Northeast Regional Research Publication

Technical Committee of Northeastern Regional Research Project NE-126, An Analysis of the Spatial Organization of the Northeast Dairy Industry.

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Preface

The United States dairy industry is currently suffering from the pains of severe disequilibrium. For reasons discussed in this report, milk production is outpacing milk demand and the consequent federal burden is politically unacceptable. To right the situation in a reasonable period of time will neither be easy nor pain-free. Whatever option is chosen will most likely make dairy farming less financially attractive to the nation's dairy farmers. It may spell trouble for some of the nation's dairy processing firms as well. Some of these farmers and processing firms will simply "tighten their belts". Some will "grin and bear it". Others may be forced to seriously consider alternative occupations or enterprises.

The research reported here was motivated by an interest in isolating and more thoroughly understanding the nature of the adjustment problems the Northeast dairy industry may be expected to face as new policy options are adopted. Hopefully this research will contribute to a better understanding of the problems and issues, also lead to more informed policy choices and to additional educational and research efforts designed to help amelioriate or assist with the adjustment problems.

The study team for this effort consisted of the authors of the individual Chapters of this report as well as Olan D. Forker, Cornell University, and Richard F. Fallert, ERS/USDA. The team is indebted to G. Joachim Elterich, University of Delaware, Lynn G. Sleight, ERS/USDA, and Blair J. Smith, The Pennsylvania State University for their contribution in reviewing the entire manuscript.

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CHAPTER I

PROBLEM SETTING FOR THE NORTHEAST DAIRY INDUSTRY

R. L. Christensen and M. C. Hallberg*

Milk marketing in the United States is highly complex involving regulations and policies at both federal and state levels. At the turn of the century milk markets were primarily local with virtually no federal regulation or price intervention. Beginning in the 1930s, state and federal governments began to play an increasing role in the marketing of milk and dairy products. State governments have been concerned with public health issues and, in some cases, with price regulation. The federal government has become actively involved in milk marketing through price support programs, the Federal Milk Marketing Order program, and food distribution programs.

By the 1950s milk marketing could be characterized as being regional in nature with physical and regulatory factors inhibiting interregional flows. Today, however, a national market exists with relatively free movement of milk among regions facilitated by developments in transportation, processing, and refrigeration technology. While a national market exists, a key aspect of milk marketing is the Federal Milk Marketing Order. In 1981 there were 47 Federal Milk Marketing Orders encompassing two-thirds of all milk produced in the United States and more than 80 percent of the milk eligible for fluid use. Within each of these Orders, minimum producer prices are set for milk used in fluid products and for milk used in manufacturing

Minimum class prices in each Order are established on the basis of a specified relation to the price of manufacturing grade milk in Minnesota and Wisconsin. The lower limit of the price of manufacturing grade milk in Minnesota and Wisconsin is effectively determined by the support price. The price of class I milk (milk used for fluid purposes) is higher than is the price of milk used in manufacturing by a fixed differential in each of the Federal Order Markets. In general, these differentials increase with distance from the Minnesota-Wisconsin base point. Thus, the lower limits of prices for fluid grade milk are also effectively determined by the support price for manufacturing grade milk. Prices under the

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Federal Milk Marketing Order program are thus coordinated through the national supply-demand situation and the price support level.

The dairy price support program and the related Federal Milk Marketing Order program could yield a structure of milk prices which would encourage producers to produce exactly that amount of milk consumers (and the government) are willing to buy. A little reflection, however, points to the unlikeliness of this event. The best that can be hoped for is that prices are set so that milk production and milk demand do not get "too far" out-of-line. Over most of the course of the last three decades, this has been the case. The past couple of years, however, represent a glaring exception.

Milk production in the United States has varied considerably since 1965, but is currently at an all-time high. As Figure 1 reveals, the number of milk cows has declined by about 30 percent during this period; but the 45 percent increase in production per cow has more than offset the decline in cow numbers.

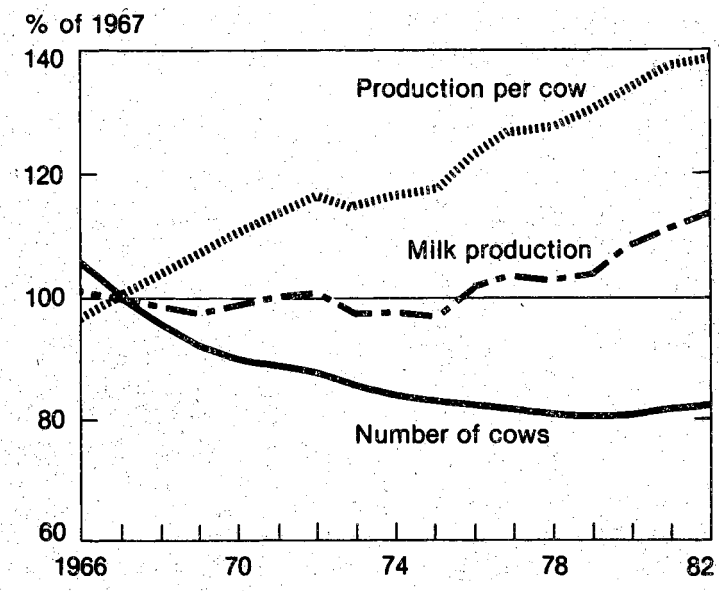
Population in the United States has increased by 51 percent between 1950 and 1981. Per capita consumption of dairy products, however, has fallen by 30 percent. The net effect on consumption for the period is an increase of only 10 percent --- significantly short of the 13 percent increase in total milk production occurring over the same period. Substantial declines in per capita consumption have occurred for on-farm consumption of milk, and for total consumption of beverage milk, evaporated and condensed milk, and butter. Strong competition for dairy products has come from vegetable oil products. A trend away from consumption of high-fat products is evident.

The consequences of these trends can be seen in Figure 2. Government purchases of dairy products under the price support program have increased to levels that are not only unprecedented, but also socially and politically intolerable under current economic conditions.

Current Setting in the Northeast

Sales of milk and of dairy products rank second among major sources of farm cash receipts in the United States. The value of cash receipts from dairy products in 1981 amounted to $18.1 billion, with additional income derived from the sale of cull cows and calves. Among the ten leading states in sales of dairy products are two Northeastern states --- New York (third) and Pennsylvania (fifth).

