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Starting a 75-Cow Intensive Rotational Grazing Dairy

This guide examines the financial feasibility of starting a 75-cow intensive rotational grazing dairy in Missouri. Data presented here reflect costs and conditions as of June 2020. This model was developed using assumptions, costs and benchmarking information from existing Missouri pasture-based dairies and dairy industry experts. While this farm was customized specific to Missouri, it could be adapted to conditions elsewhere. The model dairy farm is designed to use labor and capital as efficiently as possible.

Continued interest in the feasibility of starting a 75-cow grazing dairy operated by a husband and wife team instigated the development of this model farm. Users are cautioned to carefully examine the long term viability of this sized farm in their region. Rapid consolidation in dairy farming, reduced market access and increased milk hauling costs may limit long term viability of this sized model.

Farm description

In this model dairy, the farm is a carefully selected 100-acre piece of land purchased specifically for developing a grazing dairy. It is to be located in an area where winter weather conditions and soil types allow cattle to be housed outside all year. The farm is purchased for $3,500 per acre.

- 90 acres for paddocks
  - 1 cow per acre for 75 cows
  - 15 acres for raising heifers
- 10 acres for farmstead and facilities
- Permanent lanes, water lines and paddocks are established
- No irrigation or winter housing is planned
- A new swing-12 parabone parlor is built near the center of the farm

Dairy grazing publication series

This publication is one in a series about operating and managing a pasture-based dairy. Although these publications often refer to conditions in Missouri, many of the principles and concepts described apply to operations throughout the United States.

Herd management

The beginning herd for this dairy is assumed to include purchased crossbred dairy heifers. The heifers will be purchased with an eye to selecting cattle types best suited for grazing.

Cows are expected to be culled from the herd based on involuntary factors (e.g., death, disease, problem breeders) and voluntary factors (e.g., low milk production, disposition). Projected cow culling rates, death losses and the calving interval for the next five years are listed in Table 1. It is assumed that the average

Figure 1. The farm should be planted with annual forage and improved perennial forage varieties.

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cull rate (excluding deaths) would be 25 percent in the first year and fall to 22 percent in year two. Death loss rate would be 4 percent in all years. The total herd turnover rate would be 29 percent in year one and 26 percent in the remaining years.

Table 1. Herd turnover and mortality rates.

Description	Year 1	Year 2	Year 3	Year 4	Year 5
Target herd size (head)	75	75	75	75	75
Annual cull rate, excluding deaths (%)	25	22	22	22	22
Annual death loss (%)	4	4	4	4	4
Calving interval (months)	14.0	13.5	12.8	12.5	12.5

The entire dairy system is built around a seasonal grass-based dairy concept with a 12-month calving interval. However, higher cull rates in early years are expected when starting a dairy, which reflect the realities of beginning with commingled purchased heifers. The whole herd calving interval will drop as the hard breeders are selected out of the herd. By year four, the calving interval is expected to be 12.5 months.

Crossbred dairy cows are specified in this grazing dairy system because of their ability to make better use of pasture and their higher reproductivity and overall hybrid vigor. They typically can be purchased for lower prices than Holsteins that are traditionally selected for their high milk production traits. In the model, replacement heifers will be raised on-farm. One-third of the heifers and cows will be bred to beef genetics. Beef cross heifers are sold for $145 each. All bull calves will be sold for $120 each, reflecting a price of mixed crossbred bull calves from dairy and beef sires.

Table 2 shows annual milk production estimates and estimated rolling herd average. In the model, 97.5 percent of the total volume of milk is sold, and 2.5 percent from fresh or treated cows is discarded or consumed by calves.

Table 2. Milk production.

Description	Year 1	Year 2	Year 3	Year 4	Year 5
Pounds per day	40.0	42.0	45.0	46.0	46.0
365-day rolling herd average	12,289	12,903	13,683	13,920	13,920

Supplementary feeds are designed to complement the characteristics of the pasture forage at a reasonable cost (see Tables 3 and 4). Hay and concentrate are purchased in the dairy model. Ten pounds of concentrate costing $280/ton delivered is fed to each cow in the parlor for the milking group. Five pounds of purchased hay or silage costing $0.10/lb of dry matter is fed as needed throughout the year to the milking group. The dry cow group is being fed 5 pounds of concentrate costing $280/ton and 20 pounds of purchased hay at $0.045/lb as needed throughout the year. Heifer feed costs vary by age, see Table 5 for more detail. Milk replacer and calf starter are used in the initial months before receiving other concentrates, pasture and hay after month 2.

Table 3. Daily milking period feed costs (Cost/cow/day).

Description	Cost/cow/day
Purchased concentrates	1.40
Purchased hay	0.50
Total feed cost	1.90

Table 4. Daily dry cow period feed costs (Cost/cow/day).

