

LaDue, Eddy L.

**Working Paper**

## Farm Loans Under Price Uncertainty

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Charles H. Dyson School of Applied Economics and Management, Cornell University

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FARM LOANS UNDER PRICE UNCERTAINTY\*

By

E. L. LaDue

January, 1976

No. 76-6

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October 8 and 9, 1975

## FARM LOANS UNDER PRICE UNCERTAINTY

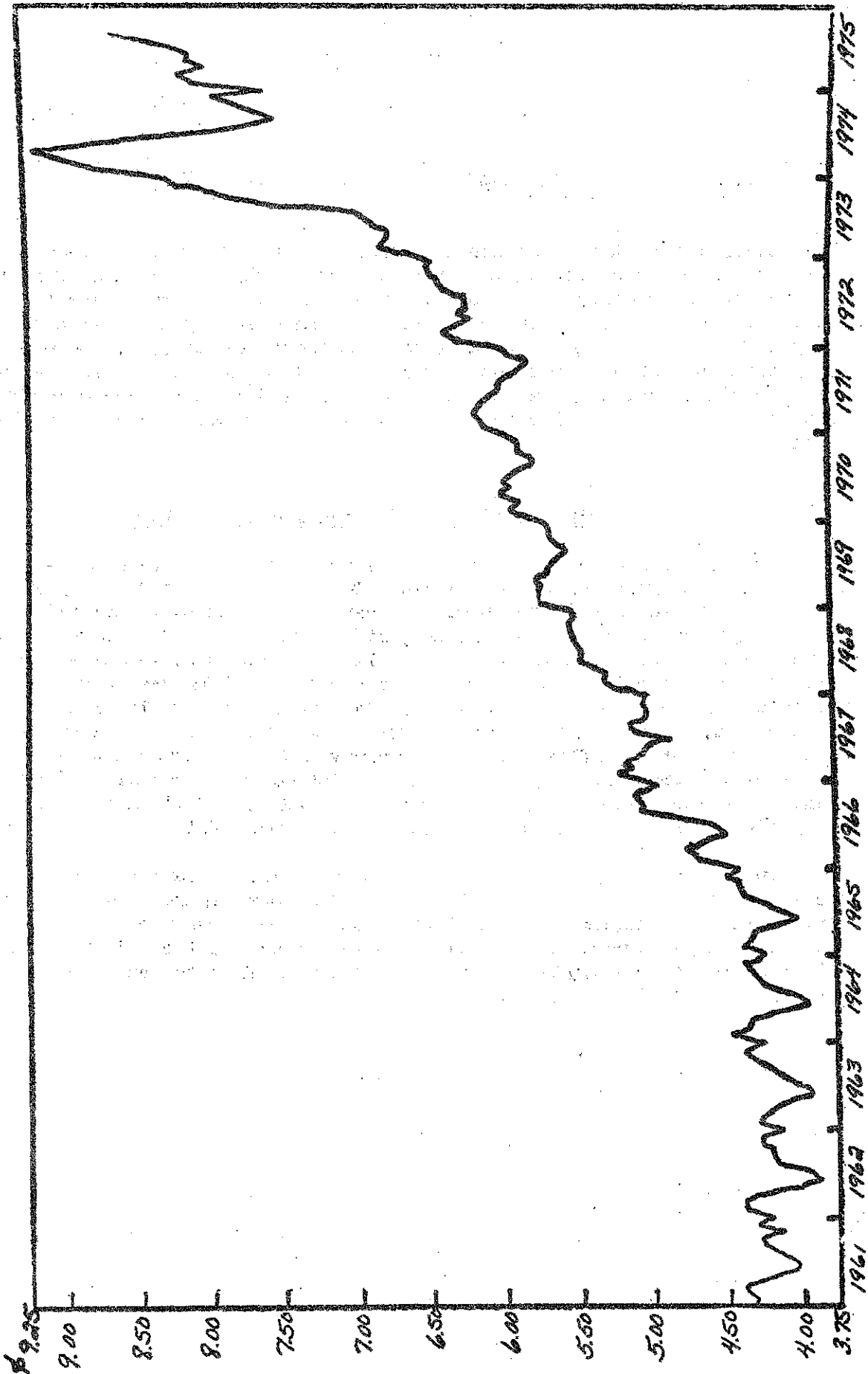
During the past several months, there has been increasing concern expressed by various members of the agricultural community about increased farm price variability and uncertainty. Farm credit representatives, county agents, and farm supply people as well as some of this group have all expressed concern that many dairy farmers are having trouble meeting payment commitments. Feed bills are not being paid on time and debt commitments are not being met. This has led to milk price hearings, calls for more cash flow information, and many dire statements about the future of particular dairy farmers and in some cases dairy farming in total.

