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FACTORS AFFECTING PROFITABILITY ON LIMITED RESOURCE DAIRY FARMS New York, 1986

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Production of milk in New York comes primarily from family enterprises. Each farm produces most of the forage required, but usually buys some part of the concentrates fed. Many farms have between 30 and 70 cows; 39 percent of farms in the 1986 New York Dairy Farm Business Summary were in this range. Most of these farms have conventional stall barns (Smith, Knoblauch and Putnam, 1987). The Farm Management and Energy Survey[2] (FMES) found 51 percent of all dairy farms obtained most of their income from milk sales, harvested no corn grain, and used conventional stall barns and milking systems. These farms had an average herd size of less than 60 cows (Myers).

Many of these smaller operations are predicted to be at risk in the future due to the pressures of technology, competition from other regions, and declining prices (Office of Technology Assessment, 1986). Data from the farm business summaries for New York show a strong positive relationship between farm size, measured by cows per farm, and net farm incomes (Smith, Knoblauch and Putnam, 1987, 1988). Farms with less than 70 cows have on average low and sometimes negative returns to labor and management income per operator, and low returns on equity. If many of the small dairy farms currently receiving low net returns are to continue in the future, they will need to learn and implement strategies which maintain or improve their profitability.

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[1]This publication summarizes one component of the analysis presented in an M.S. thesis by Roy Murray-Prior, "Management Strategies For Improving Profitability of Average Resource Dairy Farms in New York State," May 1989, Cornell University. A second publication, A.E. Res. 89-10, examining alternative management strategies using linear programming is developed from this thesis.

[2] The 1987 Farm Management and Energy Survey was conducted by the Departments of Agricultural Economics and Agricultural Engineering at Cornell University, and carried out by the New York Agricultural Statistics Service. Funding for the survey was provided by the Niagara Mohawk Power Corporation.

Objectives of the Study

The objectives of this study are to assess the relationships between selected dairy management practices and profitability for average-resource dairy farms in New York State. Limited-resource dairy farms (LRF) are defined as farms which are: primarily dairy (i.e., in which crop sales amount to less than ten percent of milk sales), have no harvested corn for grain, have a tie-stall or stanchion barn, and no milking parlor. Profitability is defined here as labor and management income per operator (LMIO).

Methodology

Cross tabulation, simple correlation, and multiple regression analysis of data from Cornell University's 1986 Dairy Farm Business Summary were used to examine the relationship between various management practices and LMIO for ARFs. From the 414 farms in the DFBS for 1986, 152 farms were selected as limited-resource farms. On average the farms had 57 cows and 167 tillable acres. Milk sold averaged 14,926 pounds per cow, at 3.7 percent test. Labor and management income per operator was -$574. A summary of averages and ranges for these and other characteristics of this group of farms is provided in Table 1. (More complete details are provided in Appendix A.1.)

Labor and management income per operator (LMIO) was used to divide the farms into two key groups. The high group contains the fifteen farms (ten percent) with the highest LMIO, while the low group includes seventy-six farms (fifty percent) with the lowest LMIO. These groupings were chosen for the following reasons: (1) to accentuate differences between profitable farms, and farms with less than average profitability; (2) most of the bottom fifty percent of farms have negative LMIO and hence as a group are the farms which are most in need of improved performance; (3) the top ten percent is consistent with the approach used for comparisons in the DFBS, and contains farms which have superior performance. Average Labor and Management Incomes per Operator were $21,989 for the top ten percent and -$10,288 for the 50 percent with below-average performance. Net farm income and percentage return on equity were also much higher for the top ten percent.

Table 1. CHARACTERISTICS OF LIMITED RESOURCE FARMS
DFBS Data, 152 New York Farms, 1986

