of typical stall conditions and comparing the pictures to the stall condition the next week may be needed to detect small, unwanted



changes in stall conditions over time. Individual stall conditions need to be looked at as well as variation in stall conditions throughout available housing.

The monthly cow inventory should be monitored. Knowing the actual number of cows milked can provide insight into whether an adequate number of replacement cows are entering the herd and/or if the cull rate is greater than anticipated. For a large herd, a few pounds of milk per cow per day can mask a slow upward or downward trend in cow numbers. The inventory of cows milked needs to be compared with projected inventories to ensure cow numbers remain adequate to implement production plans.

Milk pricing risk

Milk prices are more volatile than almost any other agricultural commodity produced in the U.S. Although milk price swings have become somewhat predictable, dairies continually evaluate changing market conditions to manage price risks. Managing milk price risk begins with a marketing plan, which is driven by the goals and objectives of the business. The suite of tools now available to be used in dairy marketing plans includes: Dairy Margin Coverage, Dairy Revenue Protection, and Dairy Gross Margin Insurance.

The futures market is also used, in addition to the packaged milk price risk protection tools listed above, to reduce the risk of price change and increase the level of price certainty. One can use futures and options to price milk up to two years in advance through a specialized dairy commodity broker. Contracts are available on the Chicago Mercantile Exchange for Class III and IV Milk; each contract size is 200,000 pounds.

In the futures market, hedging can be used to mitigate price risk. Hedging is simultaneous but opposite transactions on the cash and futures markets. The theory behind hedging is:

cash market losses (gains) = futures markets gains (losses).

Options are a hedging tool that can establish a floor price for milk to protect against any downward movement.

When using the futures market, it is important to understand the concept of basis:

basis = cash price minus futures price.

The less a producer knows about the farm's basis history, the greater the farm's basis risk and the less effective dairy futures and options will be as price risk management tools. Knowing the basis is essential

for a dairy producer to translate a dairy futures price into an expected cash milk price to be paid in the future.

Some cooperatives pass through cash-forward contracting opportunities to producers. This is a cash market transaction in which a seller agrees to deliver at least a portion of their milk to a buyer at some point in the future for a set price.

Brokers or cooperatives with risk management services are used by producers to make transactions on the futures market. Producers should take “baby steps” to get comfortable with using futures marketing tools. Those new to futures contracting, or those with low debt levels, might consider using futures to contract less than 50 percent of monthly production. Setting a minimum and maximum volume of milk to contract each month guards a producer from “locking it all in” on the futures market.

Feed risk

Corn silage and alfalfa haylage are planned to be a significant portion of the diets fed throughout the year. Soon after harvest, both the quantity and quality of the forages should be evaluated. This will determine if there is an adequate silage supply for the coming year and will determine any ration modifications needed to best use the forage supply. It is relatively easy to minimize feed cost and production problems by making small ration adjustments early in a “supply year,” rather than waiting until later in the year when the corn silage or alfalfa haylage supply is either of insufficient quantity or quality. An estimate of the quantity of forage harvested should be made at harvest to get an indication of available quantity. Finally, the amount of spoiled silage or haylage removed from storage needs to be monitored to determine if excessive waste may be reducing forage quality or quantity. Mycotoxin risks can be mitigated by irrigating forage, following careful quality control specifications in feed purchases and implementing standard operating procedures for silage storage and feeding.

Monitoring the price, quantity and quality of purchased feedstuffs ensures that an adequate amount of feedstuffs are contracted or sourced for the dairy’s feed needs. Protecting price, quality and quantity helps control input costs and ensures feedstuff quality and quantity are available for the planned rations.



Herd health risk

Assembling a large herd requires commingling replacement animals from various sources with often unknown health histories. To minimize disease introduction, the dairy will follow vaccination and cow cleanliness protocols. Replacement heifer care is a critical risk area. If heifer calves are not kept alive and raised appropriately to calve in at the targeted 24 months of age, additional cash flow will be needed to purchase replacements.

Weather risk

Heat stress causes more milk loss and cow mortality in Missouri than any other weather condition. Frostbite-caused mastitis is a risk for unprotected cows during winter extremes. Wind damage from tornados is always a possibility in Missouri; property insurance can manage tornado damage risk to farm infrastructure. Drought can lower forage yields and raise purchased hay and feed prices. Drought-distressed corn intended for grain harvest often becomes available for purchase as silage.