### Price and Cost Variation and Uncertainty

In order to look at this problem, I think we should first take a close look at what is really happening to prices. To do this, let's start by looking at Figure 1. Figure 1 indicates what has happened to the price of milk since 1961. The data presented are seasonally adjusted, using 1967-69 as base, to remove the normal seasonal price variations. The 1961 to 1966 data were further adjusted to reflect the change in seasonal take-out back pay. This procedure removes most of the seasonal price during that period. As you can see, milk price was relatively constant during the early 1960's and then rose gradually from 1966 through 1972, reflecting general inflation in the economy and some improvement in dairy farm profitability from the very low levels of 1963-1965. However, in 1973 the picture changes. Prices rose sharply in early 1973 and then fell sharply in late '73 and early '74. During late 1974 and 1975, prices rose, fell, and rose again.

Now remember this data has the seasonal price variation taken out. Adding the seasonal price variation to this variation may, in some cases, reduce the total price fluctuation; but in other cases it has made the price peaks higher and the valleys lower. One can quite easily conclude from Figure 1 that the milk price environment of 1973-1975 is much different from the environment that existed for many years prior to 1973.

Figure 1. ORDER 2 BLEND MILK PRICE PER HUNDREDWEIGHT -- SEASONALLY ADJUSTED  
3.5% Milk, 201 - 210 Mile Zone, 1961 - 1975



Now let's turn to the other side of the dairy income equation and look at a major cost item--feed concentrate. Figures 2 and 3 indicate what has happened to two major dairy feed ingredients--corn and soybean oil meal--over the past several years. Here the picture is even more dramatic than for the price of milk. Until late 1972, prices for both corn and soybean oil meal were quite constant. There was general over-production of feed grains and large stocks held by the government which were sold whenever the price started to increase much and added to whenever prices reached some government-determined minimum price. If we were to extend this graph back into the early 1960's and 1950's, we would see that this same relatively constant price situation has existed since the early 1950's.

In 1973, the price of corn rose so sharply that the price increases caused by the corn blight in 1971 looks like little more than slight price aboration. The average price continued to increase during 1974 but with much sharper month-to-month variation than had ever been experienced in immediately-preceding decades. The price has declined considerably during 1975 and, unless we sell more to the Russians, will likely decline even further.

If we look at soybean prices, we see that the price rose extremely sharply and fell at the same pace during 1973. If we combine these soybean price changes with the price changes for corn, we have a basic idea of what has happened to the price of the dairyman's largest cash expense item: the price of feed has increased and it has become significantly more volatile. When we combine this increased volatility in feed prices with the extreme milk price fluctuation, we see why farmers are having trouble with cash flows. The peaks and valleys in feed prices do not coincide with the peaks and valleys in milk prices. The farmer is not caught out in the middle of a lake in a rowboat by a sudden moderate but constant wind where amplitude and duration of the ups and downs are constant. He has suddenly found himself in a rollercoaster where the ups and downs are steep and he doesn't know where the next corner is until he is half way around it. After turning a corner, he is never sure how long or steep the next rise or fall will be. He is always looking ahead, but what appears to be ahead does not always materialize.

#### Will Price Uncertainty and Variation Continue?

The changes in price variability observed in Figures 1 through 3 raise two questions: (1) Will the price variation continue -- or do the last three years represent an unusual period of time which will not be repeated soon, and (2) What does the recent high price of grain imply for the long-run future of dairy farming in New York State?

First, will the variation continue? The answer to this is that no one is sure. However, there are a number of reasons why I believe it may continue. Basic to these reasons is the fact that for both milk and feed grains, as well as wheat, the last few years has been a time of approximate balance between production and demand. The amount used and sold is about equal to production. In addition, there are not large stocks of wheat, corn, butter, and cheese that can be used to dampen the price movement in either direction. With approximate balance between production and demand, the price is determined by current events and expectations. Therefore, a drought in the midwest, grain sales to Russia, the threat of export controls, increased import of cheese, or the refusal to load ships by longshoremen all effect production or demand and thus the price necessary to equate production with demand.