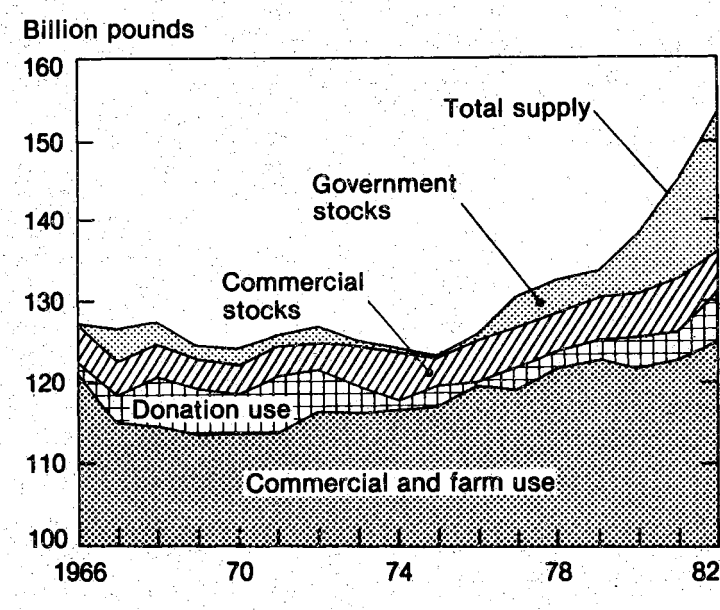
Milk Production, Number of Cows, and Milk per Cow



1982 forecast.

Figure 1

Milk Supply, Use and Stocks



1982 forecast. Stocks as of December 31.

Figure 2

Changes in milk production since 1950 show substantial differences by region. Milk production in the Pacific region doubled from 1950 to 1980. The Mountain States increased production by 50 percent and production in the Lake States increased by 31 percent. More moderate increases were noted in the Northeast (23.4 percent) and in the Southeast (18.6 percent). Decreases occurred in the other five regions with the greatest decreases in the Cornbelt (28.4 percent) and the Delta States (27.4 percent).

In the Northeast region, milk production during 1950-54 averaged 22 6 billion pounds annually. By 1981 production had risen to 27.2 billion pounds --- a 20 percent increase over the 1950-54 period. Seven of the 12 states in the region have exhibited substantial declines in milk production since the 1950s. However, production in the remaining five states has increased. By 1981, two states --- New York and Pennsylvania --- produced 73.8 percent of the total production for the region. When Maryland and Vermont are added, 88 percent of regional production is accounted for by four states.

From the foregoing statistics it is apparent that production has grown more rapidly in the Northeast than nationally over the past 30 years. Over the same period population in the Northeast has grown slower than for the nation as a whole (26.6 percent in the Northeast versus 45.8 percent for the nation). However, population in the Northeast region grew only 1.1 percent during the decade of 1970 to 1980 while milk production within the region increased by 10.4 percent.

Milk cows on farms (and number of dairy farms) within the Northeast region declined steadily from 1960 through 1980, although the rate of decline has decreased (a slight increase in cow numbers is shown for 1981). From 1960 to 1980, the number of milk cows on farms decreased from 3 million to 2 million head. Offsetting this decline in cow numbers was an increase in productivity. Production per cow in 1960 nationally was 7,000 pounds and by 1980 had risen to 11,889 --- a 70 percent increase. In the Northeast production per cow had risen to 12,284 pounds in 1981.

Prospects for Supply Reduction

One option for bringing milk supply more in line with demand is to implement some form of supply control for the dairy industry. The above evidence relating to productivity illustrates one of the dilemmas confronting supply control in the dairy industry. Reductions in the cow herd do not necessarily result in decreased output. Cows culled from the herd tend to be those which are low producers. A reduced herd size with cows of high genetic production potential may result in the same or higher production due to the reallocation of feed and other resources to the remaining cows possessing higher production capabilities.

Another problem is related to the interactions between marginal productivity, feed prices, and milk prices as they influence production. Conventionally it is assumed that the rational decision maker will adjust input use and, therefore, output with changes in either input or product prices. Thus, given stable product prices and production functions, a decrease in input prices will result in increased input use and a consequent increase in production Similarly if input prices are constant and the product price decreases, a decrease in production would be expected. Obviously, the actual situation is more complicated because other factors also influence production adjustments. But, the three variables mentioned above contribute significantly to the problem since all three have been dynamic. Production functions have been shifting upward with improvements in the genetic pool of dairy animals. Exacerbating the situation has been recent relative reductions in the cost of feed grains. Milk prices have steadily increased due to institutionally determined price support mechanisms. The latter have been notably deficient in recognizing (1) the response of milk supply to changes in input costs or product prices, and (2) changes in consumer demand.

Dairy Farm Adjustments

The production sector of the dairy industry is comprised of individual farm units. Output decisions are made on these farm units by the farmer-decision maker. In making production decisions a large number of variables specific to the individual farm situation are involved. While it is indisputable that several goals are involved, it is equally indisputable that net income from farming (including growth in net worth) ranks very high among them. Logically, farmers facing increases in costs and inflationary erosion of purchasing power will respond to exogenous factors by making adjustments that will maintain or increase real net incomes. For many farmers constrained by land, capital and other factors, and with access to non-farm alternatives, the adjustment has been to cease farming.

It should be emphasized that adjustments to non-farm alternatives depend greatly upon employment and growth in the national and regional economies. During recessionary periods these adjustments are inhibited, and when made are often painful. The dramatic decrease in the number of dairy farms nationally and in the Northeast region does not, however, mean that the resources used go out of dairying. At the same time that the number of dairy farms has decreased, the size of dairy farms (in acres and cow numbers) has increased. Expansion in the size of the remaining units has been in response to the income needs previously mentioned, along with the development of technology that has permitted such expansion with little additional labor required.

In the Northeast, for example, productivity per hour on dairy farms increased by a factor of nearly 10 from 1950 to 1980. In simple terms this means that if one man-year of labor produced 50,000 pounds of milk in 1950, the same labor input in 1980 produced 500,000 pounds of milk. This same phenomenon has also had the effect of changing the relative proportion of cost factors on the farm.

Capital costs and, in particular, debt service now claims a higher proportion of farm income than was the case even a decade ago. A 1980 survey of 119 young Wisconsin beginning dairy farmers found debt to constitute 57 percent of total assets.[1] By conventional debt-equity standards this does not appear to be a long term problem. However, it was estimated that for every one-dollar in sales within the year, these farmers paid $0.53 for debt service. Since nearly 90 percent of this debt is intermediate and long term, there is continuing economic pressure to increase output (and income) per unit of fixed resource. It is, in fact, the only way these farms will be able to survive. At the same time it is indicative of the critical nature of the current situation. The potential exists for economic disaster for a number of dairy farmers, particularly those with heavy debt loads. Of course, the situation for this group of Wisconsin farmers should not be construed as being representative of all dairy farms. But the fact remains that the pressures to maintain disposable incomes at recent levels affect all dairy farm situations.

Dairy Processing Adjustments

Milk processing firms too can be expected to make adjustments in response to changes in the price they must pay for milk. These firms can be expected to be impacted most severely, however, by changes in the number and/or location of dairy farms.