Description	Cost/cow/day
Purchased concentrates	0.70
Purchased hay	0.90
Total feed cost	1.60

Table 5. Daily youngstock feed costs (Cost/animal/day).

Description	0-2 mos.	2-6 mos.	6-12 mos.	12-24 mos.
Purchased concentrates	1.70	0.48	0.60	0.72
Purchased hay	0.00	0.06	0.35	0.49
Total feed cost	1.70	0.54	0.95	1.21

Note: mos. = months

Milk marketing

Financial projections in this model use a farm-level gross milk price of $18.30 per hundredweight (cwt) in the first two years and $18.44 per cwt in the remaining years, including Dairy Margin Coverage payments during low price months. These price levels are considered realistic based on long-term historical milk prices, component levels and expected premiums in Missouri. Marketing costs that are deducted from the gross milk price in the model include DMC insurance ($0.15/cwt), dairy checkoff ($0.15/cwt), co-op fee ($0.20/cwt) and hauling ($0.85/cwt).

Labor management

A grazing dairy that milks two times daily will ideally plan to spend no more than 2.5 hours in the parlor per milking. Outsourcing of any necessary forage harvest is used to keep labor costs low. A husband and wife team will be employed at a salary of $42,000 per year, and no additional labor will be hired. Benefits cost for labor include only the employer's share of Social Security and Medicare taxes. Table 6 presents a labor summary for the 75-cow model dairy. A 2 percent inflation rate is built into labor and select operating expenses in the model.

Table 6. Labor summary.

Description	Year 1	Year 2	Year 3	Year 4	Year 5
Full-time equivalents (FTEs) (from labor hours)	2.1	2.1	2.1	2.1	2.1
Pounds milk per FTE	430,791	449,313	476,455	484,700	484,700
Annual benefits	3,213	3,277	3,343	3,410	3,478
Total salaried labor	42,000	42,840	43,697	44,571	45,462
Total labor cost	45,213	46,117	47,040	47,980	48,940

Capital investments

Capital investments for this start-up operation are listed in Table 7. These investments include land, real estate, machinery, equipment and livestock. The total capital invested in the dairy will be $851,005 ($11,347 per cow). This includes all the minimum components necessary to make the dairy operational.

The financial success of grazing dairies depends upon keeping the capital investment and the operating expenses low. Careful farm selection is critical to minimize the investment needed and to enable low operating costs. To avoid investments in livestock housing, the farm site must have well-drained soils. To keep feed costs low, the dairy needs mostly open ground with productive soils that can be managed for high-producing pastures that can be planted with annual forage and improved perennial forage varieties.

Investments in the milking center include a milking parlor, milking equipment, holding area, utility room, milk room, rest rooms and tanks. Milking equipment includes parabone stalls designed for rapid cow flow, a flush system for the parlor, automatic take-offs, plate cooler with chilled water and a heater. The parlor is assumed to be a swing-12 parabone parlor with automatic take-offs. The basic philosophy of most graziers carries over to the milking parlor. They want a facility that is both inexpensive and efficient and can be updated or improved as cash flow permits. Parabone swing parlors were used to promote production efficiency by emphasizing cow comfort, cow movement and efficient use of labor. This does not suggest other parlors will not work, but cost and efficiency must always be always considered.

Table 7. Capital investments.

Description	Quantity	Cost/ Unit	Total (dollars)
Land	100 acres	3,500	350,000
Dairy cows	75 cows	1,100	82,500
Heifers (1 year old)	22 heifers	400	8,800
Buildings and farm setup			
Milking parlor, eqipment, tank, holding area and office	24 stalls	7,000	168,000
Manure storage for parlor and holding area		40,000	40,000
Feed bins (15 tons each)	2 bins	7,000	14,000
Hay barn and equipment storage	5,000 ft	10	50,000
Lanes	5,703 ft	2.00	11,406
Watering system (without well and pump)	5,703 ft	2.00	11,406
Fencing and paddock setup	25,992 ft	0.90	23,393
Establishing new forages (fertilizer, seed, tillage)	90 acres	150.00	13,500
Machinery and equipment			
Tractor (100 HP with loader)	1	28,500	28,500
Pickup truck	1	15,000	15,000
ATV	1	5,000	5,000
Clipper mower	1	5,000	5,000
Silage feeding equipment	1	12,000	12,000
Other farm equipment			12,500
Total investment			**851,005**
Investment per cow			**11,347**

Permanent lanes, water lines and paddocks are established in this dairy. Lanes are essential in a pasture-based dairy to move cows easily from pasture to parlor, whether the grazing cell design is fixed or flexible. Constructing raised lanes with adequate drainage capacity and using crushed rock, lime screenings or other stabilizing material reduces annual maintenance needs and keeps cows cleaner and healthier. Electrified 12.5-gauge high-tensile wire is used for perimeter fence and permanent paddock fencing in this dairy system. Water systems include buried water lines and permanently installed stock tanks.