Figure 2.

MONTHLY CHICAGO CASH PRICES OF CORN  
1967 to Date

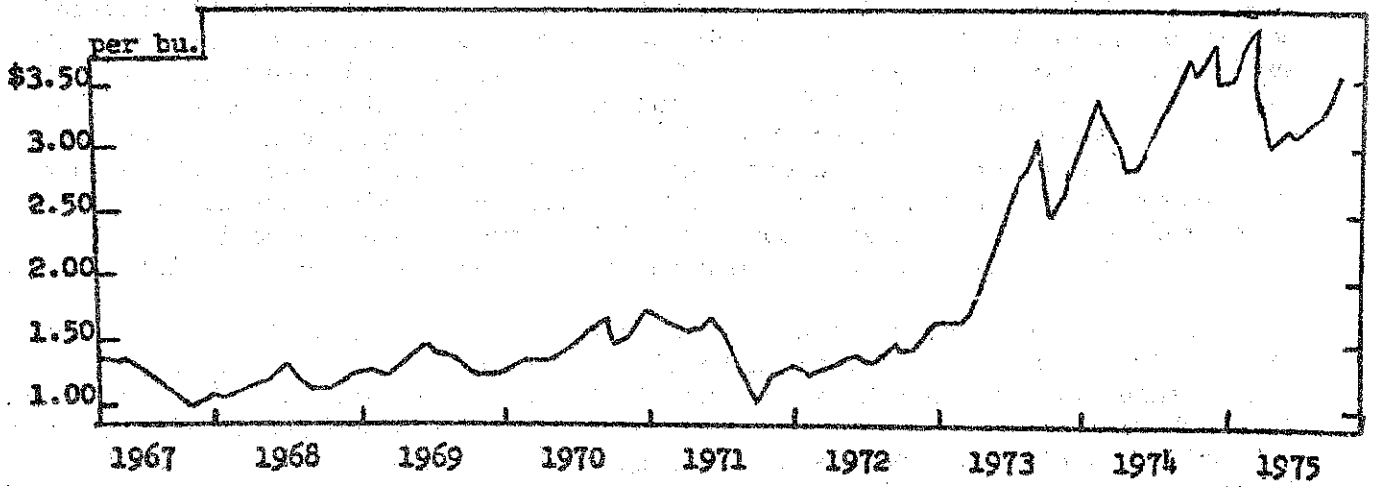
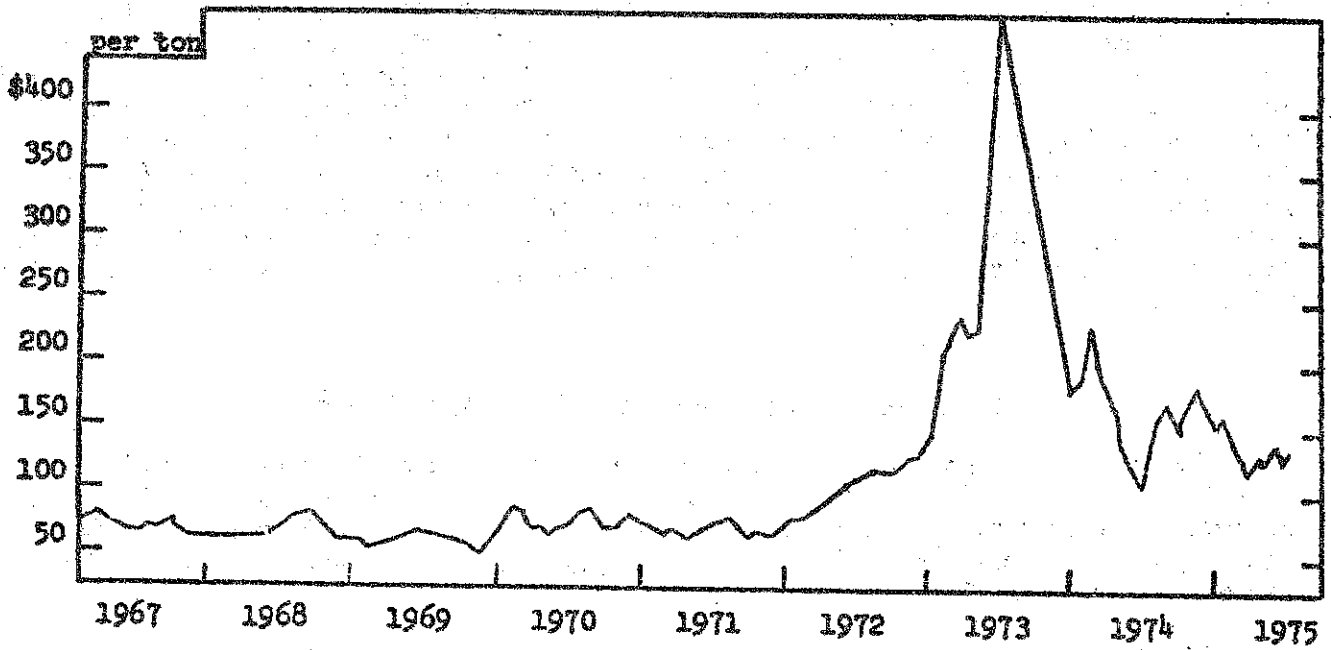