If a number of dairy farms in a given area cease producing milk, the processor in that area may find that he must incur added assembly costs to obtain the same volume of milk, or operate at a reduced volume. Added assembly costs may put the firm under severe financial stress. But operating at a reduced volume may also cause financial stress.

In most processing facilities, economies to scale are substantial so that as processing volume falls, per unit processing costs rise. Some fluid milk processing plants are probably already large enough so that a small reduction in volume will not materially affect

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[1] Philip E. Harris and William E. Saupe. "Debt Repayment Capacity of Low Equity Farmers." Economic Issues. #63. October 1981. Wisconsin Agricultural Experiment Station.

processing costs. Plants producing manufactured dairy products, however, typically must produce at capacity to realize maximum processing efficiency. Hence as the volume of raw milk available at a reasonable cost declines, some processing facilities may also be forced out of business. This could, in turn, impact producers who would otherwise remain in dairy production to the extent that a nearby market for their milk no longer exists.

Overview of Report

A question of vital importance and one currently being discussed in the halls of Congress and elsewhere, is what public policies should be adopted to alleviate the problem described in the previous sections. A wide array of proposals have been offered. Most of these proposals can be expected to create adjustment problems for certain classes of dairy farmers and for certain types of processing firms in the industry. The research presented here was motivated by an interest in the nature and likely severity of these adjustment problems. If, for example, the support price is held at $13.10 per hundredweight over the next four years, and a $1.00 per hundredweight overproduction tax is levied on dairy farmers, a series of questions are relevant: What is the likely impact on the income and debt position of different dairy farmers? Are "small" dairy farmers likely to be more severely impacted than are "large" dairy farmers? Will dairy farmers who are forced out of dairying by the proposed policy be able to shift their resources into other farming activities or will they be able to seek non-farm employment? Will some areas of the region lose so many dairy herds that milk processors and/or feed mills find it impractical to remain in business? Will the Northeast lose some of its competitive advantage for milk production vis-a-vis other regions? Are there policies that could be adopted (in addition to the support-price-maintenance policy) that might ease some of the adjustment pains that are to be expected?

These questions and others will be treated in the remainder of this report. In Chapter II some possible policy alternatives for alleviating the surplus problem are outlined, and some issues that must be faced when deciding upon these alternatives are discussed. This chapter also presents some policies that might be considered to help ease some of the adjustment problems of dairy farmers and/or dairy processors. In Chapter III the structural character of dairy farming in the Northeast is presented in detail, and the basis for an assessment of the Northeast's competitive advantage or disadvantage in milk production under various policy alternatives is presented. The likely impact on dairy farm income and farm debt position of the policy alternatives considered here are assessed in Chapter IV. A simulation model applied to budget data from specific farms in the region is used to make this assessment. In Chapter V the adjustment potentials (both farm and non-farm) for dairy farmers

in the Northeast are discussed. Chapter VI considers the impact of the policy alternatives on the processing and service industries in the region. The policy implications of the previous work are presented in summary form in Chapter VII.

CHAPTER II

POLICY CHOICES

M. C. Hallberg and R. L. Christensen*

Policy Objectives

Future policy for the United States dairy industry must recognize the existence of a multiplicity of policy objectives. One such objective is to seek an improved balance between milk supply and milk demand so as to reduce the treasury cost of the dairy price support program. A second objective is to ensure consumers an adequate and uninterrupted supply of fluid milk and processed dairy products at reasonable prices. A third is to protect dairy farmers and dairy processing firms from excessive price and market instability. A fourth is to ensure a sufficient supply of milk to help meet our food aid commitments at home and abroad. foreign competition. A fifth (related to or influenced by the first four) is to ensure farmers an adequate level of income.

How these different objectives are prioritized will be determined by tradeoffs in the political arena. This prioritization is likely to change as economic conditions and/or political philosophies change. Given the improvement that has been made in recent years with respect to farm-nonfarm income equality,[1] for example, we might expect the income goal to receive lower priority in the near future than in the past. Reducing the cost of the price support program, and maintaining price and market stability for farmers, on the other hand, are likely to receive fairly high priority. It is a generally held view that public costs should be minimized and that market stability is desirable to both producers and consumers.

Protection of United States dairy farmers from foreign competition appears likely to remain a high priority objective. This priority could change, however, if protection of the United States dairy industry should in the future seriously conflict with our goal of increasing foreign outlets for such products as grains, red meats, or industrial goods.

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*Professors of Agricultural Economics at The Pennsylvania State University and University of Massachusetts, respectively.

[1] M. C. Hallberg. "Changing Trends in United States Agriculture Call for New Policies to be Forged." Farm Economics. Cooperative Extension Service. The Pennsylvania State University. April 1982.

As was pointed out in Chapter I, government purchases of dairy products under the price support program have in recent years increased to levels that are socially and politically intolerable. Thus the goal of overriding importance for the near future is likely to be that of achieving a better balance between milk supply and demand, and hence in reducing the treasury cost of the dairy price support program. In this chapter we shall discuss various options which might be used in an attempt to achieve this goal. This discussion is intended to serve as a basis for the policy options to be examined in subsequent chapters. In addition it will highlight some of the inherent difficulties of and prospects for these different options.

Demand Expansion Options

A variety of options designed to stimulate demand for milk and dairy products have been proposed or discussed in recent months. These include (1) increasing expenditures on the promotion of milk and dairy products, (2) increasing expenditures on research designed to develop new products, (3) providing subsidies that would permit some or all consumers to increase their purchases of milk and dairy products, (4) increasing exports of dairy products, (5) enacting legislation designed to permit altering the nonfat solids and/or butterfat components of dairy products, and (6) providing more food aid in the form of dairy products.

Marginal gains may be possible using some or all of these options, but a lasting solution to the basic problem is not likely via these means. There is little consensus among experts that increased generic advertising of milk will sell significantly greater quantities of milk. The dairy processing industry has been fairly active in developing, testing, and marketing new dairy products. Increasing food aid or providing consumption subsidies is not necessarily consistent with cutting treasury costs. Increasing demand through export markets is not likely to occur when, for example, the United States price of butter is double the world price of butter as at present, or when several countries have a comparative advantage over the United States in milk production.

A more certain way to expand the quantity of milk demanded is to lower the price of milk at retail. This, of course, means that the farm price of milk would also have to drop (assuming a constant farm-retail price spread). A price reduction will not bring about large increases in quantity demanded, however, because as analysts have repeatedly demonstrated, consumers do not increase (decrease) their demand for fluid milk and other dairy products greatly in

response to decreases (increases) in the price of these products.[2] Nevertheless, since a milk price reduction (at the farm level) would not only result in a slight demand expansion but also restrict supply in the long run at least (see discussion in the following section), this is an economically viable option for contributing to the solution of the current dairy problem.