Human resources risk

Good communication between management and all employees is essential. Assembling an employment manual creates the official source for operational policies, practices, standards and other details about the business. A process should be established for timely communication and decision-making. Regularly scheduled meetings will help improve decision making assure employees are held accountability for their role in meeting farm goals. Regular employee training helps assure job satisfaction, performance and worker safety.

Financial risk

Financial risk has three basic components: 1) the cost and availability of debt capital; 2) the ability to meet cash flow needs in a timely manner; and 3) the ability to maintain and grow equity. Borrowing is necessary for most farm businesses. Although interest rate risk is mostly beyond the farm's control, appropriately structuring debt and using fixed rates can mitigate risk. Cash flows are especially important because of the variety of ongoing farm obligations like cash input costs, cash lease payments, tax payments, debt repayment and family living expenses.

Financial risk should be managed through sound planning and financial control that conserves cash and liquidity for the operation. A set of well-maintained financial records is absolutely necessary to maintain financial control of a farm or ranch. The dairy should avoid making any uncritical capital purchases. Understanding the dairy's competitive position and planning for the future is also important. If the equity

position of the operation is not maintained or improved over time, then the operator's time and investments would be better suited doing something else.

Legal risk

Site-specific environmental risks can be minimized by careful examination before construction. The dairy operator should conduct a critical overview of the farm's overall site management, cattle housing and feeding systems, manure management, nutrient management and livestock mortality management; a non-regulatory assessment of the production site should also be conducted. A good resource for exploring publicly available environmental information is the AgSite Assessment Tool (agsite.missouri.edu/). Further information about site selection can be found in Section 3.2. Dairy facilities constructed away from public roadways, with a visual landscape screen, facilitate biosecurity protocols and reduce dust, noise and odor complaints.

A plan should be developed for manure application including protocols for accidental spills, agency contact and neighbor communication. The dairy operation should follow a comprehensive nutrient management plan and apply all manure in accordance with state and federal laws.

3. Implementation plan

3.1 Timelines

The dairy's startup phase has important long-term effects on the financial performance of the overall plan. Detailed planning (see Exhibit 3.1.1) is strongly recommended given the size of the investments required and the degree of risk. Planning includes selecting and testing a site and completing all plans and drawings necessary for the dairy operation. Budgeting, permitting, financing and contractual obligations would be met during months #4 to #6. It is assumed that construction of the new facilities would take about five months before cows could be milked. Replacement heifers would also be purchased and added to maintain the herd size.

Exhibit 3.1.1. Project timeline by month.

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16
A. Site selection	B. Test borings		D. Budget												
	C. Plans and drawing		E. Permits												
			F. Financing												
			G. Contracts signed												
						H. Delivery of materials									
						I. Site prep/roads									
								K. Electrical utilities							
								L. Water and wells							
											M. Purchase cows/heifers				
													N. Startup/Begin Milking		
													O. Grade/landscape		

3.2 Site selection

Potential dairy production facility sites must be thoroughly and accurately evaluated to ensure that:

- Adequate land area is available to store and spread animal manure in an environmentally acceptable manner.
- A water supply of sufficient quantity and quality is available to serve the production needs of the facility.

Lack of land area for waste spreading or an inadequate water supply renders a site unsuitable for confined livestock production units.

Manure handling systems

Lagoons and liquid manure storage tanks are the two basic manure handling systems presently utilized to store animal manure. Planning waste handling systems for a specific site depends on the results of a geologic investigation. Earthen manure storage structures cannot be used in areas where a geologic rating of "severe" is determined for the "collapse potential" classification.

A soils investigation of the site is also necessary to determine the availability of suitable clay material to seal an earthen manure storage basin. This investigation will also reveal if soil amendments will be required to adequately seal the earthen basin. Other options such as concrete or high-density polyethylene (HDPE) lined storage facilities can also be considered when needed.

Soil properties must also be evaluated for how well effluent will infiltrate the soil-plant filter and be used by growing plants. Plant use of nutrients contained in the effluent requires certain moisture storing capabilities and an adequate residual time in the soil profile. A soil permeability range of 0.2 - 2.0 inches per hour is suitable for irrigation.