Figure 3.

MONTHLY DECATUR PRICES OF 50 PERCENT SOYBEAN MEAL  
1967 to Date



The price change necessary to equate production with demand depends on the elasticity of demand for that product--and that is what causes agriculture's extreme price fluctuation. The demand for food is inelastic. Therefore, a slight change or expected change in production or demand will cause a large change in price. With no stocks on hand nor programs for adding to these stocks, these slight changes in production or demand cannot be offset by government action. Thus, there is extreme fluctuation in farm prices.

A factor which aggravates the price fluctuation problem for agriculture is the large number of groups intensely interested in agriculture. Everyone who eats food considers himself an expert on agriculture and agricultural policy. Thus, you get Mr. Meany deciding we should not export grain. With rapid inflation, consumers get very concerned about food prices--even if food prices rise at the same rate as other costs. If food price increases mean fewer color television sets, the consumer is upset--even if the price of the color TV has gone up by the same percent as food costs. This makes consumer groups organize boycotts. Politicians who want to get elected become very vocal about export controls, importing cheese and beef and other agricultural policy topics. With everyone in the act, there are a multitude of factors that may effect production or demand slightly at any time and thus push price sharply up or down.

What this leads me to conclude is that unless or until some sort of government program which generates government stocks is developed, increased price fluctuation and uncertainty is likely to continue. Such a government program could be triggered by a desire to insure food availability, over production by farmers or an expressed decision to limit price fluctuation in agriculture. This means price variability and uncertainty are certainly likely to continue, at least in the short run.

#### The Long Run

The second question, that is, "What does the recent high price of grain imply for the long-run future of dairy farming in New York State?", really questions whether dairy farming is going to be profitable and--for this group--should farmers be given additional credit. I would like to contend that the long-run outlook for dairy farming in New York State has not materially changed from the outlook of five years ago.

The pricing factor that may have changed our competitive position is increased fuel prices. The resultant increased transportation costs increase the cost of shipping feed to New York State. However, this increased transportation cost also increases the cost of shipping milk from other areas into the eastern markets which New York serves. The reason milk is produced in New York is because we can produce forage, we have an absolute disadvantage in the production of grains, particularly corn, and we are close to market for milk. None of that has changed. If increased transportation costs have done anything, they probably have improved our relative competitive position. Milk is bulky and more perishable than grain, and railroads that are used for grain transportation are more efficient energy converters than the trucks used to move milk.

There is some concern, however, that the increased effective demand for feed grains worldwide has increased the demand for grain relative to livestock products, such as milk, and thus crop farming will be more profitable than dairy farming until some resources now used to produce milk are shifted to the production of crops. There is not certainty that this is actually happening. When you think back to 1966 when many people thought the U.S. was going to feed the world, one can become very skeptical about whether we are going to now either. But, even if it is true, most of the resources that are likely to shift from livestock forage production to food grain production are not located in New York State. Many areas in the Lake states get higher corn and soybean yields than New York State.