Supply Reduction Options

Reduce Price Support Level

Reducing the price of milk can be accomplished by reducing the support price of milk. Proponents of this tactic argue that farmers will reduce milk output in response to a price reduction and that consumers will increase their consumption of milk and/or processed dairy products as retail prices fall. These two reactions will, therefore, result in a better supply-demand balance and less government expenditure.

This argument is certainly consistent with theoretical notions currently in vogue. There is, though, considerable uncertainty about the magnitude of producer and consumer responses, and about the speed with which these adjustments might take place. Economic theory is of little help in reducing these uncertainties; thus we must resort to empirical models based on historical data. One such model was developed for use here and is reported in the Technical Appendix to this report.

In 1981, the United States average price of all milk sold to dealers was $13.80 per hundredweight or 69 percent of parity. Based on estimates made with the model outlined in the Technical Appendix, this price would have had to have been near $12 per hundredweight or 60 percent of parity in order to equilibrate demand with actual 1981 supply of 132,600 million pounds of milk without excessive government expenditures. Model projections were made assuming government purchases of milk were fixed at about two percent of total milk production in all years of the projection period as well as in 1981. This was done in order to determine equilibrium prices under conditions of no or little excess milk production not only currently but in the recent past. Projections of equilibrium prices through 1982 based on the model are as follows:[3]

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[2] Several studies have verified that as the retail price of dairy products decreases by, say, one percent, the quantity of these products demanded increases by much less than one percent. See, for example, the Technical Appendix to this report.

[3] Based on the model and projections of exogenous conditions specified in the Technical Appendix. Equilibrium prices for the Northeast were set at 1.02 times those of the United States average based on recent historical averages.

	1982	1983	1984
		($ per cwt)	
Manufacturing milk	$12.69	$13.04	$13.41
All milk sold, U.S.	13.15	13.52	13.89
All milk sold, Northeast	13.41	13.79	14.17

"Equilibrium" prices are prices that would prevail if consumers, producers. and marketers make decisions precisely according to their behavior pattern in the past (in this case from 1955 to 1980), if there are no barriers to the adjustment of resources. if the market operates free of government influence and of restrictive business practices and if there are no outside events influencing the industry such as wars or floods. These are rather strong "ifs"! For example, even if government regulations are eliminated, the indicated "equilibrium" prices are not likely to prevail because resources simply cannot be moved into or out of dairy production easily, and certainly not instantaneously. Furthermore, consumers and business firms, collectively, cannot anticipate the equilibrium, market clearing price precisely --- at times they over-consume or over-produce and at other times they under-consume or under-produce Thus even in a free market, prices are not expected to hit the mark exactly. Rather prices are more likely expected to tend toward the mark and fluctuate around it.

For these reasons, the "equilibrium" prices shown above are <u>not</u> to be interpreted as prices that are predicted to prevail in the absence of government regulations or restrictive business practices. On the contrary, these prices should be used as guidelines for anticipating the tendency of prices in the absence of such influences over a period of time sufficient to permit the necessary adjustments to take place. Lacking greater foresight concerning market and external events, these are the best such guidelines that can be produced.

In contrast to the "equilibrium" prices presented above, the minimum support levels for manufacturing milk for the United States specified in the Agricultural and Food Act of 1981 are:

in 1982, $13.10 per hundredweight,
in 1983, $13.25 per hundredweight, and
in 1984, $14.00 per hundredweight.

Based on our estimated "equilibrium prices, the minimum support levels specified in the 1981 Act are not likely to reduce milk supplies nor the treasury cost of the dairy price support program! In recognition of this fact, Congress passed the Omnibus Budget Reconciliation Act of 1982 in August, 1982 which specified that beginning in October 1982 the support price for manufacturing milk in the United States will be maintained at $13.10 per hundredweight through September 1984. This Legislation further stipulated that the Secretary of Agriculture will have the authority to collect from each dairy farmer 50 cents per hundredweight on December 1, 1982 so long as CCC purchases (on an annual basis) exceed five billion pounds of milk equivalent. Further, if CCC purchases (on an annual basis) are 7.5 billion pounds or greater on April 1, 1983, the Secretary has the authority to collect an additional 50 cents per hundredweight from each dairy farmer.[4] Thus under the worst possible scenario, dairy producers could be facing an "effective" support price of $12.10 by April of 1983.

The Secretary was enjoined from collecting the first 50 cents by a South Carolina Court decision on the basis that appropriate procedures were not followed in announcing and implementing the Legislation. As of March 1983, the Secretary intends, this time following the appropriate procedures, to implement the Legislation by not only collecting the second 50 cents but also retroactively collecting the first 50 cents. This action may also be challenged in the Courts. The important point is, however, that every effort is being made by the Secretary to make milk production less attractive to dairy farmers, and in this way attempt to reduce the burdensome surpluses.

A variety of proposals have been made for modernizing the current basis of establishing support prices including (1) updating the 1910-14 base period currently used in calculating parity prices, (2) devising a new parity formula for calculating "parity" milk prices that more adequately represent the quantity and cost of dairy enterprise inputs, and (3) replacing "parity" with "cost-of-production" as the pricing standard. Any one of these options might be superior to the current method of determining support prices for milk. However, none of them is likely to be any more effective than is the present parity base at resolving the dairy problem unless the support price is reduced. Congress seems clearly to have recognized this fact by its recent decision not to tie the support price for milk to "parity".

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[4] If the additional 50 cents per hundredweight deduction is implemented, the Secretary must also establish a production base system, and remit the payment back to those producers who stay within their base.

Adjusting Resources Out of Dairy

Another means of reducing the supply of milk is to encourage the adjustment of some of the resources now devoted to milk production into other productive activities --- farm or nonfarm. A reduction in the price of milk can be expected to encourage such an adjustment over the long term. But the "long term" may be 5-10 years --- much too long a period of time to solve the problem plaguing the dairy industry today. Hence it may be in society's interest to devise means of speeding up this adjustment process.

A thorough understanding of the possibilities for and barriers to resource adjustment in dairy production is necessary before wise choices can be made in this area. Chapter V provides the basis for some of this understanding. In this section our intent is merely to list some possible public options that might be considered as means to assist with the adjustment of resources out of dairying. Which if any of these options are salient must be determined in view of the background information presented in Chapters III thru VI.

On Farm Adjustments

One means of adjusting resources out of dairying is to encourage the transfer of some or all resources on dairy farms now devoted to dairy production into the production of other agricultural commodities. The following are possible means of encouraging such transfers:

1. Support research designed to identify enterprises in which the region or local area has a comparative advantage.

2. Support research designed to isolate the problems or bottlenecks to resource adjustments.

3. Support extension education programs designed to assist farmers with resource adjustments.

4. Encourage state departments of agriculture to provide incentives for resource adjustments in such areas as: (a) providing low interest loans for purchase of equipment or buildings needed in the alternative activity, (b) providing grants to farmers having innovative proposals for converting dairy facilities to other uses, (c) providing low interest loans to farmers for training relative to non-dairy production, and (d) providing low interest loans to farmers and research grants to educators for devising

alternative farming systems that involve less intensive dairy production.

