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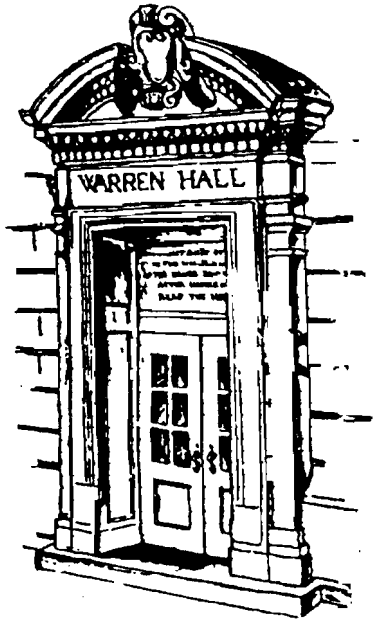

Staff Paper

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FINANCIAL ANALYSIS OF AGRICULTURAL BUSINESSES: TEN DO'S AND DON'TS

Eddy L. LaDue

Financial Analysis of Agricultural Businesses: Ten Do's and Don'ts

Eddy L. LaDue[1]

What I would like to share with you today is a few basic ideas or principles of financial analysis for farm businesses. They do not constitute a comprehensive blueprint for financial analysis. They do not include any earth shattering new ideas. But, they represent a few ideas that I think we should keep in mind, or remind ourselves of, as we consider the lending and portfolio maintenance functions.

For many of my ideas, I will be presenting data to support my point of view. Most of the data is for dairy farms. I use dairy farm data because dairy is the most important farm enterprise in New York State, and, thus, Cornell has more data on dairy farms than any other farm type. However, I believe the principles that the data are used to support are also true for other types of farms. If we had the data, we could develop similar graphs or tables for other types of farms, and those data would show the same basic ideas.

1. Don't Believe Thumb Rules on Maximum Debt Levels

At the top of my list is don't believe thumb rules on maximum debt levels. What I am referring to is such rules as don't lend more than $2,000 per cow, don't lend more than $1,500 per acre of field crops, don't lend more than $1,800 per acre of bearing fruit, or don't lend more than $8 per hen. Implicit in these rules is that you can lend up to these specified levels to any farmer, but you do not lend more to anyone.

There are currently a few people, many of whom ought to know better, going around espousing these rules. You can always get yourself quoted by the press when you do this because it is so simple and it sounds like you have cut through the chaff to the real kernel of the problem. It would really be nice if we could use such rules. They are simple, easy to understand, do not require much data, and you do not have to spend time doing a complete financial analysis. If they worked, they would make lending and borrowing much easier and more efficient.

Given the intuitive appeal of such rules, I decided to see if I could develop some data to support their value. To do this, I started with the basic principle that the amount of debt that a farm can handle is the amount of debt on which the farm business can make the payments. We look at other issues, such as the amount of collateral available, credit history and management ability, when we analyze loans, but the factor that determines the amount of debt the farm can handle is the amount that the farm can service.

To address this issue, I used the Dairy Farm Business Summary (DFBS) data collected by Cornell Cooperative Extension[2]. For each farm, we calculated the amount available for debt payments. The amount of debt required to service an average dollar of debt was then determined

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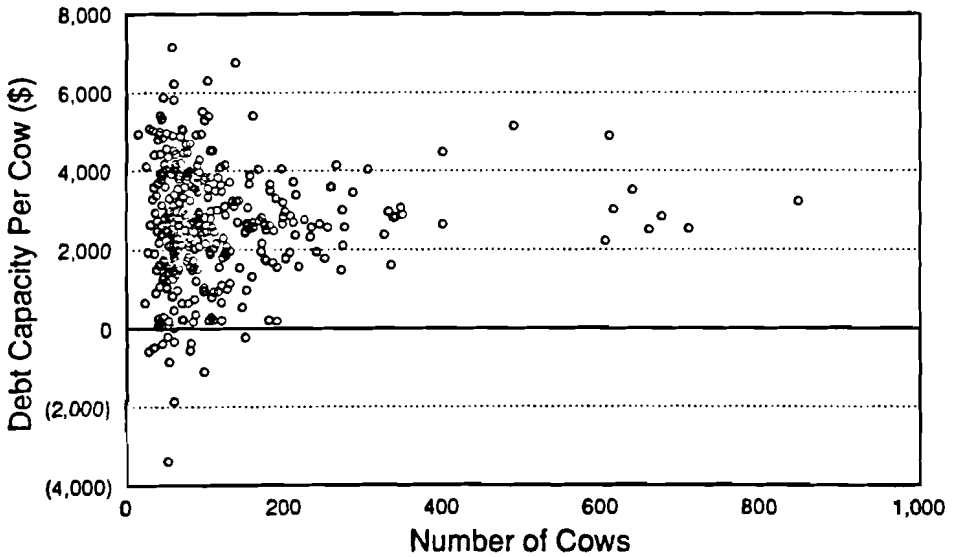
1 Professor of Agricultural Finance, Department of Agricultural, Resource, and Managerial Economics, Cornell University. This paper was presented at the 28th Annual Pennsylvania Agricultural Bankers Conference, University Park, PA, April 19, 1994.

2 For more information on this data set, see Smith, Knoblauch and Putnam, "Dairy Farm Management Business Summary, New York State, 1992." Department of Agricultural Economics, Cornell University, A.E. Res. 93-11, August 1993.

using representative credit terms[3]. By dividing the amount available for debt payments by the debt service required for an average dollar of debt, we obtained the maximum amount of debt that farm could service. That is, the debt carrying capacity of the farm. The debt carrying capacity of the farm was divided by the number of cows to determine the debt carrying capacity per cow. This tells us the maximum amount of debt per cow that the farm can handle.

Figure 1 shows a distribution of the debt capacity per cow for the 363 dairy farms in 1992. If our rule of thumb of a maximum of $2,000 per cow were valid we should have most of the farms perched on the dotted line stretching out from $2,000. If the magic number was $3,000, we should see a similar grouping of most of the farms around a $3,000 line. Obviously, we do not see the farms grouping around a line at any level. Some farms can handle the payments on $4,000 or even $5,000 of debt per cow while others can not make the payments on $100 of debt.

Figure 1. Distribution of Debt Capacity Per Cow 363 New York Dairy Farms, 1992



From this diagram, you can clearly see what happens if you try to use such a rule of thumb. If your rule is $2,000 per cow, all those farmers who want to borrow and can make the payments on more than $2,000 per cow are going to take their business elsewhere. In most cases, these are the most profitable, most aggressive, most viable farm businesses in your market area. However, do not worry that you will have no loans! All those people below the $2,000 line will be loyal customers of your bank. You are likely to be the only lender who will lend them as much as $2,000 and they will view you as a good lender who understands the problems agriculture faces and understands their needs. The only problem is that many of them will not be able to repay the $2,000 you are willing to lend them. These are the less profitable farms, many of which will not survive in the current competitive environment. Senior management's positive view of agriculture and your job could easily be placed in jeopardy by such a rule.

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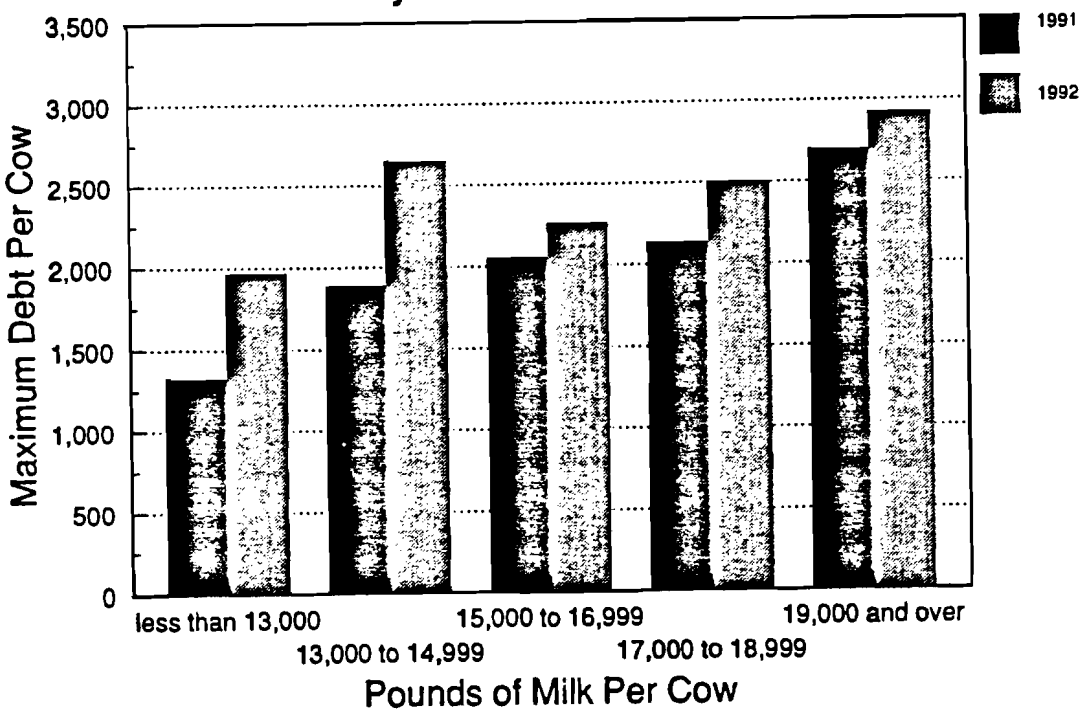
[3] It was assumed that 55 percent of the debt would be long term debt secured by real estate with a term of 25 years, and 45 percent would be intermediate term secured by cattle, equipment and other nonreal estate assets with a term of five years. Interest rates were 9.0 percent for long term and 8.5 percent for intermediate term during 1991, and 8.25 percent for long term and 8.0 percent for intermediate term during 1992. Debt service per dollar of loan was $166.18 for 1991 and $161.53 for 1992.