The worse that could happen to dairying in New York is that some of the land resources now used most inefficiently in dairying will be shifted to crop production. I do not think this will be a difficult process. There are many dairymen who would be glad to give up milking twice per day, 365 days per year, for crop farming.

This line of reasoning leads me to believe that the long-run outlook for dairy farming is good. However, at least in the short run, we are going to have considerably more price uncertainty and variability than dairy farmers, their suppliers, and their advisors were accustomed to in the past. We are going to have to get used to it and recognize that others may not understand what has happened. For instance, we can expect the popular press to carry articles on the demise of the dairy industry in times of falling prices and articles on how the farmer is making a killing at consumer expense when the price is rising. We are going to have to take a longer view and remember that as long as a few people believe those predictions, they will not come true or be true for long.

Over the long pull, however, well-managed farm businesses are going to provide good sound opportunities for lending money.

#### Management Ability and Loan Standards

One result of the increased variation in farm prices is an increased stress on management ability. Managers are going to need to increase their ability to manage cash flows and their ability to buy and sell rationally under a fluctuating price situation. What I would like to do now is look at the relationship between a few management measures and the repayment capacity of the farm business; and look at how this relates to the increased price variation we have said is likely to occur. To do this, I have used the 1974 data from the 675 dairy farms for which we have complete business and financial data. My measure of repayment capacity is the amount available for debt principle and interest payments. This is calculated by subtracting total cash expenses from total cash receipts and adding back in interest paid to give the amount available for debt service and family living. From this an estimate of cash family living expenses is subtracted. The only estimate in this procedure is the amount set aside for cash living expenses. It was estimated that each operator would need \$5,000 plus 3 percent of total cash receipts. This would provide \$6,200 for a single operator with total cash receipts of \$40,000 and \$11,000 for a single operator with \$200,000 cash receipts. In addition to this, each man would receive a house and other normal privileges. The family living expense levels used likely represent a minimum level of family living expense, implying that the repayment capacity figures given represent the maximum available.



The row of data just above the dotted line in Table 1 indicate the relationship between milk per cow and repayment capacity under 1974 prices and costs. In general, as milk per cow increases, so does repayment capacity per cow. A farm with a 14,000-pound herd average has over twice the repayment capacity of a farm with a herd average of less than 10,000 pounds per cow.

Table 1. MILK PER COW AND REPAYMENT CAPACITY  
675 New York Dairy Farms, 1974

Item	Pounds of Milk Sold Per Cow						
	Less Than 10,000	10,000- 10,999	11,000- 11,999	12,000- 12,999	13,000- 13,999	14,000- 14,999	15,000 & Over
Number of Farms	94	79	102	123	135	91	51
Total Cash Receipts	\$48,667	\$62,705	\$74,963	\$89,707	\$98,824	\$112,300	\$128,015
Total Cash Expenses	<u>39,034</u>	<u>49,196</u>	<u>58,843</u>	<u>67,789</u>	<u>74,617</u>	<u>84,541</u>	<u>87,543</u>
Net Cash Flow	\$ 9,633	\$13,509	\$16,120	\$21,918	\$24,207	\$ 27,858	\$ 40,472
Interest Paid	<u>4,545</u>	<u>5,797</u>	<u>4,957</u>	<u>5,834</u>	<u>5,425</u>	<u>4,824</u>	<u>4,479</u>
Available for Debt Payments & Living	\$14,178	\$19,306	\$21,077	\$27,752	\$29,632	\$ 32,682	\$ 44,951
Estimated Living Exp.*	<u>7,312</u>	<u>8,101</u>	<u>8,528</u>	<u>9,380</u>	<u>9,676</u>	<u>9,936</u>	<u>11,617</u>
AVAILABLE FOR DEBT PAYMENTS**	\$ 6,866	\$11,205	\$12,549	\$18,372	\$19,956	\$ 22,746	\$ 33,334
Available for Debt Payment Per Cow	\$ 123	\$ 184	\$ 187	\$ 248	\$ 259	\$ 288	\$ 407
Available for Debt Payment Per Cow With Milk Price:							
50¢ higher	\$ 165	\$ 240	\$ 244	\$ 309	\$ 324	\$ 358	\$ 482
50¢ lower	\$ 80	\$ 127	\$ 131	\$ 188	\$ 194	\$ 218	\$ 331

\*Estimated at \$5,000 plus 3% of total cash receipts, per operator.