A separate waste management system is required to treat sanitary wastes from restrooms at the production unit and any residences located on the site. These on-site treatment systems are also site-specific and need to be planned and designed to complement the other facilities in the operation.

Water supply

Each specific site has requirements for the availability of an adequate water supply. A successful livestock production unit requires a large quantity of water with sufficient quality to maintain production. Intermediate water storage, with a minimum volume of one day's usage, is necessary to provide production protection should the main water system become inoperable.

Accessibility

The site for a large dairy operation must have highway access for large trucks during construction as well as an adequate, all-weather route for milk trucks to market. Electrical service and other necessary utilities must also be available to the site.

Isolation

The site needs to be reasonably isolated so that prevailing winds and air drainage patterns do not create nuisances for neighbors or local public use areas. Each potential dairy production site should be thoroughly evaluated in order to minimize the chance of future nuisance complaints.

Topography

The topography at the building site needs to be level to gently sloping so that buildings can be properly located and constructed to the desired slopes without excessive cuts and fills. Space is also needed for the manure management and storage facilities, feed storage and other required facilities. Planned traffic lanes for efficient movement of wheel traffic, animals, and workers must be incorporated into the overall facility layout.

Biosecurity

Biosecurity is the practice of managing the herd to minimize the potential for introducing disease via people, cattle, wildlife, insect vectors or mechanical vectors (equipment, instruments and tools). The major disease risks are associated with animal contact or the contamination of drinking water. A location which prevents fence line contact or the possibility of intermingling of neighboring livestock is highly desirable. A proper way of managing the routine operational mortality should also be planned to minimize the risk of animal and human health/safety and regulatory risks, and protect environmental resources. Mortality composting is becoming more popular compared to other disposal practices because of biosecurity reasons, reduced environmental risks and the generation of a useful end-product.

Water supplies should be from deep wells or fenced reservoirs which limit access of wildlife. Buildings should be constructed in a manner that discourages bird nesting and roosting sites. Feed bunks and areas where waste feeds accumulate need to be routinely cleaned. Stringent rodent control must be routinely practiced.

3.3 Permits and regulations

Missouri State Milk Board

Operation of a dairy in the state of Missouri requires a health permit from the Missouri State Milk Board (agriculture.mo.gov/animals/milk/). The board administers the state's Grade A and manufacturing grade milk sanitation programs. The board administers inspections relating to Grade A milk and milk supplies to assure uniformity of procedures and interpretation of milk inspection regulations. Milk procurers, manufacturing plants, field superintendents, testers, grades, samplers, bulk milk truck operators and market testing laboratories are licensed by the State Milk Board.

Missouri Department of Natural Resources

As of August 2020, the operation sizes (400-cow and 690-cow) discussed in this business plan would not need construction and operating permits from the Missouri Department of Natural Resources (DNR). The DNR concentrated animal feeding operations (CAFO) regulations typically only pertain to operations maintaining an inventory of 700 dairy cows or more in confinement. This does not include animals kept on pasture. Contact information for DNR's Water Protection Program is (573) 751-1300 by phone or the web address (dnr.mo.gov/env/wpp/cafo/).

3.4 Consultants

Successful dairy producers effectively utilize the technical expertise of professional consultants. Consultants could be used as sources of information on existing and emerging technologies and how new technologies might be applied to an operation. Areas of the dairy operation benefiting from professional consultants are environment, nutrition, structures, herd health and finances.

Consulting engineers can provide the professional expertise to plan, construct and operate efficient dairy facilities. Site planning, facility layout, building design, construction, and management that are all integrated with efficient manure and nutrient management facilities can help the operation optimize cow production potentials and more fully utilize labor.

Nutritionists can evaluate the herd's nutritional needs, balance rations and offer advice on feed bunk management. In addition, nutritionists can offer technical advice on the use of alternative feedstuffs. Alternative feedstuffs offer the potential of increasing milk production while lowering feed costs per cwt. of milk produced.

The veterinarian, along with the manager and other farm personnel, should establish and monitor a complete preventive health care program for the herd. The veterinarian can provide technical information gained from examinations, observations, laboratory analysis and treatment response. This information is extremely valuable in making adjustments to the preventive health care program.

Financial advisors, bankers or accountants can provide financial evaluation and planning, tax advice and estate planning.