Characteristic	Number of farms*	Average	Maximum value	Minimum value
Labor and management income/operator	152	-$574	$34,812	-$40,304
Debts/assets	152	0.43	1.17	0
<u>Size</u>				
Number of cows	152	57	118	22
Number of heifers	152	44	119	1
Worker equivalents	152	2.2	4.1	1.0
Total farm acres	152	320	715	80
Total tillable acres	152	167	397	30
<u>Crops</u>				
Hay-crop acres	151	111	314	25
Corn silage acres	135	41	106	3
Hay, t	150	173	700	4
Hay-crop silage, t	112	310	1,720	12
Corn silage, t	134	498	1,538	40
<u>Productivity</u>				
Milk sold/cow, lbs.	152	14,926	20,848	8,206
Butterfat percent	150	3.7	4.8	3.2
Yield hay and HCS DM, t/ac.	151	2.3	5.4	0.5
Yield corn silage, t/ac.	134	12.4	23.5	1.6
Cows/worker	152	27	56	9
<u>Feed</u>				
Total forage DM, t/cow	152	6.7	13.4	1.3
Purchased concentrates, $/cow	152	$520	$957	$141

* This is the number used in calculating the average. Where the count is less than 152, it indicates the number of farms with greater than zero listed for this characteristic.

Coefficients of correlation comparing Labor and Management Income per Operator with a set of key management indices are presented in Table 2. These show the degree and direction of linear relationship between LMIO and each of the various management indices selected. In general, the larger the positive or negative value for the correlation coefficient, the stronger the relationship or degree of association. A key underlying assumption which affects interpretation of correlation studies is that the pairs of observations on the two factors are independent, and have a bivariate normal distribution. In farm management this is rarely the case as many of the factors are interrelated. This analysis suggests that many different factors have an effect on labor and management income per operator but none by itself can determine profitability. The most important factors appear to be milk sold per cow, cows per worker or labor efficiency, crop yields and size of herd. Cost control is important as well suggested by the negative correlations with feed and crop expense per cwt of milk and large investment per cow.

Table 2. CORRELATION COEFFICIENTS FOR SELECTED DAIRY MANAGEMENT INDICES WITH LABOR AND MANAGEMENT INCOME PER OPERATOR
152 New York Dairy Farms, 1986

Index	Correlation coefficient with labor and management income per operator
<u>Positive correlations</u>	
Milk sold, lbs./cow	0.28
FCM milk, lbs./cow	0.26
Cows/worker	0.22
Silage, t/cow	0.20
Cow numbers	0.20
Yield hay & HCS, tDM/ac.	0.18
Total forage, tDM/cow	0.14
(Total forage, tDM/cow)^2	0.11
Debt/asset ratio	0.08
Heifer number	0.07
Milk price, $/cwt.	0.04
Yield corn silage, t/ac.	0.03
Percent butterfat	0.02
<u>Negative correlations</u>	
Feed-crop expenses, $/cwt. milk	-0.29
Assets/cow	-0.29
Machinery & equipment cost, $/cow	-0.25
Machinery & equipment inventory, $/cow	-0.23
Hay DM/total forage DM	-0.20
Hired labor costs, $/cow	-0.12
(Purchased concentrates, $/cow)^2	-0.11
Heifer/cow	-0.11
Hay, t/cow	-0.08
Purchased concentrates, $/cow	-0.07
Total assets	-0.01

A multiple linear regression analysis using ordinary least squares was used to examine the relationship between important management factors and labor and management income per operator. The resulting regression coefficients and t-ratios for this set of records is presented in Table 3. The regression coefficients for these independent variables can be interpreted to show the average marginal effect on labor and management income per operator when the independent variable is increased by one unit. They tell us something about the relative influence of each management factor on the dependent variable studied.

Table 3. COEFFICIENTS AND t-RATIOS FOR REGRESSION OF LABOR AND MANAGEMENT INCOME PER OPERATOR ON SELECTED DAIRY MANAGEMENT INDICES
152 New York Dairy Farms, 1986

Index	Regression Coefficient	t-ratio
Milk sold/cow, lbs.	4.10	4.95
Milk price, $	4,076	2.68
Cow numbers	383	2.10
Total forage DM, t/cow	3,929	1.88
Cows/worker	363	1.76
Assets/cow	1.56	1.03
Machinery & equip. inventory, $/cow	2.10	0.74
Percent butterfat	175	0.09
Yield hay & HCS, tDM/ac.	12	0.01
Purchased concentrates, $/cow	-5.60	-0.14
Hay DM/total forage DM	-716	-0.15
Hired labor costs, $/cow	-7.90	-0.58
$(\text{Purchased concentrates/cow})^2$	-0.025	-0.80
Debt/asset ratio	-3,740	-0.91
Feed & crop expenses, $/cwt. milk	-1,977	-1.02
Heifers/cow	-5,447	-1.31
Yield corn silage, t/ac.	-279	-1.49
$(\text{Total forage DM/cow})^2$	-206	-1.54
Total assets, $	-0.081	-2.63
Machinery & equip. costs, $/cow	-30.14	-3.51

