

Economics of a Missouri Pasture-based Dairy Can a Small Farm Survive?

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As in all areas of business today there are continuous changes, and the dairy industry is no exception. For the past several years dairy producers have experienced large highs and lows in milk price with little increase in the average. At the same time, input costs for items such as feed, labor, machinery and supplies have continued to increase. High input costs have reduced or eliminated profit margins, a trend that has forced many dairy producers to explore alternative management strategies to remain competitive.

Several dairy producers have attempted to stay competitive by increasing herd size. In many cases, this has only added to the problem rather than solving it. Larger herds mean more hired labor, and that can create a whole new set of management problems. When asked, most dairy producers would rather manage cows than people. Expansion also requires additional capital for housing, feed, storage, equipment, animals and waste systems.

Other dairy producers faced with these economic and regulatory challenges have opted to increase their sustainability by lowering the cost of production through management-intensive grazing (MIG). By moving to pasture-based dairying, producers reduce capital expenditures for equipment since the cows harvest the majority of the forage and such operations are more urban and environmentally friendly. Through the use of specially designed milk parlors with high throughput, cows are not confined for more than 1 to 2 hours per milking. This reduces the amount of waste that must be contained and simultaneously reduces the size and scope of waste-management systems. Research in North Carolina demonstrated dairy animals in a MIG system deposited over 80% of their feces and urine on pasture.

Some dairy producers, university professionals and feed industry people have been critical of MiG associating it with reduced milk production, increased labor requirements and inconsistent forage quality. However, forage data from grazing operations has shown a mixture of cool and warm-season perennials and annuals can provide forages from March to November that test well above 18 percent crude protein and with energy values between 0.6 and 0.7 mcal/lb (Table 1). Some samples early in the grazing season tested above 30 percent crude protein and 0.8 mcal/lb net energy of lactation (NE_l). Forages of this quality will certainly sustain high levels of production. Experiences at the University of Missouri SW Research Center seasonal grazing dairy has shown cows peaking at 90 to 99.5 pounds per day on high quality ryegrass pasture and 16 pounds of a ground corn based concentrate.

Economic data from Missouri pasture-based dairy farms

The increased interest in MIG in Missouri created the demand for actual financial records from such operations in the state and not from generated models. Through a University of Missouri Outreach & Extension grant, core groups of pasture-based dairy operations were formed and financial records were collected and summarized for 1998, 1999 and 2000. Records for 2001 have yet to be collected.

A general overview of the structure and production of the dairies in the study for the three years is given in Table 2. There are pure breed herds of Holstein and Jersey, but most contain full-bloods as well as crossbreds. Regardless of breed, most of the grazers prefer a smaller sized mature animal as reflected by weight of cows. Climatic conditions have a major affect on days grazed with the range being from 160 to 365 days over the three year period. Quite noticeable is an 18.6% decrease in the acres grazed, even though herd size has increased. This is a reflection of better pasture management as well as establishment of improved cultivars. Even though production has not reached high levels on average, there are herds in the study averaging almost 20,000 pounds. However, those in the study have put much more emphasis on the amount of money retained, rather than the amount of money taken in.

Income, expenditures and operating margin for the dairies are listed in Table 3. It should be noted the costs associated with the operations heifers and dry cows are included in this data. During the three year period milk price decreased by 14.8% resulting in a 10.9% decline in total income per cow. While cow-related expenses remained essentially the same over this period, forage related expenses of the grazing system increased by 52%. This is highly correlated to the establishment of improved cultivars in the grazing system as well as the renting of more pasture land needing fencing, fertility and cultivar improvement. These factors resulted in a 30.4% decrease in the operating margin of those in the study. Even though production declined slightly during the period of collection, the decline in milk prices had the most significant impact. Interestingly, those in the study do notice their milk price, however is not an issue that creates great consternation since they realize it is one component they have little if any control. They are much more interested in looking at their input costs and how they compare to other grazers and how their management can be adjusted to improve operating income.