If we think about it, this result should not be particularly surprising. We know that some businesses are more profitable, and thus, can repay more debt, than others. This can be illustrated by observing the relationship between debt capacity and selected management factors. For example, debt capacity increases with rates of production. Farms with less than 13,000 pounds of milk per cow can handle considerably less debt than those with over 19,000 pounds of milk sold per cow (Figure 2). Similarly, farms with good labor efficiency can handle more debt than those that make inefficient use of labor. For example, dairy farms selling less than 400,000 pounds of milk per worker could handle only $1,500 to $2,000 of debt on average compared to $2,500 to $3,000 for those selling over 600,000 pounds per worker (Figure 3). Debt capacity is also related to cost control. Farms with low feed and crop expense per hundredweight of milk can handle considerably more debt than farms with high costs (Figure 4).

Figure 2. Debt Capacity Per Cow by Production Level



Observing the relationships shown in Figures 2 through 4 might lead us to wonder if those promoting these rules of thumb on maximum debt are really referring only to well managed farms. Maybe they believe that only well managed farms, where the managers have their house in order, should be expanding, and thus, be requesting increased funding from their lender. Clearly, many of the farms in the sample should "get better before they get bigger". For that reason we looked at those farms with production above 18,000 pounds per cow, milk per worker above 600,000 pounds, and feed and crop expense below $4.50 per hundredweight. Most of these farms had debt capacity between $2,000 and $4,000 per cow, but there was considerable variability (Figure 5). These farms do not line up on any debt per cow line like $2,000, or even $3,000 which would be closer to midpoint for these farm businesses. The basic principle, observed in Figure 1, also holds in Figure 5: there is no magic number that can be applied to most farms.

In conclusion, we can not substitute rules of thumb on maximum debt per unit for good financial analysis.

Figure 3. Debt Capacity Per Cow by Labor Efficiency Level

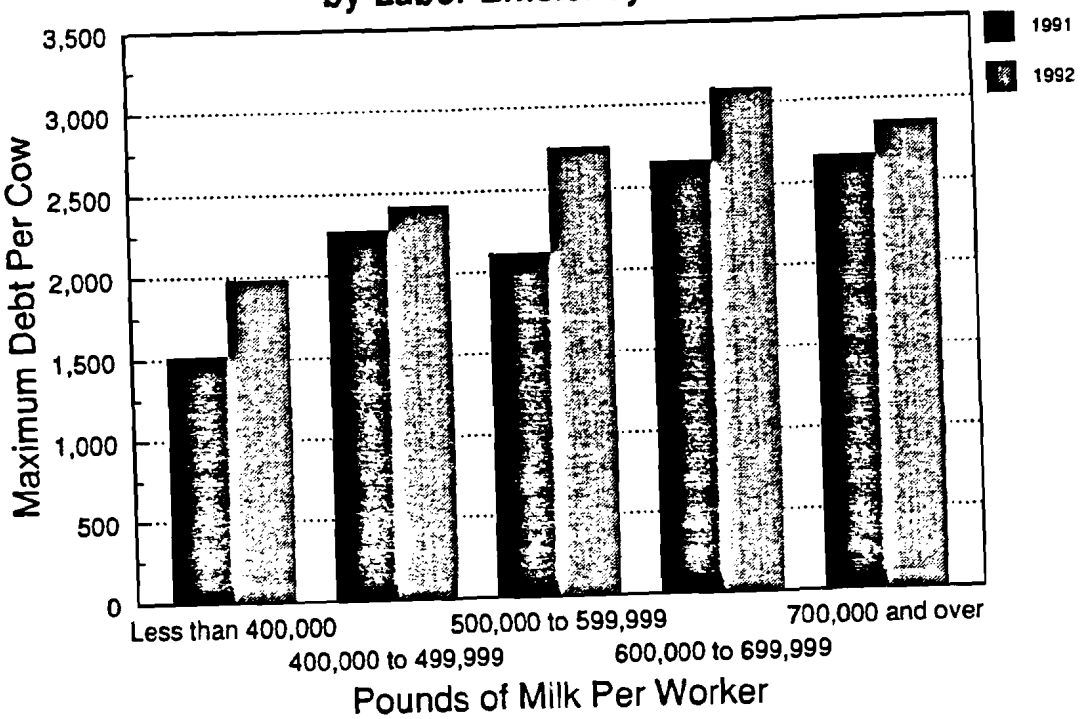


Figure 4. Debt Capacity Per Cow by Cost Control Level

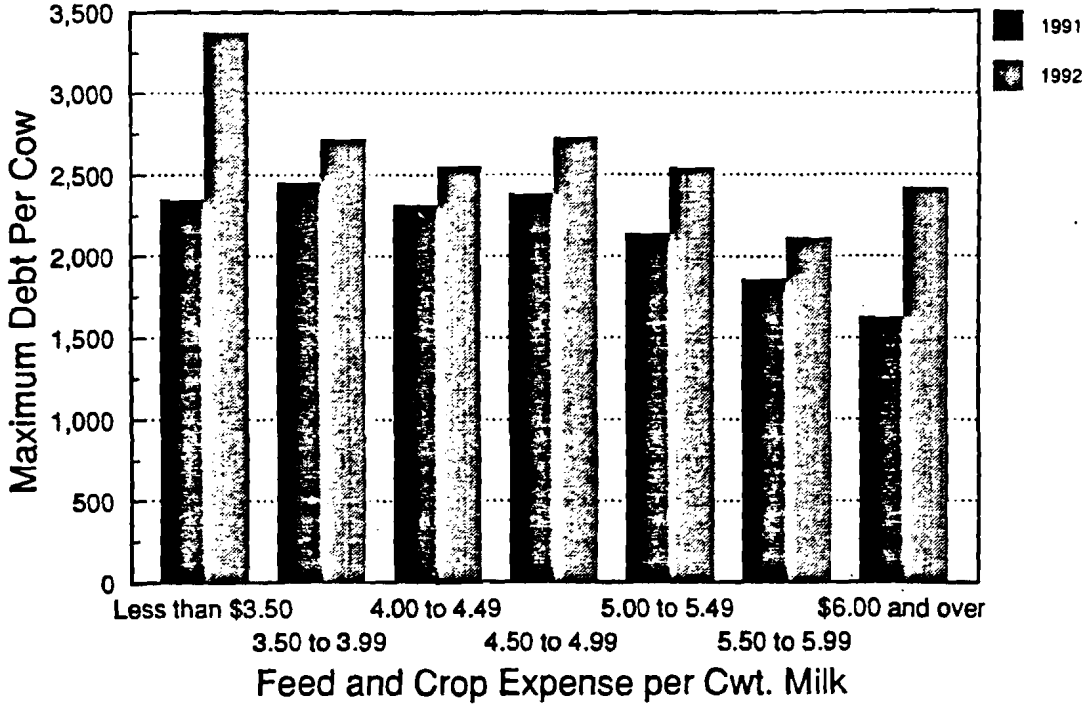
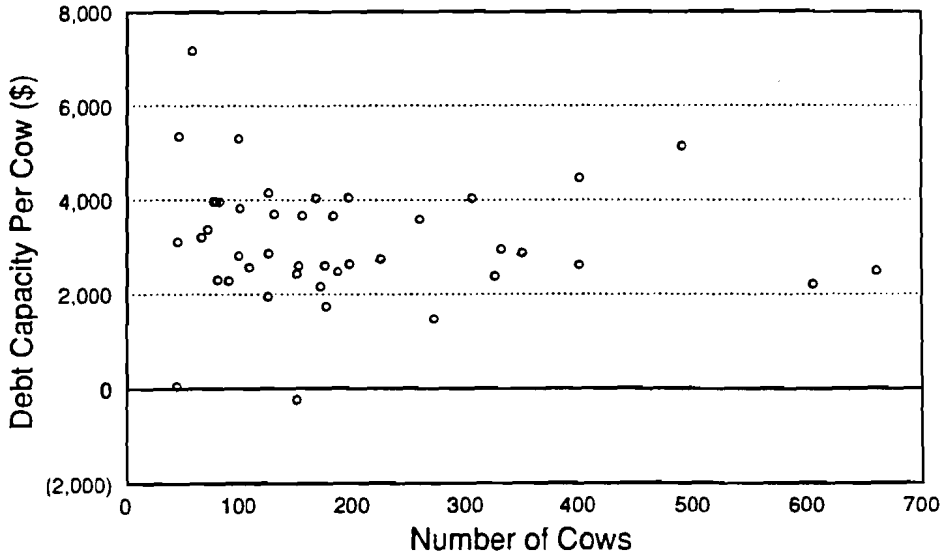


Figure 5. Debt Capacity Per Cow
>18,000 lbs milk/cow, >600,000 lbs milk/worker
and <$4.50/cwt feed and crop expense



2. Do Remember that Deferred Taxes Exist

Deferred taxes are the taxes that would have to be paid if the farm were sold. When we look at a market value balance sheet of the type we have historically used (excluding deferred taxes), we are looking at what the farm would sell for if it were sold. If the farmer actually sold the farm, he or she would have to pay taxes on the gain generated by the sale. Thus, the equity that the farmer really has in the business, that is the amount of money that could actually be taken out of the business through a sale, is the assets minus the debts, minus the taxes that would have to be paid. This after-tax equity is the amount the farmer could take from the business for retirement or reinvestment.