R-sq = 49.8%   R-sq(adj) = 42.1%

Key assumptions of the OLS estimator used in the model are that: (1) the dependent variable can be calculated as a linear function of a specified set of independent variables, plus a disturbance term, (2) the expected value of the disturbance term is zero, (3) the disturbance terms all have the same variance, and (4) the observations on the independent variables are fixed in repeated samples (Kennedy). Since the data used in the study are collected from a non-random selection of farms and the variables recorded are not independently selected, the variables used in the multiple regression analysis are likely to be correlated amongst themselves, and with other variables not included in the model, but related to the dependent variable. This means that the OLS estimator is biased, inconsistent, and inefficient. In practical terms, the regression coefficients can only provide indications of the factors which appeared to have the greatest relative influence on labor and management income per operator. The variables with t-ratios of 1.5 or more or -1.5 or less are those of greatest relative importance.

Analysis of Key Management Factors

Results from the correlation and regression analyses are discussed under the headings of size, dairy management and feeding practices, cropping practices, labor productivity, and capital efficiency and cost control. These results are compared with a number of other studies which have related dairy farm management indices with various measures of farm profitability.

Size

Total asset value total acres and worker equivalents are approximately the same for the high and low income groups, while the high group have 11 more cows, 66 vs. 55 (Table 4). Machinery and equipment inventory, and average number of operators are lower for the top 10 percent in LMIO. Although total tillable acres owned is the same for the two groups, the high group rent more, and hence have a higher proportion of tillable land to total acres.

The correlation coefficients are in general agreement with these findings. Herd size is positively correlated with LMIO (0.20), while total assets (-0.01), and heifer numbers (0.07) are not important. Results of previous studies by Fowers and Williams produced similar results. Fowers using data from 413 New York dairy farms for 1974, obtained correlations with labor and management income for herd size and total pounds of milk sold, of .238 and .340 respectively. Williams found correlations of .233 and .277 for these factors with LMIO using data from 410 DFBS farms for 1982.

Table 4. COMPARISON OF SIZE INDICES
FOR TWO GROUPS OF FARMS SELECTED FOR HIGH AND LOW,
LABOR AND MANAGEMENT INCOME PER OPERATOR
New York Dairy Farms, 1986

Index	Averages	
	Top 10%	Bottom 50%
Number of farms	15	76
Number of cows	66	55
Number of heifers	45	43
Number of operators	1.07	1.25
Worker equivalents	2.20	2.24
Total farm assets	$341,646	$331,748
Machinery, equipment inventory	$ 57,721	$ 64,008
Total farm acres	306	318
Tillable acres owned	122	122
Tillable acres rented	85	66
Total tillable acres	178	168
Total non-tillable acres	71	75
Total other acres	70	86

In contrast, the multiple regression analysis implies slightly different results. While size, as measured by the number of cows, has a positive impact on LMIO (t=2.10), the total dollar value of assets has a negative impact (t=2.63). This might be expected since increasing herd size spreads fixed costs over a larger number of cows, and hence increases LMIO.

Williams obtained a "significant" coefficient for herd size in his multiple regression on LMIO, but Fowers did not obtain a "significant" coefficient. Speicher and Lassiter concluded size of operation was an important factor influencing net income, with number of cows and number of tillable acres the key indices used. Brown and White obtained a significant coefficient for herd size in their regression analysis to predict income over feed costs.

These studies support a strategy of increasing cow numbers to improve LMIO. In the short to medium term the number of cows which can be milked is generally dependent on barn capacity. If stall numbers are limited, it is sometimes possible to use dry cow or heifer facilities to house cows and to milk them in the cow barn, but this decreases labor productivity. Increasing barn capacity requires significant capital investment which is not the focus of this study.