Operating margin is defined as the amount of money remaining per cow after subtracting direct cash expenses from total income per cow. Expenses that must still be considered would include debt service (principal and interest), capital purchases, federal and state income taxes, depreciation and family living. Since records taken from actual producers that differed in their debt load, family living expenses and capital purchases, these items were excluded from this analysis. It was determined the calculation of an average operating margin would be more helpful to producers contemplating a MIG system rather than an average net profit. The operating margin furnishes a value producers can use to determine if the income is sufficient to cover their particular debt and style of living.

The economics of Missouri pasture-based dairies compared with large conventional dairies

Record summaries of large conventional dairies were obtained from Genske, Mulder & Company, Certified Public Accountants in Chino, CA, for their dairy clients in the high plains. Expense items that were not a part of the records collected in the Missouri record were deducted from the records of conventional dairies. This included legal and accounting fees and the costs associated with herd replacements (cow depreciation and loss on sale of cows). Comparison data for 1998, 1999 and 2001 are listed in Table 4.

The conventional large dairies averaged 44.7% more cows (1214.3 vs 90.3), shipped 65.6% more milk per cow (22828 vs 13788), had a 13.5% increase in costs per hundredweight (\$10.56 vs \$9.30), experienced a 77.7% higher cull rate (34.3 vs 19.3) and showed a 13.8% higher operating margin (\$982 vs \$863). However, as previously mentioned, the high cost of replacing cows due to the high cull rate is not reflected in the data. For instance, in 2000 the loss on sale of

cows of the large herds had an associated cost of \$1.11 per hundredweight of milk or a cost of \$199 per cow. Since this value was also not a part of the grazers data, its inclusion would bring the two systems to approximately the same operating profit per cow. The factor favoring the large herd would then be size.

University of Missouri SW Research Center Seasonal Grazing Dairy

The SW Research Center dairy began operation in February 1999 as a joint effort of the university, agribusinesses and dairy producers. The university maintains a conventional confined, TMR herd on campus, but there was an expressed need by producers in SW Missouri to construct and carry out a research program for an alternative type of dairy operation, namely MIG. The seasonal component was added on our part as we observed operations in which the owner may have not been off the farm for 20 years. The objectives of the dairy are to evaluate the viability of MIG as it relates to economics, forage components, waste management, cow-type and barn design.

All cows and heifers freshen in February through April, although some animals do fall outside the calving window by freshening in late January and early May. The objective of the seasonal window in the spring is to match peak dry matter intake of the fresh cow with peak forage production. This also allows research projects to be more easily randomized with cows in similar days of milk. A dairy advisory board consisting of dairy producers, industry and university extension personnel aids in the determination of demonstration and research projects. A general overview of the structure and production of the dairy for the three years is given in Table 5.

Financial data for 1999, 2000 and 2001 are listed in Table 6. Expenses which are not directly incurred by the SW Center Dairy (insurance, property and personal property taxes, etc.) or which are not easily monitored (fuel, etc.) are denoted by an asterisk (*). The numbers listed were obtained from data collected from grazers in the study described above. This allows the data presented to compare equally to other grazing operations.

The operating margin the first year of operation was significantly less than the results of our study group, but all animals were first calf heifers and not in size or condition desired. In 2000 the results reversed. This was a reflection of both improvement in forage cultivars and a better understanding of the art of grazing. Even though operating margin increased significantly in 2001, much of this would be attributable to the large increase in milk price.

Feasibility of a Start-up MIG Dairy

In an effort to simulate a start-up operation, economic data from Missouri grazers was used in the creation of the “typical” 90 cow MIG operation observed in Missouri (Table 7). Income and expenses used for this simulated dairy represent the three-year average of 1998-2000. The loan structure used was based on information from Missouri lending institutions as well as local dairy producers. Producers should contact their lending institution(s) to determine the programs available for their own particular operation or situation.