The Farm Financial Standards Task Force (FFSTF) recommendations[4] for farm financial statements suggests that the taxes that would have to be paid upon sale be called deferred taxes. It further recommends that an estimate of these taxes be included as a liability on the balance sheet. The equity found on balance sheets prepared according to Task Force recommendations would then represent the funds that the farmer could take away from the business.

One of the first questions that is raised about deferred taxes is: just how important are they? To look at this question we collected complete tax data from a sample of our Dairy Farm Business Summary farms, on which we have complete market value balance sheets, and calculated the taxes that would have to be paid if the farms were sold. The magnitude of the taxes involved are shown in Table 1. Many farms would experience an increase in self employment taxes because the sale of crop inventories, supply inventories and feeder livestock, and the receipt of accounts receivable, which will generate earned income (net farm profit) on which self employment tax would have to be paid. The state taxes are significant. These taxes were calculated using New York State tax rules. Most would consider New York a "high tax" state. If you are from a state with lower taxes, the state part of the deferred tax would be smaller. However, if the state tax is lower, the federal tax will be higher than that listed due to the

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[4] Recommendations of the Farm Financial Standards Task Force, Financial Guidelines for Agricultural Producers, Farm Financial Standards Task Force 1991.

deductibility of state taxes for federal tax calculation. Our calculations indicate that federal taxes would be increased about one-third of the amount that the state tax is reduced. Clearly, the federal tax is by far the most important part of the total. As we look at the magnitude of the deferred tax (Table 1), we have to conclude that deferred taxes are important. They are not small numbers that we can forget.

Table 1. Deferred Taxes by Farm Size 84 New York Dairy Farms

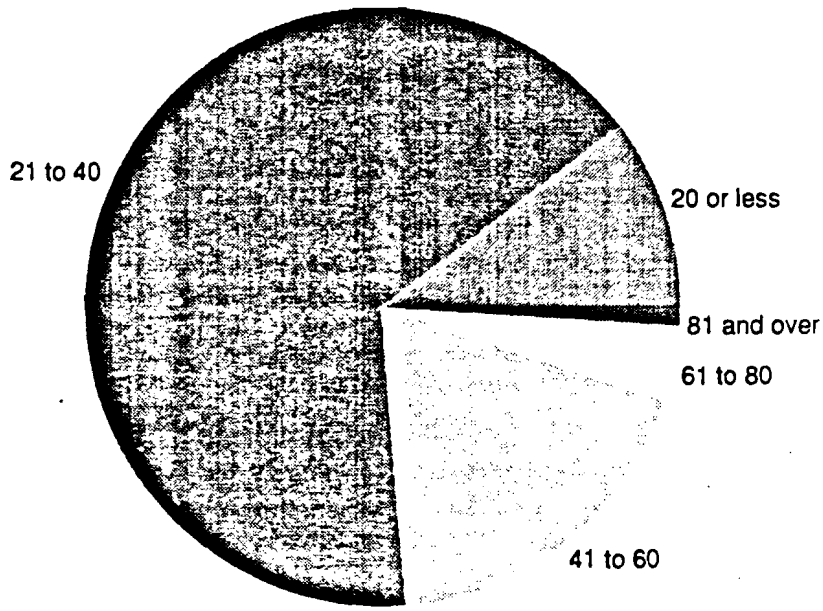
Total Farm Assets	Number of Farms	Self Employment Tax	State Tax	Federal Tax	Total Deferred Tax
Less than $400,000	18	2,602	10,105	31,963	44,671
400,000 to 599,999	22	4,405	21,544	71,816	97,765
600,000 to 799,999	16	5,667	28,192	101,397	135,256
800,000 to 999,999	9	8,852	42,254	142,594	193,700
1,000,000 or More	19	9,130	77,289	264,116	350,535
All Farms	84	5,804	35,187	119,990	160,982

How much of the farmer's equity do deferred taxes make disappear? For the dairy farms studied, the deferred tax amounted to about 33 percent of the equity calculated without deferred taxes (Figure 6). For about two-thirds of the farms, deferred taxes amounted to 21 to 40 percent of their equity. For a few farms, generally those with very little equity, deferred taxes would use up over 60 percent of the farmer's equity.

One problem with trying to develop generalizations about the effect of deferred taxes based on equity is that there is a great deal of variability in the degree of leverage among farms. If a farm does not have much equity before deferred taxes are considered, it is very easy for the taxes to be a very high proportion. To get to a somewhat more stable base, we also calculated the deferred taxes as a percent of total asset values (Figure 7). Deferred taxes equalled an average of 19 percent of total assets on the studied farms. For a high proportion of the farms (61%) deferred taxes were about 20 (16 to 25) percent of assets. A relatively small proportion were under 10 percent or over 25 percent. As a ballpark estimate, we can say that deferred taxes will amount to about 20 percent of assets on most farms.

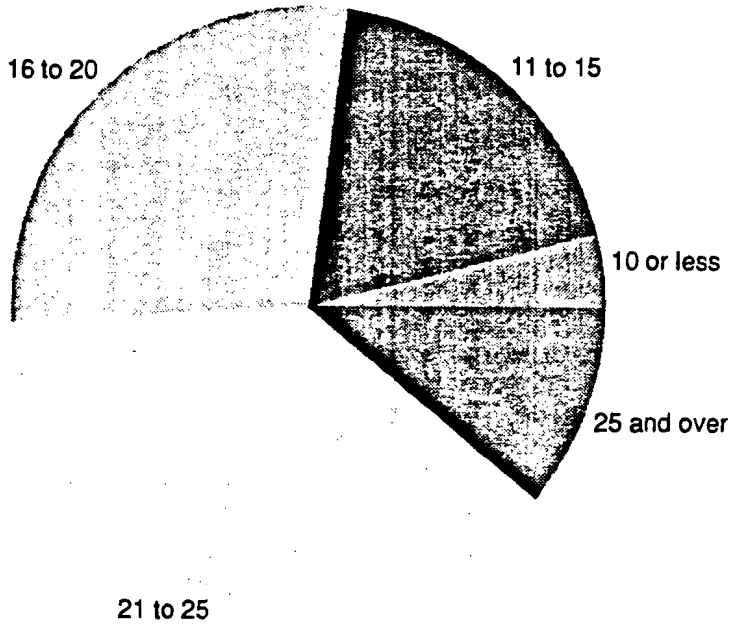
If we include deferred taxes in our balance sheets, as recommended by the FFSTF, the solvency standards that we use to evaluate loans will need to change. The solvency standard that represents any given level of credit risk will have to be reduced if the balance sheet includes deferred taxes. An example of the change that would be required is presented in Table 2. The middle column, labeled "excluding deferred taxes", represents a current standard. In this case the standard ratio values were taken from Dave Kohl's book *Weighing the Variables*. You are likely currently using some similar standard at your institution. The right hand column is the corresponding standard when deferred taxes are included, based on our dairy farm study. Clearly, the standards would change considerably. It is important to remember that these two columns represent the same farms and the same level of credit risk.

Figure 6. Distribution of Deferred Taxes as a Percent of Net Worth Without Deferred Taxes 84 New York Dairy Farms



Deferred Taxes as Percent of Net Worth	Percent of Farms
20 or less	13
21 to 40	64
41 to 60	18
61 to 80	4
81 and over	1
	Average Deferred Tax as Percent of Net Worth
All Farms	33

Figure 7. Distribution of Deferred Taxes as a Percent of Assets 84 New York Dairy Farms



Deferred Taxes as Percent of Assets	Percent of Farms
10 or less	6
11 to 15	20
16 to 20	24
21 to 25	37
26 and over	13
	Average Deferred Tax as Percent of Net Worth
All Farms	19

Table 2. Effect of Deferred Taxes on Solvency Standards		
Ratio and Standard	**Excluding Deferred Taxes[a]**	**Including Deferred Taxes**
Equity/Asset Ratio		
Strong	>70	>53
Caution	30 to 70	13 to 52
High Risk	<30	<13
Debt/Asset Ratio		
Strong	<30	<47
Caution	30 to 70	47 to 87
High Risk	>70	>87
Debt/Equity Ratio		
Strong	<45	<98
Caution	45 to 230	98 to 670
High Risk	>230	>670

[a] From Kohl, p. 80.

The magnitude of the change in standards that is required when deferred taxes are included has led some financial institutions to resist incorporating deferred taxes into their balance sheets. They do not want to change until the regulators are fully aware of the effect of including deferred taxes and change their standards. They do not want some of their good loans to be down-graded because the regulator does not understand the balance sheet data. To some degree this is a chicken and egg problem; who should change first?

I believe we should include deferred taxes and change the standards. Inclusion gives the farmer more useful information. When we did the study of the farms, we had no difficulty getting farmers to cooperate. Once they knew what we were doing, they wanted to know the results. They wanted to know how much real equity they had and how much the "tax man" was going to take away from them if they sold. We need to educate the regulators and get on with it!