Off-Farm Adjustments

Another way of adjusting resources out of dairying is to encourage dairy farmers to seek non-farm employment. Some means of encouraging such adjustments are:

1. Support research designed to identify retraining needs.
2. Provide funding for farmer retraining and for farm asset disposition.
3. Support extension education programs designed to assist with retraining, disposition of dairy assets, and for farmer relocation.

Supply Control

Reduce Number of Cows

The market for beef and, hence, cull cows shows little indication of strengthening in the near term. While recent declines in prices of dairy cows relative to slaughter cow prices have occurred, this change is probably not sufficient to stimulate higher culling rates from dairy herds. A program of incentives for culling of dairy cows to reduce production can be effective but costly. If, for example, the incentive payment were $500 per cow, a reduction of 10 percent of the national milk cow herd would cost $542 million. Such a reduction would not, however, be expected to result in a 10 percent reduction in milk output. As discussed elsewhere, those animals culled would tend to be lower producers and the released feed and other resources available would doubtless result in increased production per cow from the remaining animals. Thus, a reduction in the milk cow herd of 10 percent might induce a reduction in total supplies of only 6 to 8 percent. A reduction of 7 percent would be equivalent to 9.2 billion pounds of milk. For perspective, government purchases in 1981 were about 15 billion pounds of milk equivalent!

Milk production in the United States for 1981 was estimated to be 132.6 billion pounds. Purchases in 1981 were about 15 billion pounds at a cost of about $1.9 billion. Government purchases under the support program were, therefore, 11.3 percent of total production. To achieve a reduction in production of this magnitude (resulting in no government purchases) would require a reduction in

the national dairy herd of 13 to 15 percent. A 15 percent reduction would be equivalent to 1 63 million head. At a payment of $500 per cow, such a government supported herd reduction program would have cost $815 million.

A voluntary program to reduce the size of the national herd would have several implementation difficulties. First is the determination of the incentive payment. Presumably this would have to be higher than the market price for slaughter animals to encourage more than the normal rate of cull. Also some limits would need to be imposed so that only producing members of the herd are liquidated --- not replacement animals. A phased liquidation program would appear necessary to minimize the impact on beef cow prices. Thus, the reduction would only gradually slow government purchases and stockpiles of surplus dairy products would continue to grow for some time.

In general, the program would be met with stiff opposition from the beef industry. Further as milk prices stabilized or improved rebuilding of the herd would take place, effectively erasing any gains achieved. Thus, a corollary supply control program (perhaps a production quota plan) would be needed.

Production Quotas

Letters to the editor in recent issues of Hoard's Dairymen indicate increasing acceptance by dairy farmers of the concept of a production quota program. As Manchester[5] points out such a program has limitations. It requires detailed regulation of individual producers, restricts resource adjustments, and results in the capitalization of quotas in land values. Nevertheless, quota programs have worked successfully in other countries (notably Canada) and could be designed so as to minimize their inherent weaknesses.[6]

Production rights or quotas are typically assigned to farms or farmers as a proportion of production in some historical or "base" period. Milk produced in excess of the quota either may not be sold or is sold at a substantial discount. Theoretically the price paid for "excess" should be below the marginal cost of production so that it is economically irrational to produce beyond the quota. Since

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[5] Alden C. Manchester. Dairy Price Policy: Setting, Problems, and Alternatives. ESCS/USDA. Agricultural Economic Report No. 402. April 1978.

[6] For one of the more complete discussions of the problems and prospects of production quota plans, see U. S. Government Printing Office. "A Study of Alternative Methods for Controlling Farm Milk Production and Supporting Prices to Farmers for Milk and Butterfat". House Document No. 57. 84th Congress, 1st Session. 1955.

marginal cost will vary somewhat from farm to farm it is necessary that the price for "excess" be below the marginal cost for even the most efficient farms. Increases in quota would occur only with increases in demand. Reductions in quota would be necessary if demand should fall. Distribution of increases (or decreases) in quotas might be expected to be different if the concepts of equity or, alternatively, efficiency were the guiding principle. The two concepts would obviously exert different forces on the structure of the industry.

A major problem of a quota program is that, like most "rights" or licenses, the quotas acquire value. For example, experience with crops has shown that quotas identified with land can result in capitalization of the value of the quota into land values. If quotas on milk sales are permitted to be transferred between farms they will also acquire value. The implications of capitalization of quota values are significant.

On the positive side, transferability permits adjustments to occur within the industry. Economically efficient adjustments may occur. At the same time it may lead to even greater concentration of milk production and effectively restrict production opportunity only to well capitalized family or corporate entities. This leads to a point concerning market entry under a production quota system. Dairy farming already has high capital requirements which restrict entry of new farmers. With quotas acquiring capitalized values, entry would become even more restricted. This is why it is sometimes urged that increases in market quota resulting from growth in demand be reserved for new entrants into production. Another mechanism might be to require that on any sale of quota a given percentage of that quota (say 5 percent) would revert back to the quota pool to be reserved for new entrants.

A difficult question concerns regional differences in markets. It is well documented that there have been substantial differences in milk production growth in different regions, and supply-demand balances vary considerably in the different market areas. Quotas established on the basis of a national market would have differential impacts. In individual market areas with relatively favorable supply-demand balances, uniform reductions might result in deficits. This would indicate the desirability of different proportional quota adjustments in the separate Federal Milk Marketing Order areas reflecting the supply-demand situation in those markets. Impacts on producers in the surplus producing markets could be severe. While general procedures for institution of quotas could be established on a national basis, the aspects of determination and adjustment of quotas within individual market areas would require considerably greater administrative costs. In general, a quota program would increase administrative costs, however, government purchases of surpluses could be essentially eliminated. On balance, it would be expected that government dairy program costs would be reduced substantially from current levels.

A major problem with a supply control-quota program relates to its impact on farmer incomes. Assuming that a support program continues to provide the price floor for milk (with supports at or near current parity levels), a reduction in output would have an enhancing effect on prices. This effect would be different in different markets depending on the impact the reduction would have on blend prices (the weighted average price for Class I and Class II milk that farmers receive). It would not be expected, however, that in most cases the increased blend price and the reduction in variable and fixed costs associated with cow ownership would compensate for the decreased income. Consider the following example in which we assume:

total herd production is 10,000 hundredweight,
Class I price is $16 per hundredweight,
Class II price is $12 per hundredweight,
Class I utilization is 50 percent, and
Class II utilization is 50 percent.