Since this is a start-up operation, three groups of heifers are purchased at prices indicated to maintain herd size. The operating expenses used in this simulation include costs associated with heifer development. Based on experience with cull rates associated with Missouri grazing operations it will be possible in most years to expand internally or market replacement heifers for additional income.

Average milk shipped per cow (13,788) was multiplied by a milk price of \$13.00 per hundredweight. Additional income was derived from both cattle sales and other income (dividends, etc.). Prices of livestock, machinery, parlor and land, as well as interest rates and terms, were based on local prices and programs in Southwest Missouri. Quite noticeable in the table is a minimum of expenses related to machinery and equipment when compared to more conventional dairy operations where investments are generally well over \$100,000. Conventional operations have more investment due to their perceived need of harvesting and feeding equipment (TMR wagons, hay/silage equipment, etc.). Grazing operations often have the attitude of limiting investment in items that rust, rot or depreciate. If forages need harvesting, hire it done.

The table was also designed to allow a producer interested in beginning a grazing dairy to input or delete their own predicted capital expenditures (example: may not need an ATV). Debt load for this start-up operation is nearly \$2,900 per cow. Most lending agencies in Missouri have been willing to loan to only \$2-2,500 per cow so communication with your lender is very important.

Using the three-year average of \$730 operating margin per cow, this operation would generate a total margin of \$65,700. After paying principle and interest of \$33,643, \$32,057 would be available for federal and state taxes, new capital expenditures and family living. The question then becomes one of “what is an acceptable level of income?” The ultimate decision on whether this is acceptable or not must remain in the hands of the operator.

Summary

Comparison of the operating margins of Missouri dairy grazers and the MU SW Center dairy to those of the large conventional dairies clearly demonstrates the smaller dairies can compete on a per cow basis. The big discrepancy then becomes an issue of size, with the large dairies averaging 1121 more cows per operation.

Even though the operating margins are very similar on a per cow basis, there are several important aspects of the small dairy that must be considered. Grazers must continue to maintain strong control over production costs. An increase of \$1.00 in cost per hundredweight will lower margin by approximately \$138 per cow, conversely this amount of income will be realized if production costs can be decreased by this amount. Obviously there is ample opportunity for Missouri grazers to lower their costs when their data is compared to that being experienced in Wisconsin.

Production per cow also becomes an important factor. Missouri producers, over the past three years, have averaged 13,788 pounds per cow. Granted, three of the participants in the program are new grazers, but there remains ample room for production improvement. There are several producers in the 15-16,000 pounds per cow range and one grazer is approaching 20,000. Analyzing individual data from producers in the data set indicates an increase in production can be achieved without a major increase in production. Grazers demonstrating the most improvements have come through the establishment of improved cultivars grazed and incorporation of both annual and warm season varieties in the system. These changes come with time.

Perhaps the factor most involved in improving margin, other than precipitation, is experience. Not meaning to lessen the importance of animal management, which is vital, a successful grazer

is one that is a master at grass management. Since grazing is an art instead of a science, this level of expertise comes only with time. Initially a grazer will need to walk a pasture to determine forage availability and stocking rate, but over time, the successful grazer will be able to do this as they drive past on an ATV.

Much of the discussion has been related to the financial aspects of the small, family grazing operation, but there are other benefits of a grazing operation not as easily measured as financial data or directly related to profitability of the farm. Contrary to the opinion that MIG requires more time and effort, grazers in the study report a major improvement in both leisure time and quality of life since they implemented MIG. Perhaps it is the rewards in life such as these that are free, that has the most appeal to a grazer.

Grazing isn't for everyone. Individuals must assess if the type of system they are evaluating can meet their family, farm and quality of life goals.

Table 1. Forage quality throughout the grazing season.