One of the big problems with including deferred taxes is that the estimation procedure could be complex. Anything that has to do with taxes has that possibility! Our research indicates that we can ignore big hunks of the tax code when making our estimates without having a material effect on the calculated tax. A reasonable approximation can be obtained using a form similar to that shown in Table 3. The market value data come from the balance sheet. The new data that are required are the four or five items in the tax basis column. Most of this information comes from the depreciation schedule. The hard part is the tax basis of the nondepreciable real estate. But, since these change infrequently, once they are determined, the same values can be used for a number of years.

The appropriate tax rate to use does vary by the amount of taxable income involved. A table such as that shown in Table 4 can be used for rate determination. This table presents the average rates observed in our dairy farm study. If you are dealing with only large farms use of a

standard rate of 35 percent would likely be reasonable. Those with a wide array of farm sizes may want to use a standard rate of 30 percent to make things simple.

Table 3. Rough Estimate of Deferred Taxes

	Market Value	Tax Basis	Taxable Income
Accounts Receivable	100,000		100,000
Crops and Feed	270,000		270,000
Supplies	25,000		25,000
Livestock	750,000	120,000	630,000
Machinery	445,000	275,000	170,000
Real Estate	1,350,000	900,000	450,000
Other			
Sub-Total			1,645,000
Residences in Real Estate	75,000	35,000	(-) 40,000
Accounts Payable	30,000		(-) 30,000
TOTAL			1,575,000
Approximate Average Total Tax Rate			.35
Deferred Tax			551,250

My main point in this discussion is encourage you not to forget that deferred taxes exist. Even if you do not put it on your balance sheets (for a while!), remember it ***is*** there. If you provide financing for a farmer who is expanding his or her business, and that expansion puts the farmer in a 20 to 30 percent equity position without consideration of deferred taxes, you are likely allowing that person to go to a zero, or maybe negative, real equity position. That can be a high risk situation. What does the farmer lose if he or she walks away and leaves you with the assets?

Table 4. Average Total Tax Rates New York Dairy Farms

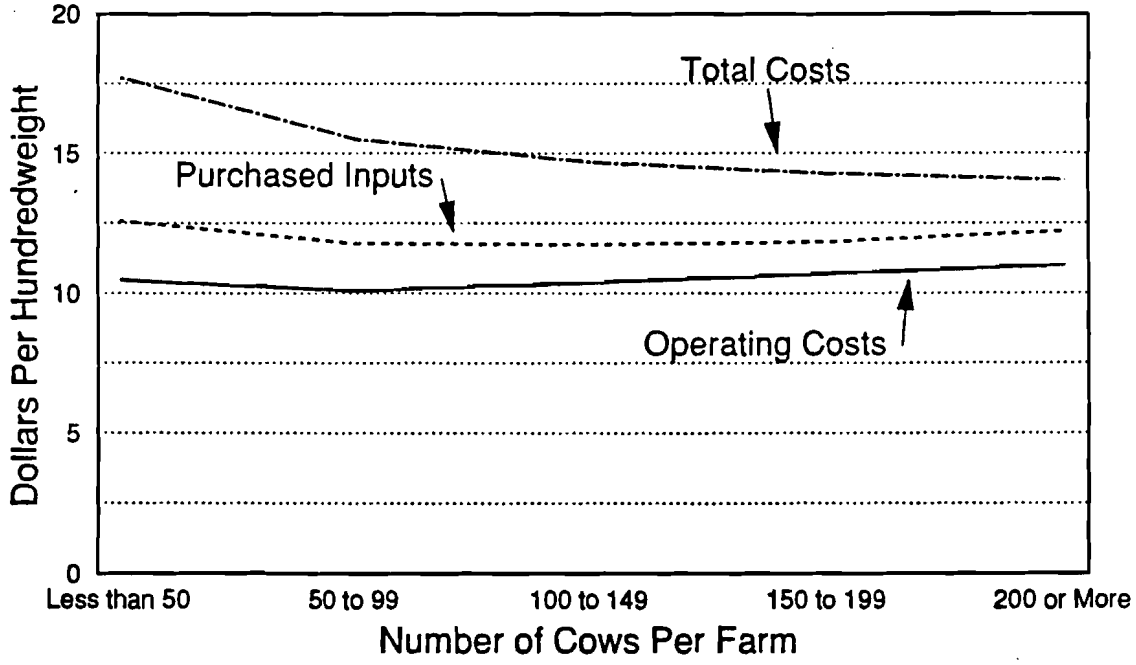
Total Taxable Income	Average Tax Rate
Under $100,000	25
100,000 to 400,000	30
Over $400,000	35

3. Don't Believe In *THE* Cost of Production

It is not unusual to hear a farmer exclaim: "Boy, the price of corn is so low, it is below the cost of production. How can we make any money at that price?" What he or she may really be saying is: "The price is below *my* cost of production and *I* can not make any money." There is no such thing as *the* cost of production. To illustrate this, lets return to our dairy farm data.

The first question is which cost of production are we talking about? I am going to talk about three different costs (Figure 8). The first is operating costs, which include what are frequently referred to as operating expenses. These include those expenses for such things as feed, seed, fertilizer and hired labor that are purchased each year for operation of the business. The operating cost of producing milk was relatively flat at around $11.00 per hundredweight. Larger farms were at a slight disadvantage compared to small farms.

Figure 8. Average Cost of Producing Milk by Herd Size New York Dairy Farms, 1992



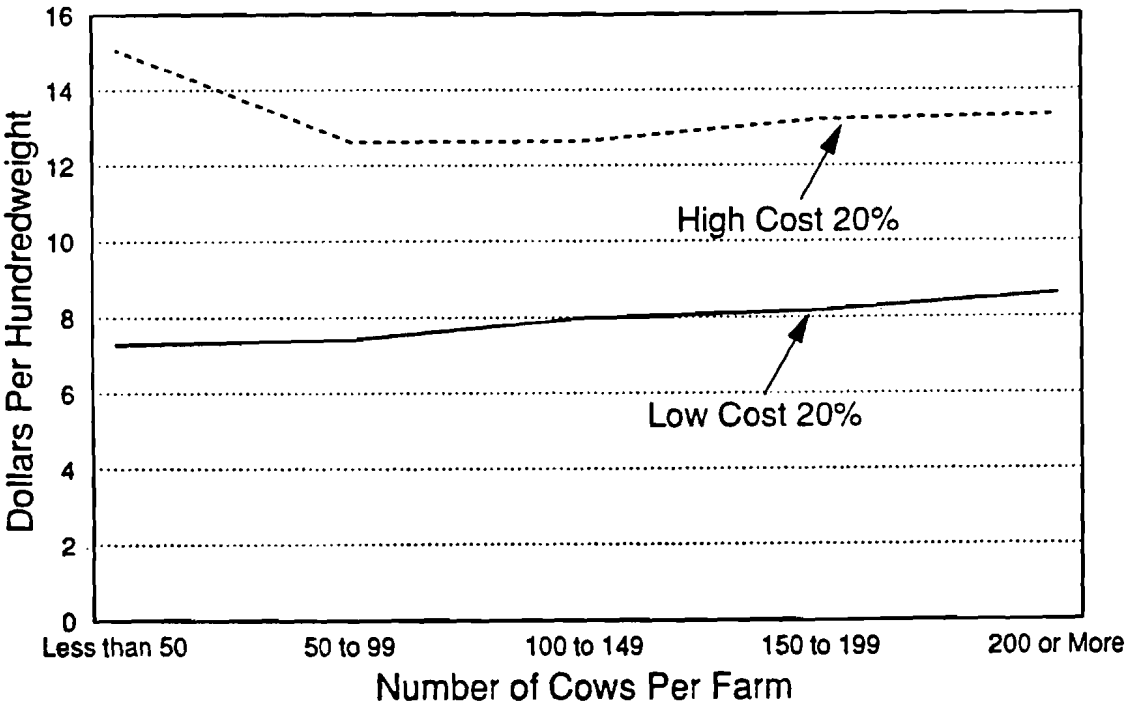
The second cost of production is the purchased inputs cost. This includes all of the operating costs as well as depreciation. Thus, it includes the costs of all the items that the farmer must purchase in order to produce, in this case, milk. The operating costs are purchased each year as they are used. The depreciation represents the allocation of a part of the cost of capital items that were purchased in this year and in past years. If the price of milk equals the purchased inputs cost, the farmer covers his or her out-of-pocket costs, but receives nothing for his or her resources and efforts.

The third cost of production is total costs. This includes all of the purchased inputs plus those inputs provided by the farmer. Farmer supplied inputs include operator labor and management as well as equity capital. If the price of milk equals the total cost of production, the farmer receives enough money to pay all out-of-pocket costs plus five percent return on equity capital and a payment for labor and management equal to his or her own estimate of their value.

Notice that there is $3 to $7 per hundredweight difference in the cost of production depending on which "cost" you are talking about.

Once we decide which cost of production we are talking about, we can look at how much difference there is between farms. To do this, I have developed a graph for each different cost of production definition showing the average cost of production of the top 20 percent of producers and the average cost for the bottom 20 percent of producers. To start, lets look at the operating cost of producing milk (Figure 9). The low cost producers ranged from a little over $7 per hundredweight for the small farms to a little under $9 for the large producers. However, the high cost 20 percent of farms had cost that were $4 or $5 per hundredweight higher. For any size of farm, some producers are able to produce at much lower operating costs than other farmers. As an aside, large farmers clearly do not have an advantage in operating costs. Part of this difference is caused by the fact that for larger farms a higher proportion of the labor used is hired labor, and thus, is an operating expense.