\*\*Average price received for milk was \$8.54 per hundredweight.

The data below the dotted line indicate what happens to repayment capacity with a 50 cent change in the price of milk. Obviously, a higher price increases repayment capacity and a lower price reduces it. The change in repayment capacity ranged from approximately \$40 per cow for herds of under 10,000 pounds per cow to about \$75 for herds of 15,000 pounds and over.

However, the important factor to notice is that an increase in herd average of 1,000 to 2,000 pounds can offset a 50 cent decline in the price of milk. For example, the herds producing 11,000 - 11,999 pounds of milk had a 1974 repayment capacity of \$187, and herds with 12,000 - 12,999 pounds would have had a repayment capacity of \$188 with a milk price 50 cents lower than the 1974 price. Because of the irregularity of the data, other similar comparisons provide somewhat different results. The average increase in repayment ability per cow per 1,000 lbs. increase in production is \$47. The average decrease in repayment ability with a 50 cent decrease in price is \$61. Thus, on the average it takes 1,300 pounds increase in milk per cow to offset a 50 cent decline in milk price.

I do not mean to imply that you should go out exort your customers to increase production by 1,300 pounds each time the price of milk goes down 50 cents. But, it does mean that in making loans management factors such as milk per cow can be used as an indicator of the amount of money they can safely borrow and as an indicator of how susceptible that repayment capacity is to changes in the milk price.

One should also remember that a change in costs will have a result similar to that of a change in milk price. If all other prices were constant, a \$25 per ton change in the price of grain would have an effect about equal to 50 cents change in the price of grain\*.

To look at other management indicators, turn to Tables 2 and 3. Table 2 indicates the relationship between labor efficiency as measured by milk per man and repayment capacity. Although the pattern is somewhat irregular, higher repayment capacity is associated with higher milk per man. A farm with over 450,000 pounds of milk sold per man has a much higher repayment capacity per cow than a farm with sales of less than 300,000 pounds per man. Again, the differences are great enough that farms with high milk sold per man will have higher repayment capacity after a 50 cent cut in the price of milk than farms with a lower level of milk per man had before the price cut.

Table 2. MILK SOLD PER MAN AND REPAYMENT CAPACITY  
675 New York Dairy Farms, 1974

Pounds of Milk Sold Per Man	Milk Price Per Hundredweight		
	1974 Actual	50 Cents Above 1974	50 Cents Below 1974
	- - - -Available for Debt Payments Per Cow- - - -		
Less than 250,000	\$130	\$179	\$ 81
250,000 - 299,999	208	265	150
300,000 - 349,999	207	265	149
350,000 - 399,999	228	288	168
400,000 - 449,999	267	332	202
450,000 - 499,999	304	368	239
500,000 - 599,999	267	333	201
600,000 and over	384	450	318

\*Assuming a milk-grain ratio of 2.5 to 1.0.

Table 3 shows the relationship between purchased feed as a percent of milk sales and repayment capacity. Only farms with 2.5 to 3.5 crop acres per cow were included in order to exclude from this analysis the effect of the substitution of home-grown grains for purchased feed or vice versa. That is, one way to get the purchased feed as a percent of milk sales low is to use more land and grow more grain, or just maintain fewer cows on the same land. Limited in this way, purchased feed as a percent of milk receipts is a good measure of cost control.

As with most cost control measures, the optimum level of purchased feed as a percent of milk sales is neither the maximum nor minimum level possible. The data in Table 3 indicate 20-24 percent as the optimum level for this measure. As purchased feed as a percent of milk sales increased beyond the optimum level, capacity declines rapidly. Again, the better-managed farms can withstand a 50 cent cut in the price of milk and still be in a better position to make their payments than poorer-managed farms were before the price cut.