	% DM	% CP	% ADF	% NDF	NE_i, mcal/lb
April	21.6	25.1	23.8	48.7	0.73
May	20.7	20.1	28.5	52.8	0.67
June	22.5	19.2	32.1	56.2	0.63
July	21.5	20.4	31.9	56.3	0.63
August	34.5	17.3	34.6	57.4	0.60
September	22.4	20.9	29.9	52.5	0.64
October	22.8	22.4	29.6	56.1	0.66
November*	22.2	21.4	27.3	49.5	0.69
December*	26.7	20.3	29.9	57.5	0.66

*For these months, data are from only one sample.

Table 2. Structure and basic production data of southwest Missouri pasture-based dairy farms surveyed in 1998, 1999 and 2000.

	1998	1999	2000
Cow numbers	82.6	96.3	91.8
Total farm area (acres)	325	303	317.9
Dairy grazing area (acres)	122	90.8	99.3
Grain fed during year (lb/cow/day)	16.3	17.2	17.6
Hay fed during year (lb/cow/day)	9.4	12	11.2
Other forage fed during year (lb/cow/day)	1.2	1.2	2.4
Numbers of days grazed	245	239	235
Weight of cows (lb)	1,190	1,205	1219
Age of cows (months)	52	57.7	55.2
Cull rate (percent)	20	19.9	17.6
Milk shipped per cow (lb)	14,022	13,660	13,682
Milkfat (percent)	3.66	3.63	3.74
Protein (percent)	3.21	3.27	3.22
Somatic cell count	334,480	335,250	369,986

Table 3. Income, expenditure and operating margin for Missouri pasture-based dairy producers in 1998, 1999 and 2000 (including dry cow and heifer expenses).

	1998		1999		2000	
	\$/cow	\$/cwt	\$/cow	\$/cwt	\$/cow	\$/cwt
Income:						
Milk sales	2,097.72	14.96	1,942.28	14.22	1,743.35	12.74
Cattle sales	140.12	1.00	166.54	1.22	192.19	1.40
Miscellaneous/Dividends	27.66	0.20	44.45	0.33	83.63	0.61
Total Income	2,265.50	16.16	2,153.27	15.77	2,019.17	14.75
Expenditures:						
Concentrates	560.98	4.00	535.45	3.92	519.73	3.80
Harvested forages	156.24	1.11	145.94	1.07	190.11	1.39
Hired labor	62.89	0.45	59.66	0.44	56.51	0.41
Rent	4.12	0.03	3.95	0.03	20.90	0.15
DHIA	9.14	0.07	7.24	0.05	6.88	0.05
Semen/Breeding	4.88	0.03	8.15	0.06	10.71	0.08
R.E./P.P. taxes	7.83	0.06	6.63	0.05	7.48	0.06
Milk marketing	112.59	0.80	106.16	0.78	110.16	0.81
Repairs/Truck/Fuel	81.13	0.58	77.03	0.56	58.45	0.43
Vet/Medicine	34.65	0.25	38.82	0.28	31.13	0.23
Parlor supplies	54.02	0.39	43.94	0.32	54.30	0.40
Utilities	51.04	0.36	46.88	0.34	54.29	0.40
Insurance	19.92	0.14	18.90	0.14	25.88	0.19
Miscellaneous	14.42	0.10	8.94	0.07	25.92	0.19
Total Cow Expenditures	1,173.50	8.37	1,107.90	8.11	1,172.45	8.59
Rent	5.41	0.04	7.88	0.06	11.35	0.08
Fertilizer	50.32	0.36	43.94	0.32	51.00	0.37
Seed/Spray	24.50	0.17	17.05	0.12	39.58	0.29
Custom	8.01	0.06	21.00	0.15	16.79	0.12
Fuel	3.13	0.02	9.81	0.07	12.12	0.09
R.E./P.P. taxes	6.25	0.05	6.37	0.05	6.30	0.04
Fence/Water	8.52	0.06	12.88	0.09	24.14	0.18
Total Forage Expenditures	106.14	0.76	118.93	0.86	161.28	1.17
Total Operating Expenditures	1,279.99	9.13	1,226.62	8.97	1333.73	9.76
Operating Margin	985.51	7.03	926.65	6.80	685.44	4.99

Table 4. Comparison of Missouri MIG dairies to large conventional operations.