Figure 9. Operating Cost of Producing Milk
New York Dairy Farms, 1992



When we look at total purchased input costs (Figure 10), we find about $5 difference between the low and high cost producers for all sizes except the smallest farms where the difference is about $8. Again low cost large farms have little advantage over low cost small farms.

When we look at total costs (Figure 11) we again find about a $5 difference between the low cost producers and the high cost producers. Regardless of which cost of production you prefer, it is clear that there is no such thing as ***the*** cost of production. Some farms have much higher costs than others. Or, stated differently, some farms have a lot more opportunity for improvement than others!

Figure 10. Purchased Input Cost of Producing Milk New York Dairy Farms, 1992

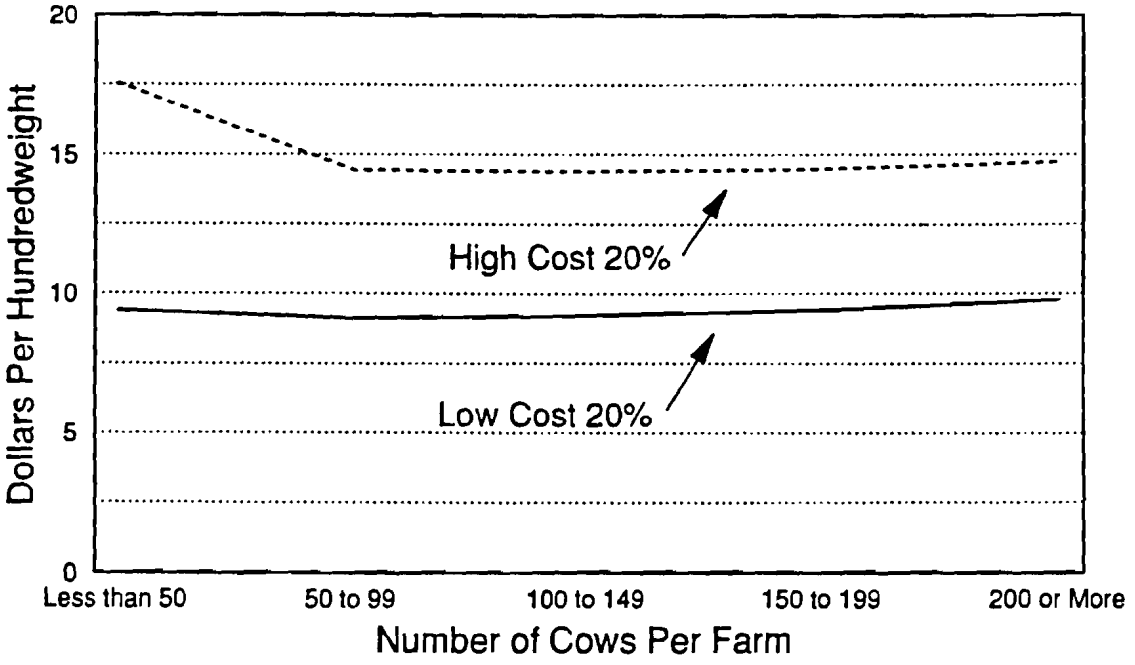
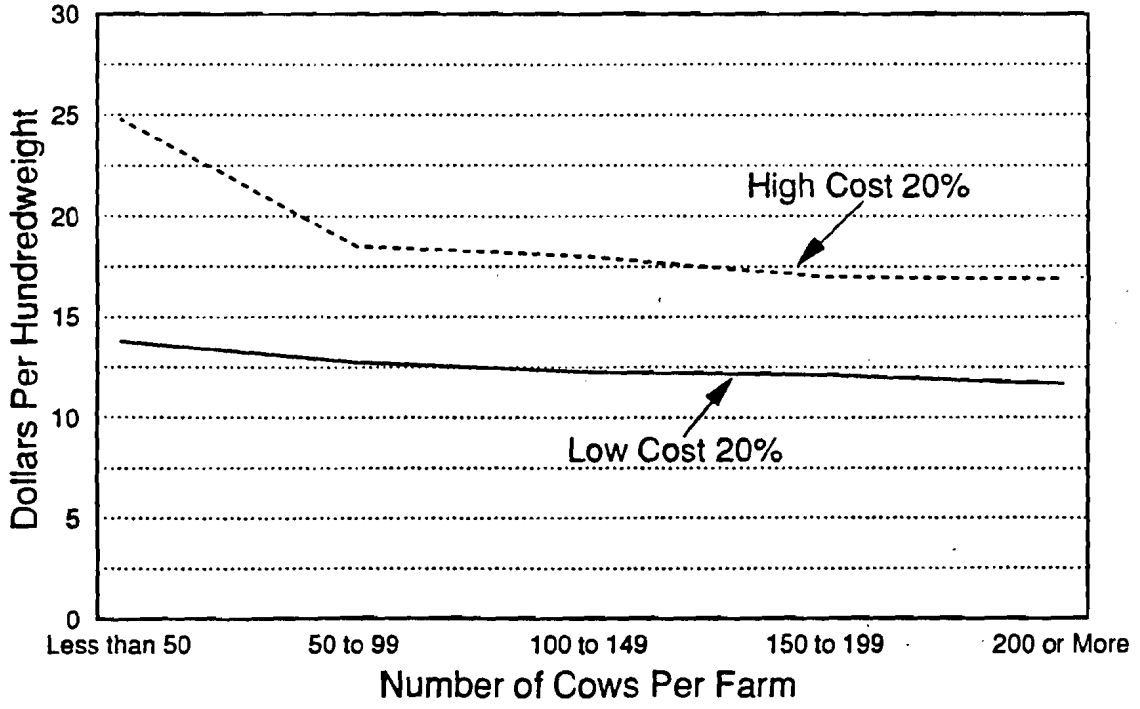


Figure 11. Total Cost of Producing Milk New York Dairy Farms, 1992



4. Do Remember that a Cost Based ROA is for Bragging Rights Only

When assessing agriculture, some analysts have looked at the rates of return reported by the USDA, seen numbers like four percent, five percent or six percent, and concluded that agriculture is a poor place to invest or loan money. Industries outside of agriculture obtain higher rates of return than that. Recently, however, some people have observed that the reason agriculture fares so poorly is that rates of return for agriculture are calculated based on current market value and rates of return for everyone else are based on book values. Since book values, of agricultural assets at least, are usually below market values, this procedure understates the relative profitability of agriculture.

When we did our deferred tax study, we collected information on book values and those data tend to support that hypothesis. Using the tax basis as the book values, which many people would say is appropriate[5], the average book value of assets was considerably below the market value. Aggregating all assets, the average book value was only one third of the market value (Table 5). This would mean that a market value ROA (rate of return on assets) of five percent would convert to a 15 percent rate of return on book value.

Table 5. Distribution of Book Value (Tax Basis) as a Percent of Market Value 84 New York Dairy Farms

Book as Percent of Market	Breeding Livestock	Machinery	All Real Estate Except House	All Farm Assets Except House
		Percent of Farms		
Under 20	85	17	6	15
20 to 39	12	27	29	55
40 to 59	1	32	24	26
60 to 79	1	15	23	4
80 to 100	1	5	7	0
Over 100	0	4	12	0
		Average Book Value as Percent of Market Value		
All Farms	9	45	59	34

Since these farms were dairy farms, a significant part of the assets were raised livestock which had a zero tax basis. For nonlivestock farms, the 45 percent number indicated for machinery will likely be reasonably close. The 59 percent value for real estate may overestimate the tax basis of real estate on nonlivestock farms because a significant portion of the tax basis results from

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[5] The Farm Financial Standards Task Force indicates that using the tax basis for calculation of depreciation, and thus book values, would not be "...materially misleading for most farm operations". Guidelines p. 29.

the tax basis of recently constructed dairy barns with high levels of lost capital (amount that the cost of the barn exceeds the increase in the market value of the real estate resulting from addition of the barn). Thus, it seems likely that the book value of all U.S. farm assets is something like 50 percent of the market value. If that is true, a general rule for comparing the ROA values for farm and nonfarm business would be to multiply the farm rates of return by two before making the comparison. With that adjustment, of course, agriculture looks much better than historically portrayed.

An individual farmer can determine his or her cost based rate of return by using a sum of the cost basis of the assets, rather than the market value, in determining ROA. Many farmers will have a good rate of return on that basis. They can do a little bragging, and they have every right to do so. Remember, however, that the cost based ROA tells us how good the farmer's decisions were 5, 10, 20 and 40 years ago. It tells us how much was made on the amount that was invested back in history. It is not a good basis for decision making. One of the basic tenants of economics is that decisions should be based on opportunity cost. The market value, not the cost basis, is the opportunity cost. You do not evaluate how well a business is managed, or whether a business is a good place to invest, using a cost based ROA. The market value ROA is based on the current resources used in the business, and provides the rate of return to those resources. The cost based ROA is for bragging only!

5. Don't Forget Machinery Replacement when Determining Capital Debt Coverage

When we are evaluating expansions or major refinancing with term debt, the most important decision variable is the term debt coverage ratio (i.e., will they be able to make their payments). The normal method of assessing term debt coverage is to calculate the income available for debt service using something like the left column of numbers in Table 6. This is the procedure recommended by the FFSTF. However, if we take the calculated income available for debt service as the amount available to repay the debt we are now lending, we can be in trouble.