Initial expenses of forage establishment are included in the capital investments. These expenses include fertilizer, seed and tillage. Pastures can be seeded either on a prepared seedbed or no-till drilling, depending on site conditions and crop requirements. Machinery investments include a tractor, pickup, ATV, clipper/rotary mower, silage feed wagon and other farm equipment. Other facility investments include equipment storage, hay barn and feed bins.

Financial analysis and statements

The 75-cow model dairy will gross $186,373 per year in milk and young stock sales. This farm will have a net loss of $10,260 after all operating costs, labor and depreciation are deducted (see Tables 8–11 for financial measurements and statements). On a per cow basis, this is a gross operating income of $2,485 per cow and a net loss of $137 per cow, after labor and depreciation are deducted.

The model represents a dairy using 100 percent equity financing with no debt. Although unrealistic, this simplifying assumption helps lenders analyze the free cash flow to determine how much debt the operation will support. Adding net income from operations plus the building and machinery depreciation yields a free cash flow of $21,336 available for principal and interest payments (-$10,260 net loss + $31,596 depreciation). On a per cow basis, this is equivalent to $284 of cash available for principal and interest payments. This free cash flow estimate assumes no additional cash will be used for family living expenses other than what is already used to pay labor in the dairy.

Table 8. Financial measurements.

	Year 1	Year 2	Year 3	Year 4	Year 5
Current ratio	1.51	4.67	4.67	4.67	4.67
Return on assets	-2.7%	-1.9%	-0.8%	-0.4%	-0.6%
Operating expense ratio	89.7%	86.8%	82.9%	81.6%	82.3%
Depreciation expense ratio	23.0%	21.7%	20.5%	20.0%	20.0%
Net farm income from operations ratio	-12.6%	-8.5%	-3.4%	-1.6%	-2.3%

The character of the investments in the dairy reduces a lender's risk because a high percentage of the initial investment is concentrated in appreciating land and reproducing cattle rather than specialized assets that are harder to liquidate at full value.

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Table 9. Dairy enterprise budget for the 75-cow grazing dairy model (5-year average).

	Dollars per herd	Dollars per cow	Dollars per cwt	Percent
INCOME FROM OPERATIONS				
Milk sales	179,343	2,391	18.36	96.2%
Sales of young stock and calves	7,029	94	0.72	3.8%
Total gross receipts	186,373	2,485	19.08	100.0%
OPERATING EXPENSES				
Feed				
Feedstuffs	67,166	896	6.88	34.2%
Less feed for heifers	-16,500	-220	-1.69	-8.4%
Total feed costs	50,666	676	5.19	25.8%
Herd replacement costs				
Depreciation—dairy cows	7,510	100	0.77	3.8%
Loss on sale of cows	3,959	53	0.41	2.0%
Total herd replacement costs	11,469	153	1.17	5.8%
Hired labor (including benefits)	47,058	627	4.82	23.9%
DHIA[1] testing	1,950	26	0.20	1.0%
Semen/breeding	1,875	25	0.19	1.0%
Real estate/personal property taxes	2,214	30	0.23	1.1%
Milk marketing[2]	13,188	176	1.35	6.7%
Repairs	7,350	98	0.75	3.7%
Vet/medicine	4,875	65	0.50	2.5%
Parlor supplies	2,732	36	0.28	1.4%
Utilities	3,903	52	0.40	2.0%
Insurance	3,122	42	0.32	1.6%
Fertilizer	5,831	78	0.60	3.0%
Seed/spray	2,592	35	0.27	1.3%
Custom hire	2,082	28	0.21	1.1%
Truck and fuel	2,000	27	0.20	1.0%
Fence/water	2,000	27	0.20	1.0%
Other expenses	1,500	20	0.15	0.8%
Depreciation	31,596	421	3.23	16.1%
Less other expenses for raising heifers	-1,371	-18	-0.14	-0.70%
Total operating expenses	196,632	2,622	20.13	100.0%
NET INCOME FROM OPERATIONS	**-10,260**	**-137**	**-1.05**	

Notes

[1] Dairy Herd Improvement Association

[2] Includes milk hauling, Dairy Margin Coverage (DMC) insurance, federal promotion and cooperative fees.

Table 10. Pro forma income statement for the 75-cow grazing dairy model.