In this case the blend price is $14 per hundredweight and total milk receipts to the farmer is $140,000. Now consider the case where a production quota of 9,000 hundredweight is imposed and:

Class I and Class II prices are as before,
Class I utilization is 55.55 percent, and
Class II utilization is 44.45 percent.

In this case blend price is $14.22 per hundredweight and total milk receipts is $128,000 --- a reduction of $12,000. The reduction in milk production to the quota level can be accomplished by reducing the herd by eight cows, each of which produce 12,500 pounds per year. A reduction in variable and fixed costs of $1,500 per cow culled from the herd will offset the reduction in milk receipts.

In the example just given, the effect of the quota would be a significant reduction in farm receipts. (The reduction in cash receipts can be easily calculated as the product of reduced output in hundredweights multiplied by the blend price.) The net effect on farm income, however, depends on the reduction in costs associated with the reduction in number of cows. Impacts on net income would be greater for more efficient producers than for those with higher production costs.

Policies to be Considered

Subsequent chapters of this report will consider, in various degrees of specificity, three pricing alternatives for the 1982-84 planning horizon. The alternatives are as follows:

	1982	1983	1984
		($ per cwt)	
Reduced Price Support			
Blend Price in Northeast	$13.36	$13.36	$13.36
Reduced Price Support with Overproduction Tax			
Blend Price in Northeast	$13.77	$13.08	$13.34
Market Equilibrium			
Blend Price in Northeast	$13.41	$13.79	$14.17

The first of these alternatives is designed to encourage supply reduction by lowering the price support levels somewhat below equilibrium levels. (The prices shown here are assumed to be higher than for the average in the United States for reasons explained in footnote 3 above.) The second anticipates that a producer tax of 50 cents per hundredweight in December of 1982 and of $1.00 per hundredweight in April of 1983 will be imposed. Alternative three specifies prices based on the model presented in the Technical Appendix to this report. The prices specified here are those estimated to equilibrate supply and demand under the assumed exogenous conditions. Because of resource adjustment lags, and other factors discussed previously, however, the prices specified in alternative three are not expected to bring about an immediate supply-demand balance.

CHAPTER III

INTERREGIONAL COMPETITION AND DAIRY FARM ADJUSTMENTS

B. F. Stanton*

Over the past 25 years a revolution has taken place in the United States dairy industry. It started quietly and went almost unnoticed by most people outside dairy production. The results of that revolution are now making the headlines.

The number of dairy cows in the United States was cut in half, but simultaneously milk production per cow increased dramatically. Milk consumption in all forms per person dropped modestly while population increased so that total consumption remained relatively constant. During most of the 1960s and 1970s, national demand and supply were in reasonable balance. In the late 1970s, cow numbers stabilized, rates of production continued to rise, and demand remained steady. The resulting gap between supply and demand has become a costly national issue in the 1980s.

This chapter describes the nature of adjustments in cow numbers and milk production which have occurred in the United States during the most recent years. These data provide background in understanding the changes that have occurred and those now in progress. The nature of regional competition within the production sector of the dairy industry is given primary attention. Some adjustments have occurred which cannot occur again. The decrease in numbers of dairy cows in a number of states in the last decade has been quite substantial. Milk production is now concentrated on a much smaller number of farms in the major producing states than just 10 years ago. The adjustments required to bring national supply into balance with national demand and the likely locations where such adjustments will be required are highlighted.

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Changes in Numbers of Cows and Herd Sizes in Selected States

The dramatic changes in numbers of dairy cows and changes in herd sizes are shown in Table 1. In 1969 about one-third of the nation's dairy cows were on farms with less than 30 cows. Only about 17 percent were on farms with 100 cows or more. Milk production came primarily from one- or two-worker farms throughout the United States. The situation today, however, is markedly different.

Table 1. Percent of All Milk Cows by Size of Herd, United States, 1969 and 1981.

Size of Herd	1969	1981
	percent	
Under 30	32	12
30-49	29	23
50-99	22	31
100 or more	17	34
Total Number of Milk Cows (thousand)	12,578	10,919

Source: U.S. Census of Agriculture and USDA Statistical Reporting Service.

Changes in Herd Sizes

There are striking differences among the leading dairy states in the sizes and types of dairy farms (Tables 2 and 3) and the changes which have occurred between 1969 and 1981. Census data were the only source of information available in 1969. The Census data appear to be roughly compatible with the Statistical Reporting Service (SRS) data for 1981.

Table 2. Percent of Milk Cows by Herd Size in Leading Dairy States and United States, 1969.

States	Number of Cows	Herd Size		
		Under 50	50-99	100 or more
	thousands	percent of total		
1-Wisconsin	1,846	79	19	2
2-New York	1,030	55	34	11
3-Minnesota	980	88	10	2
4-California	775	5	8	87
5-Pennsylvania	720	71	23	6
6-Iowa	508	86	12	2
7-Michigan	469	67	24	9
8-Ohio	457	73	21	6
9-Missouri	362	75	20	5
10-Texas	354	26	32	42
United States	12,578	61	22	17

Source: U.S. Census of Agriculture and USDA, Statistical Reporting Service.

Table 3. Percent of Milk Cows by Herd Size in Leading Dairy States and United States, 1981.

States	Number of Cows	Herd Size		
		Under 50	50-99	100 or more
	thousands	percent of total		
1-Wisconsin	1,825	54	36	10
2-California	923	1	3	96
3-New York	912	29	44	27
4-Minnesota	886	62	30	8
5-Pennsylvania	721	48	33	19
6-Michigan	393	34	39	27
7-Iowa	382	51	40	9
8-Ohio	380	53	35	12
9-Texas	324	7	26	67
10-Missouri	249	33	45	22
United States	10,919	35	31	34

Source: USDA Statistical Reporting Service.

The top five states in dairying have changed rankings in the 12 years. Wisconsin has been the nation's leading dairy state for many years and continues as the nation's leader. California ranked fifth in 1969, but by 1981 ranked second by virtue of a 19 percent increase in cow numbers over the period. In 1969, more than 75 percent of the cows in Wisconsin, Minnesota, and Iowa were on farms with less than 50 cows. By 1981 the proportion of farms with dairy herds of that size had dropped to between 51 and 62 percent. In the center of the Lake States, dairy production is still concentrated on small farm businesses where most of the labor is supplied by family members.

In New York, Vermont, Pennsylvania and Michigan there were more cows on farms with 50 cows or more in 1969 and the adjustment to larger herd sizes occurred more rapidly in the years to 1981. Much of this adjustment was accomplished by combining existing farms and by investing in relatively new dairy facilities with pipeline milking systems or milking parlors. A somewhat smaller proportion of Iowa, Minnesota and Wisconsin farmers have made such size adjustments.