The reason for this trouble is that we have not allowed for future machinery purchases. Most farms I know purchase some machinery each year, and most of the purchases are financed with debt capital. What can happen if you make a loan that uses a high proportion of the expected amount available for debt service for the current loan, is that the purchases of machinery in future years will cut into and may more than wipe out the excess repayment ability that you expected to cover cash flow variability. For example, assume you make term loans of five years (nonreal estate) and fifteen years (real estate) that require $75,000 of debt service to a farmer with $100,000 of annual debt repayment ability. You have $25,000 of excess repayment ability and consider your position to be quite good. However, in the following year (year two) the farmer purchases machinery that requires $10,000 in annual payments financed over five years. Your excess slips to $15,000. In year three another $10,000 is added to committed payments, and your excess slips to $5,000. In year four a couple of major items of equipment break down and need to be refinanced, adding another $10,000 in annual payments. Your excess disappears; the farmer can not make his or her payments and you have a bad loan.

Now, you may say, we will refinance that five year loan each year incorporating the new machinery purchases so that the total payments do not increase and cause trouble. That is a good solution, ***If*** there is enough paydown of the loan each year to cover the machinery purchases without increasing the loan balance above its original level. However, that is a big ***If***. I have observed many situations where the ***If*** did not hold. Problems are most likely to occur when the terms of the intermediate loans are long, say seven years, when the magnitude of the intermediate term loans that can be refinanced is relatively small, and when the farm has a relatively large machinery investment or high susceptibility to "new paint disease".

Table 6. Income Available for Debt Service

		Historical (FFSTF)		Projected (LaDue)
Net Income from Farm Operators		100,000		100,000
Nonfarm Income		(+) 5000		5000
Depreciation/Amortization Exp.		(+) 45,000		45,000
Interest on Term Debt & Leases		(+) 35,000		35,000
Available for Debt Service, Family Living, Cash Investment or Retained Earnings		185,000		185,000
Family Withdrawals	75,000		75,000	
Income Tax Expense	(+) 10,000		10,000	
Cash Machinery Investment			15,000	
Total Withdrawals		(-) 85,000		100,000
Income Available for Debt Service		100,000		85,000

Approximation	
Average annual machinery investment	40,000
Principal due in next 12 months on loans that can be rolled over annually	(-) 25,000
Cash machinery investment	15,000

I recommend making explicit calculations to see how much of the expected machinery purchases can be handled by refinancing, and if some machinery purchases can not be handled by refinancing, recognizing that fact when evaluating the current (original) loan. This can be done using the procedure outlined in the right hand column of Table 6. The only change is the addition of a "cash machinery investment" item to the calculations.

This "cash machinery investment" is calculated using a three step process. First, average annual machinery purchases are estimated. This should be an estimate of the average dollar amount of machinery this farm can be expected to purchase. This estimate can be based on the historical purchases of the farm or the amount, average life and normal salvage value of farm machinery[6]. Second, the principal due in the first 12 months on the intermediate term loan that will

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[6] If cm is the current market value of the machinery inventory, s is the salvage value of machinery as a percent of the new price of the replacement, and y is the (dollar weighted) average period that machinery is kept on the farm, average replacements can be estimated as N x P where N = cm/(1+s)/2 and P = (1+s)/y.

be refinanced is calculated. This is the maximum amount that can be refinanced annually without the outstanding balance on the intermediate term loan increasing. Third, the amount that can be handled by refinancing each year (step two) is subtracted from the average annual machinery purchases. If the amount available from refinancing exceeds machinery purchases, the "cash machinery investment" is zero. However, if the amount available is less than the annual machinery purchases, the amount calculated in step three should be set aside for cash machinery investment in calculating the amount of debt service you can count on for the current loan.

In the Table 6 example, average annual machinery purchases were estimated at $40,000. The amount of machinery investment that could be handled by refinancing of intermediate term debt (principal repaid in the first 12 months) is only $25,000. Thus, $15,000 should be set aside for cash machinery investment in determining the amount of funds available to service the debt incurred with refinancing or expansion. Do not forget that machinery!

6. Do Develop Different Procedures for Handling Small Loans

I do not have to tell you that there is a lot of pressure to increase efficiency - particularly if your bank has merged lately. There is a tendency for management that is looking for increased efficiency to fire 10 or 20 percent of your group and them tell you that they expect total output of your group to increase. I call this improving efficiency on the backs of loan officers. There has to be a better way!

One approach for some institutions is to recognize that they spend too much time in analysis, use too much time in review, and require too much documentation of small loans - and then organize to make the process of handling small loans more efficient. The first step may be to develop some different loan products to use with borrowers who do not want very much money. Years ago, many institutions got away from installment loans to farmers because they were an interest gouging vehicle. But, you ***can*** charge any interest rate on an installment loan and small loans likely should require a higher rate. You could develop a commercial installment loan product for farmers; make the loan with about as much information and documentation as a car loan, and do not review it unless there is default or consistent late payment.

Another product would be a farm equity line of credit. Do an analysis once. Set it up so the farmer can borrow and repay as needed. Let the computer monitor performance and print out a message when performance is not within standards for such loans that you establish.

My third suggestion is a farm credit card with a line of credit specifically designed for purchases of certain products such as feed, fertilizer and major machinery repairs. I am sure you can think of other products that represent reasonable risk but reduce the amount of work required of the loan officer.

One very important step in the process of designing new products and procedures for small loans is to be sure to modify your written agricultural loan policy. Tailor the loan analysis detail and loan review requirements to the individual products. Carefully decide just how much analysis and personal monitoring is appropriate for the risk involved in each product. Maybe a loan does not need reviewing as long as the payments are made. Or, you may be able to review small loans in July or September when the pressure for large loan analysis is less.

After deciding exactly what is to be required, be sure to write it in policy. If it is written in policy, the regulators know that your institution has given careful thought to the risks and they can not "get you" for not following your own policy.

I am sure many of you already have small loan policies and you have developed better ideas than I have provided, but some others of you should give it some more thought.

7. Don't Believe Income Tax Net Income

Now, I am not accusing your farmers of lying on their income tax forms! Taxable net income is designed to provide a basis for deciding how much money the farmer should send to state governments and Billery; not to tell you if the business is profitable. For most farmer's taxable net income is a cash based income measure which is far from the accrual income of the business. To illustrate just how much error there is in the tax income numbers we will return to the DFBS data for farms on which we have data for the 1990 through 1992 years. The absolute difference between the cash income and accrual income for the farms was calculated for each farm for each year. Decile averages for each year were then determined (Table 7). Clearly, many of the farms had differences between cash income and accrual income that are large enough to influence your loan decision. For example, the 10 percent of the farms with the largest absolute error in 1990 had an average error of $108,000. That is, for the average farm in this group the taxable net income would misestimate the accrual income earned by this business by $108,000. If this farmer approached you for a loan and the $108,000 represented an underestimate of income, you likely did not make the loan. If the $108,000 represented an overestimate and you made the loan, you may soon be having repayment problems. The 10 percent of farms with the greatest error in 1991 had an average error of $83,000. Over 50 percent of the farms had an error of more than $10,000 each year.

Table 7. Distribution of Error In Using Cash Income Instead of Accrual Net Income 240 New York Dairy Farms, 1990-92

Decile Group	Difference Between Cash and Accrual Net Income			
	1990	1991	1992	Average[a]
1 (most error)	108,000	83,000	134,000	89,000
2	40,000	32,000	42,000	25,000
3	25,000	21,000	28,000	14,000
4	17,000	15,000	20,000	10,000
5	11,000	11,000	15,000	8,000
6	8,000	8,000	12,000	6,000
7	6,000	6,000	9,000	4,000
8	4,000	4,000	6,000	3,000
9	2,000	2,000	4,000	2,000
10 (least error)	1,000	1,000	1,000	1,000
Average Error	22,000	18,000	27,000	16,000
Average Accrual Net Income	51,000	31,000	46,000	43,000

Note: Values rounded to the nearest $1,000.

[a] 1990-92 average accrual income minus 1990-92 average cash income.

Some people say that these inventory adjustment errors average out and if you get three years of data, you likely have reliable information. To look at that proposition we averaged the errors for the three years for each farm. The results are arrayed in the column labeled "average". Clearly, the positives and negatives did offset each other on some farms, but not all the error was averaged out with three years of data. Only about a third of the farms had errors in excess of $10,000. However, the 10 percent of the farms with the most error still under or over estimated their income by an average $89,000. Average error on all farms was $16,000, which was 37 percent of the average accrual net income.

Fortunately, it is not all that difficult to convert tax data to accrual-adjusted net income. A procedure like that shown in Table 8 can be used. The top two lines of data come from the tax records (Schedule 1040F and Form 4797). The rest of the data items are changes in inventory from the beginning and end of year balance sheets. On many farms the investment in growing crops, supply inventory, and prepaid expenses are small enough that they can be ignored with little error. Also, farms that make monthly (rather than annual, quarterly, etc.) payments on all loans can likely ignore changes in accrued interest expense with little error. For any farm where the magnitude of net income is important to your decision, I encourage you to at least take this step and calculate accrual-adjusted net income.