Alternatively, the heifer to cow ratio has a negative correlation coefficient, and a negative regression coefficient. It is influenced by factors such as the culling rate, time taken to raise a heifer from birth to freshening, and demand of replacement animals for herd expansion. Many operators are averaging thirty months before heifers enter the milking herd, when this is possible in twenty-four months. This extra time consumes valuable labor, housing, and farm grown forage. Another alternative is to raise less heifers and use released resources to increase cow numbers. Other problems such as disease control and breeding quality may arise with purchased heifers, which may strongly influence such a decision.

Dairy Management and Feeding Practices

Milk sold per cow averages 1,000 pounds less for the low group, although there is a wide range of production within each group (Appendix A). Butterfat percentage is slightly lower for the top 10 percent.

The largest positive correlation found among any of the factors is for milk sold per cow (0.28) and LMIO (Table 2). This agrees with the coefficients found by Fowers (1979) of 0.36, and by Williams of 0.22. Percent butterfat has essentially no effect on net income.

Table 5. COMPARISON OF MILK PRODUCTION AND FEEDING PRACTICES FOR FARMS WITH HIGH AND LOWER LABOR AND MANAGEMENT INCOME PER OPERATOR
New York Dairy Farms, 1986

Index	Top 10%		Bottom 50%	
	Number	Average	Number	Average
Milk sold/cow, lbs.	15	15,416	76	14,436
FCM sold/cow, lbs.	15	15,594	74	14,783
Butterfat, %	15	3.60	74	3.70
Purchased concentrates, $/cow	15	$473	76	$527
Hay-crop & corn silage, t/cow	13	13.62	71	11.01
Hay, t/cow	15	3.33	75	3.47
Total forage DM, t/cow	15	7.04	76	6.61
Hay DM/total forage DM	5	0.43	76	0.48

Milk sold per cow (t = 4.95) is an important variable in the multiple regression estimates of LMIO, while butterfat percentage is unimportant (Table 3). Milk sold per cow and milk sold per man were significant predictors in Fowers' regression model, but not in Williams' model. Milk sold per man is not used in this study because it is the product of the two factors already included in milk per cow and cows per worker. Speicher and Lassiter obtained significant effects of milk sold per cow and milk sold per man on net income, while Brown and White included only milk yield per cow for predicting income over feed costs. Kauffman also concluded that a high level of milk production was important, with milk sold per cow being the "most consistently important variable utilized in the models" (1985, pg. 96).

On average the farms with the highest LMIO in this study had slightly more forage dry matter per cow and purchased less concentrates per cow. They also have a lower proportion of hay to silage and hay to total dry matter. This is in agreement with the correlation coefficients. The linear and quadratic terms for total forage dry matter per cow are both positive, but not very high, while the linear and quadratic terms for purchased concentrates per cow, while not large, are both negative. A negative coefficient of -0.20 is indicated for the ratio of dry matter in the form of hay to total forage dry matter. This compares with the coefficient of -0.14 obtained by Fowers who used percent net energy from hay. He obtained a coefficients of .10 for percent net energy from silage, -.082 for percent net energy from concentrates and -.197 for percent net energy from pasture. No significant correlations were obtained for any of these factors by Williams.

While the linear and quadratic terms for purchased concentrates per cow in this study have negative regression coefficients, possibly suggesting overuse of concentrates by some farms, the t-ratios are low, signifying that these results should be treated with caution. On the basis of his regression analyses, Williams concluded that high concentrate feeding is a profitable practice although there was a negative coefficient for the quadratic term of pounds of concentrate fed, implying diminishing marginal returns to concentrate feeding.

On the other hand, the linear index for total forage dry matter per cow has a positive coefficient, while the quadratic index has a negative coefficient (table 3). This implies a decreasing return to increases in forage dry matter per cow, as would be expected from nutritional requirements for increased milk production. The low t-ratio for the ratio of dry matter in the form of hay to total forage dry matter indicates the proportion of hay in the diet may not be as important as suggested by the correlation and tabulation analysis.

All of the analyses suggest that increasing milk production per cow is likely to be a very important strategy for increasing LMIO. Analysis of feeding programs, the quality and quantity of forages available, and the ability to balance rations to meet the nutritional requirements of the cow are all important considerations in increasing milk output per cow.