In contrast, dairy production in California, and to a large degree in Texas as well, is concentrated on farms with 100 cows or more, many on units with 1,000 or more milking cows. In all the states, the number of farms selling milk has decreased sharply while herd sizes have increased.

Changes in Numbers of Cows

Actual changes in the numbers of milk cows by states during the past decade indicate something about the forces at work in the dairy industry and how different these forces are in different locations. Figure 1 shows the states in which significant increases in cow numbers have occurred over the decade. The actual numbers of cows in 1981 and the changes in cow numbers for these and selected additional states are shown in Table 4. Milk production has become more concentrated on fewer farms with more cows. Dairying is of some importance in all states with obvious economic and political consequences.

Substantial decreases in cow numbers occurred in Iowa, New York, Missouri, Kentucky, Mississippi and Minnesota. California had the one big increase in numbers, but other western states expanded cow numbers as well. In general there was a shift of cows out of the southeastern states, the Corn Belt and the Great Plains. With the exception of Pennsylvania, all increases in cow numbers occurred in the West and Southwest.

FIGURE 1. STATES WITH AN INCREASE IN COWS BETWEEN 1969 and 1981

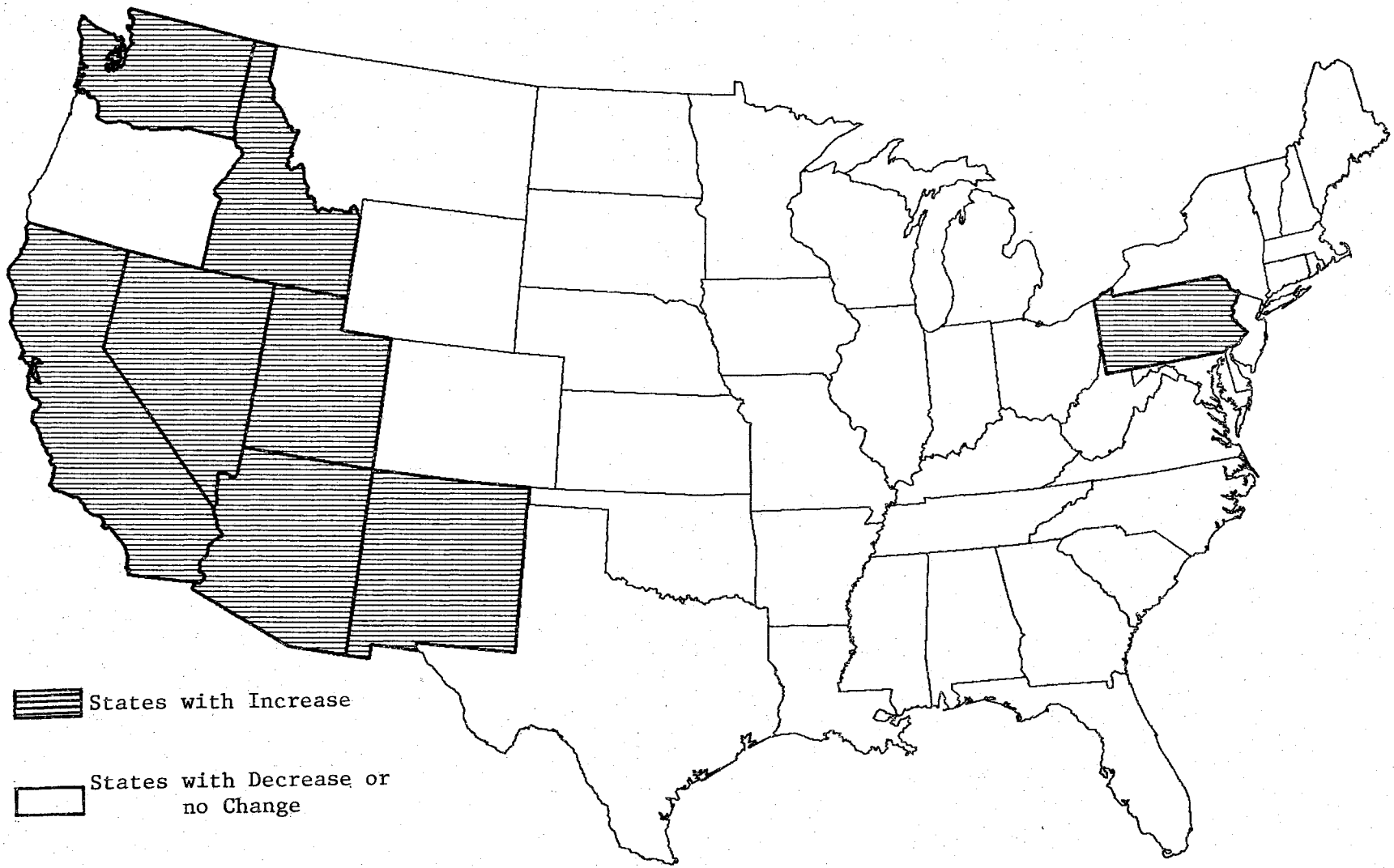


Table 4. Changes in Numbers of Milk Cows in Selected States Between 1969 and 1981.

Selected States	Cows in 1981	Change in Number of Cows	Percent Decrease or Increase
	-----thousands------		
Decreases			
1-Iowa	382	-126	-25
2-New York	912	-118	-11
3-Missouri	249	-113	-31
4-Kentucky	242	-106	-30
5-Mississippi	97	-101	-51
6-Minnesota	886	-94	-10
7-Tennessee	214	-93	-30
8-Kansas	124	-80	-39
9-Ohio	380	-77	-17
10-Michigan	393	-76	-16
11-Illinois	233	-75	-24
12-Alabama	63	-73	-54
Increases			
1-California	923	148	19
2-Arizona	77	26	51
3-New Mexico	51	15	41
4-Washington	205	15	8

Source: U. S. Census of Agriculture and USDA, Statistical Reporting Service.

Table 4 calls attention to Mississippi and Alabama, where not only did dairy cow numbers decline in large numbers absolutely, but the numbers were reduced by more than 50 percent. Other states where the number of cows was reduced by more than 35 percent in 12 years included North Dakota, Nebraska, Kansas, Louisiana, West Virginia and New Jersey.

During the 1970s, crop farming, particularly wheat, corn, soybeans, and sorghum, was a profitable alternative to dairying.

Off-farm jobs were increasingly available to operators of the smaller dairy units and the opportunity to give up the routine of twice daily milking was exercised. In 1983, such alternatives are less readily available.