Table 8. Conversion of Cash to Accrual-Adjusted Income

Schedule F net farm income (profit or loss)	
Proceeds from sale of culled breeding livestock	(+)
Change in (feeder) livestock inventory	(+)
Change in crop and feed inventory	(+)
Change in accounts receivable	(+)
Change in investment in growing crops	(+)
Change in supply inventory	(+)
Change in prepaid expenses	(+)
Change in accrual expenses (interest, taxes, rent, etc.)	(-)
Change in accounts payable	(-)
Accrual-adjusted net farm income from operations	(=)

Note: Change is the increase or decrease from beginning of year to end of year. For example, if beginning inventory of feeder livestock is $40,000 and end of year inventory is $35,000, the change for the year is $-5,000.

8. Do Get Your Farm Borrowers to Prepare an End-of-Year Inventory (Balance Sheet)

To know what is happening to a farm business over time, you need balance sheets for each year as of the end of the year; not balance sheets as of whatever date you happened to do the loan review for that farm. It is very difficult to do much with balance sheets when one year's

balance sheet is dated February 15, the next year's is dated January 9 and the next year's is dated April 17. You can not really tell what happened during the year and you certainly can not use such balance sheets to adjust tax data to obtain accrual-adjusted net income. Crop and livestock inventories can change a great deal between December 31 and April 17, and memories are not usually good enough to reconstruct the situation of two or three months ago.

One solution would be to do all of your loan reviews on January 2. However, that day is not long enough to accomplish that feat. But, you could send each of your borrowers a blank balance sheet or form for listing the assets and accounts payable as of December 31. You could send them about Christmas time - with a card. Or you could send them soon after Christmas, so they would arrive with their tax forms! When you send out the forms, ask the farmers to return them by, say, January 10 or 15, and have a clerk call all delinquents by January 20. Other dates could be established for files with fiscal years ending other than December 31. If these time sensitive data are collected close to December 31, or at the end of the fiscal year when other than December 31, the rest of the balance sheet and the determination of accrual income can be accurately calculated by you, their accountant or financial analyst whenever time allows.

Timely collected balance sheet data will be more useful to you, and just as importantly, to the farmer. We need to convince more farmers that a good set of financial records is critical to good financial management of a farm business. An annual balance sheet is a first step.

9. Don't Believe In Miracles

Do not believe in miracles when projecting the future or future cash flows. We could restate this by saying that major changes in management performance rarely occur quickly. A poor manager this year is likely to be pretty poor next year. A person with high costs this year is likely to have high costs next year.

I am sure that all of you have observed the kind of miracles I am talking about. The farmer produced 10,000 pounds of milk per cow last year, but his budget for next year assumes production of 17,000. A farm with high cost per pound of gain last year, assumes they are going to be better than average, or at least average, next year. Apple yields have averaged 400 bushels per acre for the last three years, but next year's budget shows 600. These kind of miracles occur most often on farmer and lawyer prepared budgets and pro formas. To look at this issue, I put together some evidence from our DFBS data on just how frequently this kind of miracle occurs.

The left two columns in Table 9 indicate the average veterinary expenses per cow for each decile group (10 percent) of the farms. The 10 percent of farms with the highest vet expenses per cow had average vet costs of $108 per cow. The 10 percent with the lowest vet costs spent only $12 per cow. To look at the stability of cost levels, we followed each of these groups of farms through 1991 and 1992. In general, high cost farms in 1990 were also high cost farms in 1991 and 1992. Those farms that averaged $108 in 1990 averaged $96 in 1991, and $107 in 1992. Those farms that averaged $12 in 1990 averaged $17 in 1991, and $19 in 1992.

There was, however, some shifting of the relative position of some farms. Some high cost farms improved their situation somewhat. The high cost 10 percent with an average decile rating of 1.0 in 1990 improved their position to an average decile rating of 1.9 in 1991, and 1992. Correspondingly, some of the low cost farms saw their costs rising. The 10 percent with the lowest costs, and an average decile ranking of 10 in 1990, experienced a deterioration in their average decile ranking to 9.3 in 1991, and 9.4 in 1992.

Table 10 shows the same kind of data for purchased concentrates per cow. The same basic result is observed. High cost farms continued to be high cost farms; low cost farms continued to be low cost farms. There was a little more shifting of the relative position of farms from year to

tended to deteriorate somewhat. The high cost 10 percent improved their average decile ranking to 2.0 in 1991, and 2.2 in 1992, showing some improvement on the part of some of the farms.

Table 9. Stability of Veterinary Expense Per Cow 240 New York Dairy Farms, 1990-92

1990		Average for Same Farms			
		1991		1992	
Decile	Average Expense	Expense	Decile*	Expense	Decile*
1 (worst)	$108	$ 96	1.9	$107	1.9
2	882	73	2.8	80	3.0
3	69	68	3.3	80	3.3
4	58	57	4.4	64	4.7
5	52	53	5.0	62	4.8
6	46	47	5.9	51	6.1
7	40	42	6.6	51	6.2
8	32	37	7.3	42	7.2
9	24	26	8.5	31	8.4
10 (best)	12	17	9.3	19	9.4

* Average decile rank this year (1991 or 1992).

Table 10. Stability of Purchased Concentrates Per Cow 240 New York Dairy Farms, 1990-92

1990		Average for Same Farms			
		1991		1992	
Decile	Average Expense	Expense	Decile	Expense	Decile
1 (highest)	$1,070	$920	2.0	$930	2.2
2	910	840	3.1	850	3.3
3	840	790	3.4	840	3.4
4	790	730	4.5	730	5.0
5	740	640	5.9	740	4.9
6	680	670	5.4	680	5.9
7	630	620	6.3	680	5.8
8	570	530	7.7	590	7.4
9	480	540	7.6	560	7.8
10 (lowest)	380	400	9.1	420	9.3

When we look at total accrual operating cost per cow (Table 11), we find the same general result. High cost farms improve a little in future years; low cost farms tend to deteriorate somewhat.

Table 11. Stability of Total Accrual Operating Expenses Per Cow 240 New York Dairy Farms, 1990-92

1990		Average for Same Farms			
		1991		1992	
Decile	Average Expense	Expense	Decile*	Expense	Decile*
1 (worst)	$3,000	$2,700	2.1	$2,800	2.3
2	2,700	2,500	2.5	2,500	3.0
3	2,600	2,300	3.8	2,500	3.7
4	2,500	2,300	4.0	2,400	4.3
5	2,300	2,200	5.0	2,400	4.4
6	2,200	2,100	6.3	2,200	6.3
7	2,100	2,100	6.2	2,200	6.1
8	2,000	2,000	7.1	2,000	7.2
9	1,800	1,800	8.3	1,900	8.4
10 (best)	1,500	1,500	9.7	1,600	9.4

* Average decile rank this year (1991 or 1992).

Note: Expenses rounded to the nearest $100.

On the income side, milk per cow shows the same pattern (Table 12). High producing herds tended to continue to obtain about the same average production level from year to year but saw a deterioration in their average ranking. Low producing farms saw improvement in their production levels of about 500 pounds per year but remained low producing herds.

In general, next year's costs are a lot like last year's costs, next year's production can be expected to be a lot like last year's production. Miracles are few and far between.

One corollary of the lack of miracles is that very few people are average this year and about the same number will be average next year. This means that reliable projections of repayment capacity or cash flow can not be made from average farm budgets, whether the budgets are for a state, a county or a township. A reliable projection of cash flows can only be made if it is based on the performance of the farm being projected. While farms do improve, that improvement is usually modest in any one year.

10. Do Help Farmers Think and Speak Finance

It seems to me that over the past few decades the production people have been more successful in getting farmers to think and talk production than we have been in getting them to think and speak finance. When you ask a farmer how things went last year, he or she is most likely to respond with things like "production was up", "the flood reduced our corn yields to 50 bushels per acre", "crop yields were the highest in three or four years", "the barn is full", or " we have nine daughters of High-Monkey-Monk, the new highest plus proven bull". They rarely respond with "net

income was up", "the land price declined so that our equity dropped from 60 percent to 40 percent", or "we lost money hand over fist last year".

Table 12. Stability of Milk Sold Per Cow 240 New York Dairy Farms, 1990-92

1990		Average for Same Farms			
		1991		1992	
Decile	Average Lbs/Cow	Lbs/Cow	Decile*	Lbs/Cow	Decile*
1 (best)	21,400	21,600	1.5	21,400	2.2
2	20,000	20,000	2.8	20,200	3.2
3	19,000	19,400	3.6	19,800	3.9
4	18,300	18,700	4.5	19,100	4.6
5	17,700	18,200	5.1	19,400	4.3
6	17,100	18,000	5.7	18,500	5.5
7	16,700	17,400	6.3	18,200	6.0
8	16,000	16,600	7.3	17,100	7.3
9	14,600	15,300	8.6	15,900	8.5
10 (worst)	12,100	12,900	9.6	13,200	9.5

* Average decile rank this year (1991 or 1992).
Note: Production rounded to the nearest 100 pounds.

We need to get farmers to think and talk more about the financial performance of their businesses. Farmers would be better off if we could get them to publish their ROA in the local county news, rather than their rolling herd average. That would separate the wheat from the chaff! I am not suggesting that we have much chance of getting farmers to do such a thing, but there are some other things we could do that might help.

The FFSTF published definitions for 16 ratios, often referred to as the sweet 16, that they believed could be useful in the financial analysis of farm businesses (Table 13). This is a good set of ratios. They represent each of the five financial analysis categories that are frequently used in analysis of financial performance of businesses. I am sure that each of you has a couple of pet ratios that you would add to this list to make it complete.