Table 3. PURCHASED FEED AS PERCENT OF MILK SALES AND REPAYMENT CAPACITY  
Farms with 2.5 to 3.5 Crop Acres Per Cow  
277 New York Dairy Farms, 1974

Purchased Feed As Percent of Milk Sales	Milk Price Per Hundredweight			Change as Percent of 1974
	1974 Actual	50 Cents Above 1974	50 Cents Below 1974	
- - Available For Debt Payments Per Cow - -				
Less than 20	337	399	276	18
20-24	371	435	308	17
25-29	245	308	183	25
30-34	213	272	154	28
35-39	172	232	113	35
40 and over	109	170	47	56

Another measure of the effect of a change in the price of milk on repayment capacity is presented in the last column of Table 3. This column, labeled "change as percent of 1974" indicates the percent change in repayment capacity that would result from a 50 cent change in the price of milk. For example, a 50 cent decline in the price of milk would reduce repayment capacity by 17 percent for farms with 20-24 percent of the milk check being spent for feed. However, the same 50 cent change in the price of milk would decrease repayment capacity by 56 percent on farms with over 40 percent of the milk check spent for feed.

Of course, this process also works in the other direction. A farmer with over 40 percent of milk check spent for feed, who is just making his payments, would experience considerable relief from a 50 cent change in the price of milk, while a better manager would not feel his relative position had changed so much.

In looking at these three indicators of managerial ability, yields as indicated by milk per cow, labor efficiency as measured by milk sold per man, and cost control as measured by purchased feed as a percent of milk sales, you can see that without any consideration of increased price variability we have considerable

variability in repayment capacity based on other management characteristics. In addition, any given price change is going to have greater relative impact on more poorly-managed farms. Thus, even though we do not have a measure of a manager's ability to handle increased cash flow stress, we can estimate which farmers are more likely to experience problems given any particular degree of price or cost change. Hopefully, the data presented in Tables 1 through 3 will provide some standards for use in making loans to farmers and evaluating the loans already outstanding.

### Monthly Cash Flow Variability

Use of management data similar to those presented in Tables 1 through 3, however, may not completely handle one of the problems evident in the price variation data that we observed in Figures 1 through 3. The month-to-month variation indicated in Figures 1 through 3 may cause severe cash flow problems but may be masked in annual data by having the low months at least partially offset by high months or vice versa to provide a manageable annual price change. Thus, you may have farmers who, because their loans are reasonably tailored to their repayment capacity, can sustain considerable year-to-year fluctuation, but still have cash flow problems because of the extreme month-to-month price and cost variation.

These farm businesses will have periods in which their cash flow will be very favorable. I am sure you remember back in late 1973 and early 1974 when many farmers had "more money than they had ever had before". However, there will also be periods in which there will be severe cash flow problems.

For example, in the first half of 1975 we heard a number of statements to the effect that there were people with cash flow problems who "had never had trouble making their payments before". In handling this situation, the real problem is how to get people to use their excess cash flow in good periods to avoid problems in later periods when cash available is short.

One technique that has been used with some success in the past is to require payment equal to some percent of the milk check. This technique does reduce payments when income is low and raise them when income is high. However, it does not take into consideration changes in feed or other costs which are major elements in determining net income available for debt repayment. Further, increases in milk and feed costs through time have increased the proportion of net income paid each month by the standard 25 percent of the milk check. For example, as the milk price increases from \$5 to \$10 per hundredweight, 25 percent of the milk check implies an increase in debt payments from \$1.25 per hundredweight to \$2.50 per hundredweight. At the same time, cost increases have kept farm incomes relatively constant. Thus, even if we were to continue to use the percent of the milk check technique, the 25 percent figure needs revision.

However, I do not believe the percent of the milk check technique provides sufficient flexibility to handle the extreme variability in prices that we have experienced in the recent past and are likely to experience in the near future. We need to consider other techniques. I do not have a prescription for the appropriate technique to use, but I have a few ideas I think you should consider.

1. When collecting data from a farmer on the profitability of his business to determine his repayment capacity, be sure to adjust for whether this was a good year for his type of agriculture or not. This will not help you get more money out of him in good periods but it will keep the periods of cash flow shortages from being a severe problem and will allow you to loan realistic amounts.
2. Keep the loan period short and the payments higher than the farmer can expect to make on average. Thus, whenever there is any money available, you get it. This always leaves the banker in control. However, if this procedure is employed, you as the banker are going to have to recognize that there will be times when the farmer will not be able to make his payments--even if he is a good manager. In this case you are going to have to be ready to skip a payment, accept partial payment, refinance a feed bill, or provide other short-run operating capital. I am sure that some of you are already employing this technique. And for some farmers it may be the only one that will really work.