	1998		1999		2000	
	Grazing	Conv.	Grazing	Conv.	Grazing	Conv.
# Milk Shipped	14,022	23,529	13,661	21,472	13,682	23,483
Cost/CWT Milk	\$9.18	\$10.88	\$8.96	\$10.53	\$9.76	\$10.26
Operating Margin	\$977	\$1158	\$926	\$996	\$685	\$793
# Cows	83	1185	96	1149	92	1309
% Cull Rate	20	27	20	39	18	37

Table 5. Structure and basic production data of University of Missouri SW Research Center for 1999, 2000 and 2001.

	1999	2000	2001
Cow numbers	49.1	59.1	60.4
Total farm area (acres)	84	84	84
Dairy grazing area (acres)	79	79	79
Grain fed during year (lb/cow/day)	12.4	14.2	12.1
Hay fed during year (lb/cow/day)	11.4	11.5	11.2
Other forage fed during year (lb/cow/day)	0	0	0
Numbers of days grazed	188	244	230
Weight of cows after calving (lb)	1022	1030	1061
Age of cows (months)	25	32	38
Cull rate (percent) Total	32	19	22
Outside Calving Window (%)	12	16	16
Other Cull (%)	20	3	6
Milk shipped per cow (lb)	10,146	12,714	12,952
Milkfat (%)	3.95	3.96	3.74
Protein (%)	3.4	3.24	3.22
Somatic cell count	223,000	51,800	129,182

Table 6. Income, expenditure and operating margin for University of Missouri SW Research Center seasonal MIG dairy 1999, 2000 and 2001 (includes dry cow expenses; excludes heifer expenses).

	1999		2000		2001	
	\$/cow	\$/cwt	\$/cow	\$/cwt	\$/cow	\$/cwt
Income:						
Milk Sales	1348	13.29	1738	13.67	2141	16.53
Cattle Sales	179	1.76	205	1.61	239	1.84
Total Income	1527	15.05	1943	15.28	2380	18.37
Expenditures:						
Concentrates	299	2.95	330	2.59	305	2.35
Forages	106	1.05	174	1.37	254	1.96
Labor*	54	0.53	54	0.42	51	0.40
DHIA	0	0.00	14	0.11	12	0.09
Semen/Breeding	23	0.23	21	0.16	14	0.11
R.E./P.P.Taxes*	7	0.07	6	0.05	7	0.05
Milk Marketing	90	0.89	114	0.90	117	0.90
Repairs/Truck*/Fuel*	107	1.05	66	0.52	74	0.57
Vet/Med	41	0.40	53	0.42	37	0.29
Parlor Supplies	52	0.51	55	0.43	38	0.29
Utilities	46	0.45	38	0.30	41	0.32
Insurance*	17	0.17	17	0.13	24	0.18
Miscellaneous	33	0.33	15	0.12	42	0.33
Total Cow Expenditures	874	8.61	931	7.32	1016	7.84
Fertilizer	7	0.07	29	0.23	70	0.54
Seed/Spray	27	0.27	32	0.25	39	0.30
Custom Hire*	0	0.00	19	0.15	15	0.12
Fuel*	3	0.03	9	0.07	11	0.09
R.E./P.P. Taxes*	5	0.05	5	0.04	6	0.04
Fence/Water	5	0.05	4	0.04	9	0.07
Total Forage Expenditures	47	0.46	99	0.78	150	1.16
Total Operating Expenditures	921	9.07	1030	8.10	1166	9.00
Operating Margin	606	5.98	913	7.18	1214	9.37