Increased total forage dry matter per cow can be achieved by increasing the production per acre of existing crops, increasing crop acres, or altering the mix of crops. One possible method of increasing the production of dry matter is to increase corn silage production. This may be limited by soil resources and storage capacity, and may increase the requirement of purchased protein feeds.

Another strategy suggested by the results of this section is to decrease the quantity of purchased concentrates fed. Concentrate expenses might be decreased through improved ration balancing, improved forage quality and quantity, and growing corn grain. For a given level of milk production per cow, the quantity of concentrate required will depend on the quantity and quality of forage available. Farms harvesting poor quality forage will require more concentrates. Increasing the quality of forage should increase the optimum milk production level, and may not decrease concentrate costs per cow. It may decrease concentrate costs per hundredweight of milk produced. Concentrate costs should only be decreased, therefore, if the reduction in costs is not significantly less than the value of any decline in milk production which occurs. The farms selected for this study did not grow corn grain, which indicates possible land, equipment, or management constraints which limit its production.

Cropping Practices

All farms in the top 10 percent and the low 50 percent harvested either hay or hay-crop silage, with only one farm (from the low group) not harvesting any hay (Table 6). The high group had slightly more acres of hay crop, and produced more hay and hay-crop silage. This is not surprising since they have more cows, higher production per cow, and therefore require more feed. Thirteen out of the fifteen in the high group produced corn silage, with an average of 47 acres and 354 tons. Of the 76 in the low group, 68 produced some corn silage, with an average of 37 acres and 303 tons. Very few in either group grow other crops, with about one-fifth of the farms in both groups having some tillable pasture.

Yields of dry matter per acre in the form of hay and hay-crop silage, and of corn silage per acre, are about 10 percent greater for the high group. Fertilizer costs per acre are approximately the same, indicating other factors may be causing the higher yields, such as better soils, better management, or both. Interestingly, yield of dry matter per acre in the form of hay and hay-crop silage has a higher correlation coefficient (0.18) with labor and management income per operator than does yield of corn silage per acre (0.03). Fowers reported a similar trend with positive correlations of LMIO with yield of hay per acre (.202), and yield of corn silage per acre (.153).

Table 6. COMPARISON OF CROPPING PRACTICES ON FARMS WITH HIGH AND LOW LABOR AND MANAGEMENT INCOME PER OPERATOR
New York Dairy Farms, 1986

Index	Top 10%		Bottom 50%	
	Number*	Average	Number*	Average
Hay-crop, ac.	15	122	76	115
Corn silage, ac.	13	47	68	37
Tillable pasture, ac.	3	31	19	30
Idle, ac.	6	21	22	27
Hay, t	15	213	75	178
Hay-crop silage, t	11	354	50	303
Corn silage, t	13	646	68	439
Yield hay & HCS DM, t/ac.	15	2.36	76	2.14
Yield corn silage, t/ac.	13	13.64	68	12.01
Fertilizer expenses/tillable ac.	15	$19.34	73	$19.28

* This is the number used in calculating the average. Where the count is less than 15 or 76, this indicates the number of farms with greater than zero for this characteristic.

Labor Productivity

A key difference between the top 10 percent and the bottom 50 percent is in labor productivity. The high group averages thirty-one cows per worker while the low group averages twenty-five. Cows per worker has a positive correlation coefficient of 0.22 (Table 2), and a positive regression coefficient with a t-ratio of 1.76 (Table 3). All of these results point up the importance of labor productivity. Fowers and Williams did not study cows per worker but used the inverse concept of labor per cow. As might be expected, they obtained negative correlations with LMIO of -.122 and -.135, respectively.

Increasing cows per worker has the potential for improving productivity. At a fixed number of cows, this involves decreasing labor input per cow. For a given level of management, lower labor input per cow might be achieved by increased investment in labor saving equipment. This is an investment decision. Alternatively, the operator could analyze time spent in doing chores, employ less labor, or work longer hours. Johnson has illustrated the effect of field operations management on productivity and profitability. Similar results might be expected from a study of ways to improve operations and time management within the dairy barn.