However, I do not like it very well for the good manager. You are actually asking him to commit himself on paper to something that both you and he know he cannot do. This is not a very business-like way of handling the situation.

3. A better way would be to convince the farmer that he should make prepayments whenever his cash position will allow and then use these prepayments to allow skipping payments when there is a tight cash flow situation. Once the farmers were educated to this procedure, you could even send them a little notice whenever the price situation was favorable encouraging them to make prepayments.

The real problem with this technique, however, is that farmers are human and we all seem to be able to spend any cash that is available. Thus, it may not be that easy to convince a farmer that "right now" is a flush period. One technique that might help is a drawing account so that any excess cash does not necessarily go into the personal cash account. Use of a drawing account and agreement as to what is reasonable withdrawal may provide a basis for determining when there is cash available for prepayment and when a payment must be skipped or additional operating capital advanced. This also has the advantage of separating personal activities and expenditures from business.

4. Another approach which I feel has considerable merit but which I do not have completely worked out is to adjust the payment to be made by use of easily accessible standard parameters. For example, the payment could be increased by ten percent for every tenth increase in the milk feed price ratio over some level, say 1.5. Conversely, the payment would be reduced by ten percent for every tenth below a minimum level, say 1.2.

A parameter which might provide a better representation of real price changes, particularly for those items we expect to fluctuate widely, would be to calculate a standardized return over feed cost, by subtracting the cost of 40 pounds of 16 percent concentrate from the price of

milk. This makes use of the normal average feeding rate of one pound of grain per two and one-half pounds of milk. When this parameter exceeds some predetermined level required payments could be increased. When it falls below some level, payments could be reduced.

A third approach would be to convert the milk price to an index and use a total cost, say Cornell's index of costs of dairy farming, and use the ratio of these indexes to vary the payment required. This technique has the advantage that it includes all costs and most income variables affecting dairy farmers.

Appropriately used, all of these parameter techniques have one thing in common: they will increase payments when income should be high and reduce payments when income is low. I have not worked out the technical details for use of any of these methods. I am sure they all have some problems. At least they are more complicated than a constant payment. Most would require use of demand notes or other procedures similar to those used when payment is a percent of the milk check. I am sure, however, that some technique must be developed and used which will allow, and possibly force, more flexibility in farmers payments so that they can handle the extreme cash flow fluctuation they are likely to experience.

#### Summary

During the last three years, farmers have experienced much more variability in both milk and feed prices than they had experienced during the previous two decades. In the absence of stocks which can be used to control price variation, production and use must be equated by current price changes. There are many elements which can and will force a small change in expected or actual production or demand of food. Because of the inelasticity of demand for food, these slight changes in production or demand will bring about large changes in the prices of food items such as milk and feed grains. There appears to be little reason to expect supplies of grain or milk products to be built up, at least in the short; thus, the increased price variation will likely continue.

I believe the future for dairy farming in New York State looks good. Increased transportation costs have likely improved our competitive position. Milk is a bulky, perishable product normally hauled by truck. Grain is more compact and usually shipped by rail which is more efficient in energy conversion than trucks. Increased effective export demand for food and feed grains may increase the resources that the U.S. should be using for grain production. However, I believe that these resources will be shifted primarily on the edge of the corn belt and in the southern Lake states. These areas have an absolute advantage over most of New York State in grain production. Further, I do not believe this shift of resources will be difficult nor time consuming.

Increased price variability and uncertainty will increase the importance of good management. While we do not have good indicators of a manager's ability to handle increased cash flow stress, we can make use of the management indicators we do have. Frequently there is more difference in repayment capacity based upon relatively modest differences in management ability than relatively significant milk price changes. Better tailoring of loan amounts and terms to repayment

capacity could reduce cash flow problems. Good managers will be able to withstand increased price variability easier than poor managers.

Increased use of repayment capacity indicators, however, cannot be expected to completely handle the large increase in intra-year price variability that we have experienced during the past three years. Techniques must be developed which will encourage or force farmers to make increased payments when their businesses are relatively "cash flush" and allow reduced payments in time of cash flow squeeze. I have suggested a few techniques which may be of use. Better techniques will likely be found. The important thing is that we find a way to increase the flexibility of loan repayment so that required repayment more nearly coincides with the availability of funds for payment.