However, there is one thing wrong with this list, or your expanded list, from a farmers perspective. It is too long. Farmers have too many things going on to remember 16, or 18, ratios. In order to communicate and have meaningful discussion with the farmer, we need to cut the list down. We need to decide which ones are the most important and focus on them. I encourage you to think about which three, four or five ratios are most important to you and your farmers, and then use them in your financial analysis and in your discussions with your farmers. You do not have to limit your analysis to the reduced list. The other ratios do have value for financial analysis. But focus on the reduced list when talking with the farmer.

One way to develop a reduced list would be to select one ratio from each of the financial analysis categories. Using that procedure, I developed what I call my "fabulous five" (Table 14).

This set of ratios covers all the bases and reduces the number to a more manageable number. You could make a case that five is still too many, particularly to start with. In that case you may want to develop your "fascinating four" or "thrilling three". My fabulous five are listed in my approximate order of importance. So I would get to a fascinating four by dropping the current ratio, and to a thrilling three by also omitting the operating expense ratio. Regardless of which ratios we chose, we should make sure the farmer knows what they mean and how they should be used, and we should use them consistently.

Table 13.	**Farm Financial Standards Task Force Recommended Ratios (The Sweet 16)**
Liquidity	
1.	Current Ratio
2.	Working Capital
Solvency	
3.	Debt/Asset Ratio
4.	Equity/Asset Ratio
5.	Debt/Equity Ratio
Profitability	
6.	Rate of Return on Farm Assets
7.	Rate of Return on Farm Equity
8.	Operating Profit Margin Ratio
9.	Net Farm Income
Repayment Capacity	
10.	Term Debt and Capital Lease Coverage Ratio
11.	Capital Replacement and Term Debt Repayment Margin
Financial Efficiency	
12.	Asset Turnover Ratio
13.	Operational Expense Ratio
14.	Depreciation Expense Ratio
15.	Interest Expense Ratio
16.	Net Farm Income from Operations Ratio

One way to help with the process is to use graphics. They say a picture is worth a thousand words. With modern computers we can do lots of things we could not do only a few years ago. We should be able to add some graphics to our financial analysis software that would automatically generate up to date graphs for the farm business. With properly selected ratios, a few graphs could allow the farmer to see and assess his or her performance with ease.

For example, a set of graphs like those shown in Figure 12 would be consistent with my fabulous five. Each graph presents one ratio. The range and scale of the graph is established by the range of ratio values that can be expected. It is not necessary that all possible values of the ratio fit on the graph. For a farm to be "off the graph" can be used to emphasize extreme positions. The shaded area is determined by your critical values for the ratio. These may vary by type of farm and could be specific to particular farms. Farm performance may be considered acceptable if the ratio is in the shaded area, at a preferred level, if above the shaded area, and unacceptable if below the shaded area. If you like colors, the shaded area could be yellow, above the shaded area green and below the shaded area red. Or, the shaded area could be referred to as the grey area, above the shaded area, good, and below, poor.

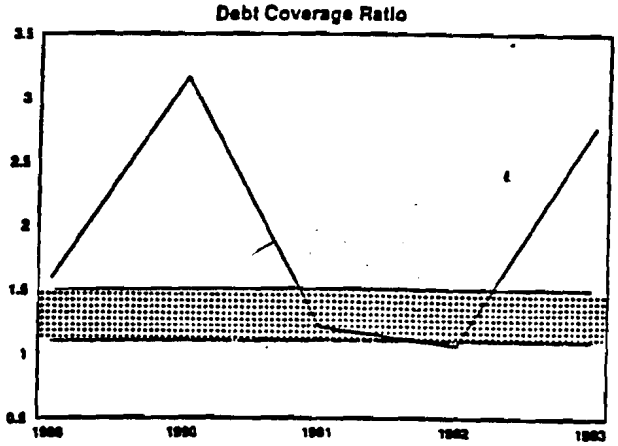
For Big Green Farm the debt coverage ratio (repayment ability) was good in 1989 and 1990. It slipped in 1991 with the precipitous milk price fall and declined further in 1992 as an expansion program was started. By 1993, the results of the expansion yielded positive results. Equity was at a good level and improving until the expansion provided a significant amount of lost capital (building costs that exceeded the amount the buildings added to market value of the real estate). The operating expense ratio has been excellent though declining until the expansion improved operating efficiency. Return on assets has been in the acceptable range throughout the five year period, but the trend has been negative and the expansion has helped only modestly as of 1993. The current ratio has been very good throughout. As would be expected, the ratio declined sharply as the added debt with the expansion increased the principal on term debt due within 12 months.

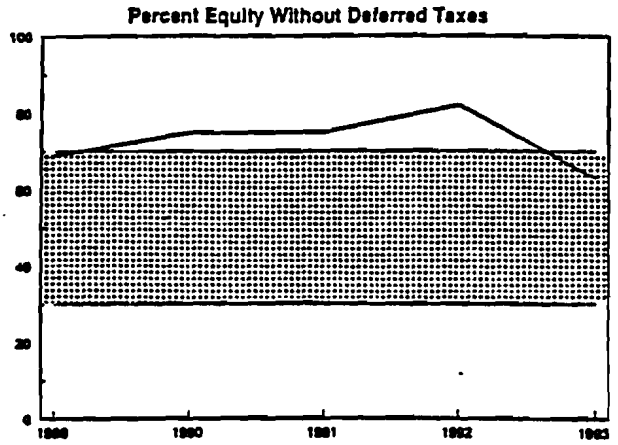
Table 14.	**The Fabulous Five**
1. Debt Coverage Ratio (Repayment Capacity)	
Debt Coverage Ratio =	Net Farm Income and Nonfarm Income plus Depreciation and Interest minus Taxes and Family Living Expenses Principal and Interest Payments on Term Debt plus Capital Lease Payments
2. Percent Equity (Solvency)	
Percent Equity = (equity/asset ratio)	Total Farm Equity Total Farm Assets
3. Return on Assets (Profitability)	
ROA =	Net Farm Income plus Interest minus Unpaid Family & Operator Labor & Management Average Total Assets
4. Operating Expense Ratio (Financial Efficiency)	
Operating Expense Ratio =	Total Accrual Operating Expenses (excluding interest and depreciation) Gross Revenue (accrual)
5. Current Ratio (Liquidity)	
Current Ratio =	Total Current Farm Assets Total Current Farm Liabilities (including principal due in next 12 months on term debt)

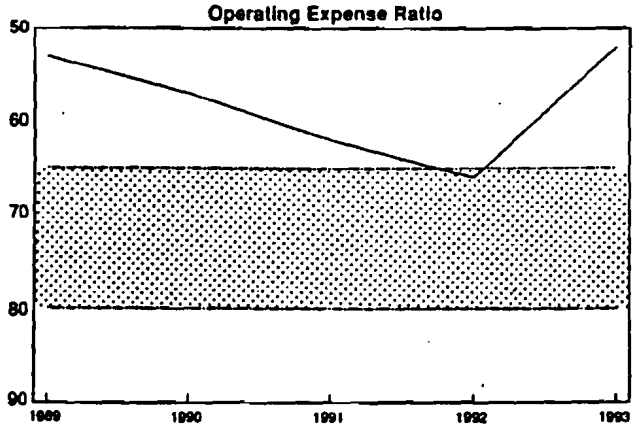
Summary

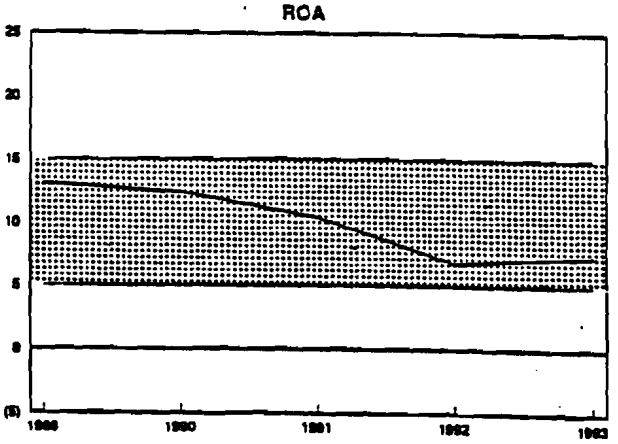
That is my 10 financial analysis do's and don'ts. I am sure you could add to the list. They are not a financial analysis blueprint. But, hopefully, they may provide you at least and idea or two to add to your own personal financial analysis blueprint.

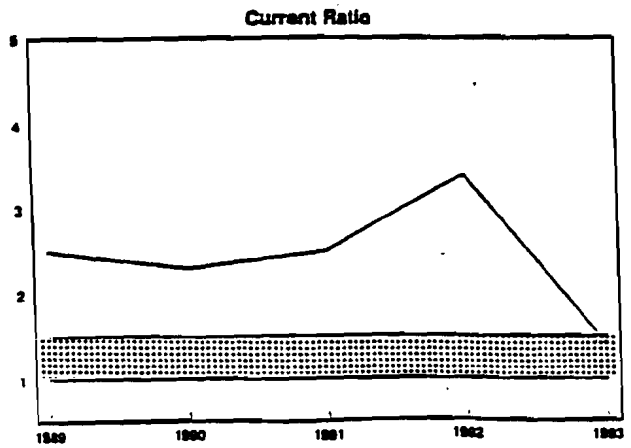
Figure 12. Financial Performance Picture
Big Green Farm











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