Capital Efficiency and Cost Control

Farms in the top 10 percent have lower investment per cow, and lower fixed costs per cow. As shown in Table 7, two factors related to this are lower real estate costs per cow and lower machinery inventory per cow, both of which could be linked to higher cow numbers. The 10 percent with the highest labor incomes also have better cost control, with lower total operating expenses, and lower variable costs per cow. They also have lower machinery costs per cow, lower milk marketing costs per hundredweight of milk, and a lower ratio for purchased concentrates as a percentage of milk sales. Overall, this group of farms showed stronger evidence of cost control and effective use of the purchases made in milk production. The top 10 percent had more cows, produced more milk but had smaller total cash outlays.

Negative correlation coefficients of particular importance which indicate the importance of cost control are feed and crop expenses per hundredweight of milk (-0.29), assets per cow (-0.29), machinery and equipment costs per cow (-0.25), and machinery and equipment inventory per cow (-0.23). (Table 2.)

These are similar to the results obtained by Fowers and Williams. Fowers found negative correlations with labor and management income per operator for investment per cow (-.217) and investment per man (-.042). Williams obtained negative correlations for investment per cow (-.123), investment per man (-.082), and machinery investment per cow (-.123) with LMIO. Both machinery cost per cow (-.155) and labor per cow (-.122) were negatively correlated with LMIO in Fowers' study, while Williams also obtained negative correlations for machinery costs per cow (-.168) and labor costs per cow (-.135). The findings for labor expense per cow were supported by Kauffman, who found farms which had lower hired labor costs per cow had higher profitability.

The largest negative t-ratio for the multiple regression equation is for machinery and equipment cost per cow. This calls further attention to the need to control machinery costs. None of the capital efficiency indices were found to be significant in

Fowers' multiple regression study; Williams, however, obtained a significant regression coefficient for machinery cost per hundredweight of milk as a reason for decreasing LMIO.

Table 7. COMPARISON OF CAPITAL EFFICIENCY AND COST CONTROL INDICES FOR FARMS WITH HIGH AND LOWER LABOR AND MANAGEMENT INCOME PER OPERATOR
New York Dairy Farms, 1986

Index	Top 10 percent	Bottom 50 percent
Real estate cost/cow	$2,468	$3,271
Machinery inventory/cow	849	1,202
Accrual operating expenses	81,596	82,815
Total accrual expenses	119,610	129,997
Total fixed costs/cow	617	803
Total variable costs/cow	1,212	1,308
Hired labor/cow	$350	$401
Machinery cost/cow	274	386
Milk marketing costs/cwt.	0.72	0.90
Purchased feed & crop expenses/cwt	3.74	4.37
Purchased concentrates as % milk sales	25%	29%

Efforts to control machinery and equipment costs should prove beneficial on most farms. Older equipment will generally have higher operating costs; in contrast, new equipment will have higher interest and depreciation costs. Choices on machinery replacement and repairs can make a real difference in net incomes over time. Other factors influencing machinery and equipment costs are the level of skill of the equipment operators, soil and land conditions, and repair and maintenance skills of the farm's labor force.

Other Factors

On average the top 10 percent in LMIO have a higher debt to asset ratio than the low group (0.48 vs. 0.41). Evidence about the importance of the debt to asset ratio from the correlation and regression analyses in this study are conflicting. There is no clear evidence that the ratio by itself determines success or failure. It is rather how debt and assets are managed in individual circumstances. Neither Fowers nor Williams obtained convincing evidence of the importance of the debt to asset ratio by itself. Kauffman's study indicated the optimal debt equity position over a span of years depended on price levels and interest rates, with low debt levels being most advantageous during periods of high interest rates and declining prices.

Conclusions

A number of possible management strategies which might be used to increase labor and management income per operator on a limited resource farm are indicated by the examination of the DFBS data. These include:

1. Increase milk production per cow.
2. Increase cow numbers.
3. Increase production of forage dry matter per cow.
4. Increase the number of cows per worker.
5. Control machinery and equipment costs.
6. Decrease purchased concentrates per cow by improved quality of home produced forages.
7. Control purchased feed and crop expenses.
8. Decrease heifer to cow ratio.

The value of each of these strategies to a particular farm will depend on the existing resource and management situation on the farm. In addition, these strategies will have interacting effects with the other strategies, and on other aspects of the farms' management.