	Year 1 (dollars)	Year 2 (dollars)	Year 3 (dollars)	Year 4 (dollars)	Year 5 (dollars)	5-year average (dollars)
GROSS REVENUE						
Milk sales	165,553	172,671	183,102	187,695	187,695	179,343
Calves and heifers sold	6,544	6,786	7,158	7,402	7,547	7,087
Total gross revenue	172,097	179,457	190,259	195,097	195,242	186,431
OPERATING EXPENSES						
Feed						
Purchased concentrates	46,722	45,957	46,287	46,635	46,764	46,473
Purchased hay	20,762	20,292	20,594	20,866	20,954	20,693
Less feed for heifers	-16,725	-15,536	-16,240	-16,892	-17,109	-16,500
Total feed costs	50,759	50,713	50,641	50,609	50,609	50,666
Herd replacement costs						
Depreciation—dairy cows	7,929	7,406	7,405	7,405	7,405	7,510
Loss on sale of cows	4,339	3,864	3,863	3,863	3,863	3,959
Total herd replacement costs	12,268	11,270	11,268	11,268	11,268	11,469
Hired labor (includes benefits)	45,213	46,117	47,040	47,980	48,940	47,058
DHIA[1] testing	1,950	1,950	1,950	1,950	1,950	1,950
Semen/breeding	1,875	1,875	1,875	1,875	1,875	1,875
Real estate/personal property taxes	2,128	2,170	2,213	2,258	2,303	2,214
Milk marketing[2]	12,213	12,738	13,508	13,741	13,741	13,188
Repairs	7,350	7,350	7,350	7,350	7,350	7,350
Vet/medicine	4,875	4,875	4,875	4,875	4,875	4,875
Parlor supplies	2,625	2,678	2,731	2,786	2,841	2,732
Utilities	3,750	3,825	3,902	3,980	4,059	3,903
Insurance	3,000	3,060	3,121	3,184	3,247	3,122
Fertilizer	5,603	5,715	5,829	5,945	6,064	5,831
Seed/spray	2,490	2,540	2,591	2,642	2,695	2,592
Custom hire	2,000	2,040	2,081	2,122	2,165	2,082
Truck and fuel	2,000	2,000	2,000	2,000	2,000	2,000
Fence/water	2,000	2,000	2,000	2,000	2,000	2,000
Other expenses	1,500	1,500	1,500	1,500	1,500	1,500
Depreciation (buildings and equipment)	31,596	31,596	31,596	31,596	31,596	31,596
Less other expenses for raising heifers	-1,356	-1,294	-1,354	-1,406	-1,422	-1,371
Total operating expenses	193,817	194,716	196,716	198,255	199,657	196,632
NET INCOME (LOSS)	**-21,720**	**-15,259**	**-6,457**	**-3,158**	**-4,415**	**-10,202**

Notes

[1] Dairy Herd Improvement Association

[2] Includes milk hauling, Dairy Margin Coverage (DMC) insurance, federal promotion and cooperative fees.

Table 11. Pro forma cash flow statement for the 75-cow grazing dairy model.

	Year 1 (dollars)	Year 2 (dollars)	Year 3 (dollars)	Year 4 (dollars)	Year 5 (dollars)	5-year average (dollars)
CASH INFLOWS						
Milk sales	165,553	172,671	183,102	187,695	187,695	179,343
Livestock sales	16,857	15,862	16,233	16,477	16,622	16,410
Total cash inflows	182,410	188,533	199,334	204,172	204,317	195,753
CASH OUTFLOWS						
Purchased concentrates	46,722	45,957	46,287	46,635	46,764	46,473
Purchased hay	20,762	20,292	20,594	20,866	20,954	20,693
Hired labor (including benefits)	45,213	46,117	47,040	47,980	48,940	47,058
DHIA[1] testing	1,950	1,950	1,950	1,950	1,950	1,950
Semen/breeding	1,875	1,875	1,875	1,875	1,875	1,875
Real estate/ personal property taxes	2,128	2,170	2,213	2,258	2,303	2,214
Milk marketing[2]	12,213	12,738	13,508	13,741	13,741	13,188
Repairs	7,350	7,350	7,350	7,350	7,350	7,350
Vet/medicine	4,875	4,875	4,875	4,875	4,875	4,875
Parlor supplies	2,625	2,678	2,731	2,786	2,841	2,732
Utilities	3,750	3,825	3,902	3,980	4,059	3,903
Insurance	3,000	3,060	3,121	3,184	3,247	3,122
Fertilizer	5,603	5,715	5,829	5,945	6,064	5,831
Seed/spray	2,490	2,540	2,591	2,642	2,695	2,592
Custom hire	2,000	2,040	2,081	2,122	2,165	2,082
Truck and fuel	2,000	2,000	2,000	2,000	2,000	2,000
Fence/water	2,000	2,000	2,000	2,000	2,000	2,000
Other expenses	1,500	1,500	1,500	1,500	1,500	1,500
Total cash outflows	168,055	168,681	171,445	173,689	175,324	171,439
NET CASH FLOW	**14,355**	**19,852**	**27,889**	**30,483**	**28,993**	**24,314**

Notes

[1] Dairy Herd Improvement Association

[2] Includes milk hauling, Dairy Margin Coverage (DMC) insurance, federal promotion and cooperative fees.

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