Each farm is different. It is important to examine past experience and one's own records of costs and output in relation to what other farmers have done. These comparisons indicate some general guidelines or suggestions to investigate when looking for ways to improve profitability. Looking for ways to reduce costs without sacrificing income and providing better quality feed to improve production per cow are important steps in that process. Spending some time in analyzing alternatives and improving management skills will be crucial as well.

Appendix A

Table A. AVERAGES AND RANGES OF INDICES FOR LIMITED RESOURCE FARMS
New York DFBS - 1986

Index	Number	Average	Maximum	Minimum
Number of cows	152	57	118	22
Number of heifers	152	44	119	1
Milk sold/cow	152	14,926	20,848	8,206
FCM sold/cow	150	15,292	21,346	8,263
Butterfat percent	150	3.7	4.8	3.2
Net Farm Income	152	$11,329	$51,824	-$37,445
Labor and management income	152	-$686	$34,812	-$44,219
Labor and management income/operator	152	-$574	$34,812	-$40,304
Return on equity, percent	152	-15.01	29.03	-345.85
Total farm acres	152	320	715	80
Tillable acres owned	152	116	350	7
Tillable acres rented	111	70	390	4
Total tillable acres	152	167	397	30
Non-tillable acres owned	132	61	330	4
Non-tillable acres rented	42	49	150	4
Total non-tillable acres	135	75	330	4
Other acres owned	142	84	330	4
Other acres rented	21	57	184	5
Total other acres	144	92	340	4
Rent $/acre	98	$36	$487	$1
Hay-crop acres	151	111	314	25
Corn silage acres	135	41	106	3
Other forage acres	18	15	45	4
Oats acres	13	19	38	10
Wheat acres	1	21	21	21
Other crop acres	6	15	25	3
Tillable pasture acres	37	28	85	3
Idle acres	45	30	247	1
Hay t	150	173	700	4
Silage t	112	310	1720	12
Total hay and silage DM t	151	242	704	22
Yield hay and silage DM t/acres	151	2.29	5.39	0.45
Corn silage t	134	498	1538	40
Yield corn silage t/acre	134	12.40	23.53	1.67
Other forage t	15	68	300	6
Oats bu	12	1199	2287	372
Wheat bu	1	1000	1000	1000
Number of operators	152	1.22	3	1
Worker equivalents	152	2.19	4.08	1.00

Table A. (continued)

Index	Number	Average	Maximum	Minimum
Cows/worker	152	27	56	9
Milk sold/worker	152	395353	742007	126912
Accrual operating cost	152	$81,207	$168,933	$21,748
Total accrual without labor management, and capital	152	$97,348	$209,879	$28,968
Total accrual cost	152	$126,557	$281,634	$50,695
Hired labor costs	152	$21,074	$44,145	$10,200
Hired labor/cow	152	$384	$837	$171
Machinery cost	152	$20,151	$68,696	$3,824
Machinery cost/cow	152	$361	$773	$89
Total fixed costs/cow	152	$745	$1,337	$410
Total variable costs/cow	152	$1,292	$2,380	$460
Total variable costs/cwt.	152	$9	$14	$6
Real estate cost/cow	152	$2,928	$9,511	$292
Hay crop silage t/cow	142	12.01	29.17	1.21
Hay t/cow	150	3.21	10.77	0.07
Total forage DM t/cow	152	6.72	13.36	1.25
Hay DM/total forage DM	152	0.43	1.00	0.00
Purchased concentrates $/cow	152	$520	$957	$141
Purchased concentrates $/cwt.	152	$3.46	$7.00	$1.00
Purchased concentrates percent of milk sales	152	28	48	12
Purchased feed and crop expenses/cwt	152	$4.24	$7.73	$2.11
Fertilizer expenses per tillable acres	148	$21.48	$65.67	$0.75
Debts/assets	152	0.43	1.17	0
Debt/cow	152	$2,298	$5,988	0
Net farm worth	152	$193,608	$591,587	-$32,988
Total farm assets	152	$325,178	$679,285	$123,872
Machinery investment	152	$61,627	$200,768	$14,000
Machinery investment/cow	152	$1,115	$2,881	$353
Milk price/cwt.	152	$12.44	$15.17	$10.97
Milk marketing costs	151	$7,301	$24,048	$1,045
Milk marketing costs/cwt.	151	$0.87	$1.77	$0.15

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