Changes in Herd Sizes by Counties

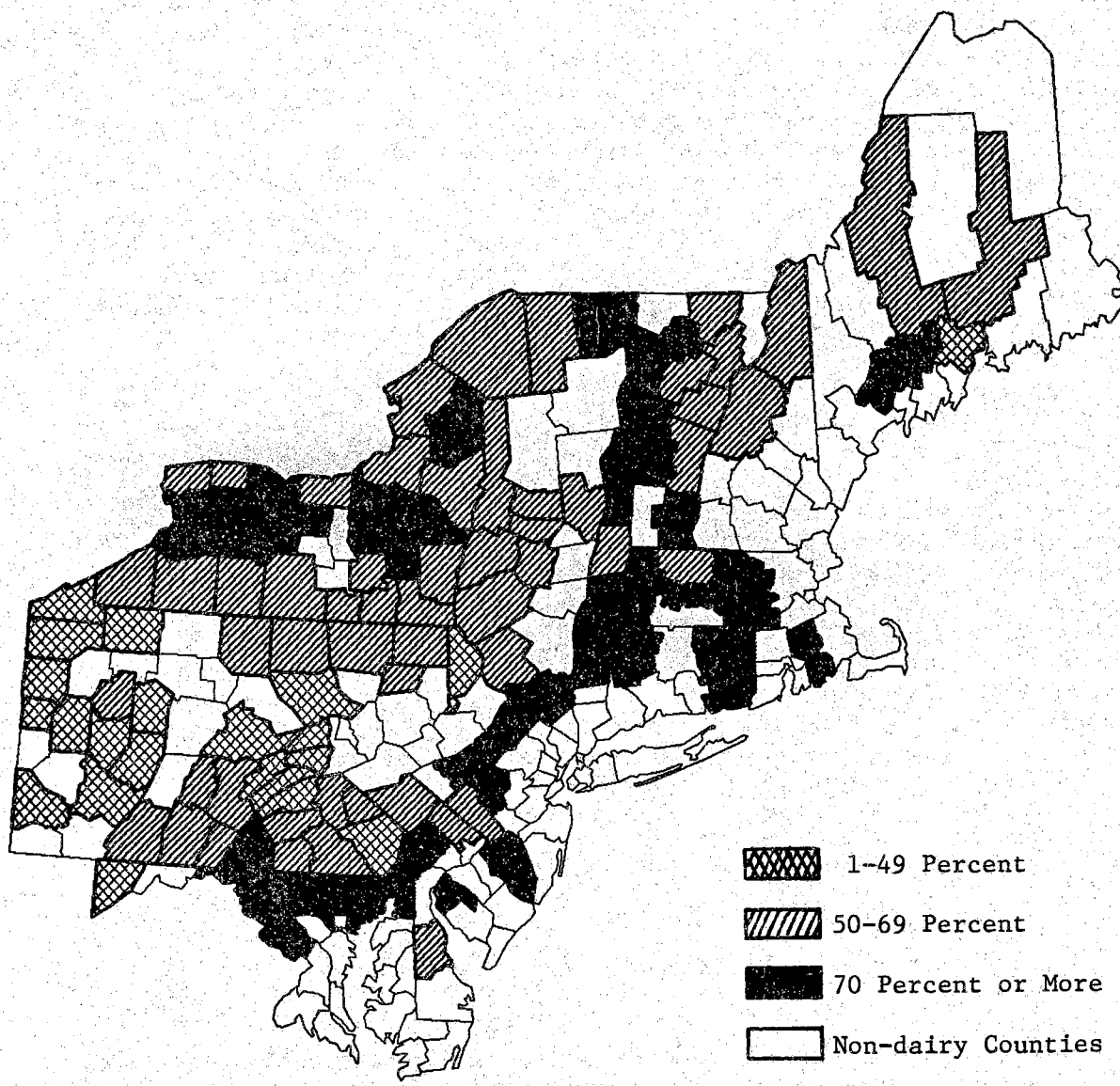
The Northeastern States.

Nationally, it is generally true that cow numbers have held steady or increased during the past 12 years in counties where 70 percent of more of all the cows are in herds with 50 or more cows. But as small dairy herds have gone out of business, the land and resources in many cases have been combined with existing dairies to provide larger, more economic units. This has been the general pattern in the 12 Northeastern States.

The leading dairy counties in the Northeast are identified in a county map in Figure 2. For every county with 5,000 or more dairy cows in the 1978 Census, the percent of all dairy cows in herds of 50 or more is presented. Most of the dairy cows are located in New York, Pennsylvania and Vermont (83 percent), but all of the other states have at least one county where dairying is important. Lancaster County, Pennsylvania has more cows than any other county in the Northeast and is one of the top ten counties nationally.

One reason for considering these figures carefully is to note the amount of adjustment or consolidation in dairy enterprises that has already taken place or may be necessary in the future. Competitive pressures may well cause cooperatives and private handlers to consider more carefully the additional costs of obtaining their supplies of milk from small producers. Moreover, the costs of enlarging barns or modernizing facilities in the 1980s may make it more difficult for some of the farms with less than 50 cows to continue under stronger pressures from increased costs and narrower operating margins. In general, the higher the percentage of cows in herds of 50 or more, the more likely these counties will maintain or increase cow numbers. At least this has been the general pattern in the past decade. At the time of the 1978 Census, Pennsylvania had more counties and more cows in herds of less than 50 cows than did any other state in the Northeast. These counties were largely those with the less desirable soils and steeper slopes. Most counties in New England, New Jersey, Maryland and New York had 65 percent or more of their cows in herds of 50 or more.

FIGURE 2. PERCENT OF DIARY COWS IN HERDS OF 50 COWS OR MORE BY COUNTIES IN THE NORTHEAST, 1978



Minnesota, Wisconsin and California.

With 50 percent of the national dairy cow herd now concentrated in the five leading dairy states, it is important to look at some of the differences in the distribution of herd sizes in each of these states by county. Minnesota and Wisconsin have modest proportions of their cows in herds of 50 or more cows. In much of northern and central Wisconsin as well as many of the leading dairy counties in Minnesota, only from 30 to 49 percent of the cows were in herds of 50 or more cows (Figure 3). Relatively small specialized dairy farms are the rule. Good alternatives to dairy farming within production agriculture are few because hay and forage crops are generally the best way to use the available land and soil resources. These areas are somewhat less industrialized than New York and Pennsylvania. Off-farm jobs are often few in number and movement of some dairymen out of agriculture is likely to be slow, even though persistent. In both Minnesota and Wisconsin, herd sizes are largest in the more heavily populated areas, closer to cities and where there are more alternatives both for the productive use of cropland and for off-farm employment.

In contrast, almost all the dairy cows in California are in herds of 100 or more cows (Figure 3). Units of 500 to 2,000 cows are much more nearly typical. During the past decade, dairy herds have moved out of the area immediately adjacent to Los Angeles and the San Francisco-Oakland area. The number of cows in San Bernardino and Riverside counties has doubled in 12 years to 253,000. San Bernardino with 163,000 cows in 1981 was the largest dairy county in the United States. The other area of growth has been in the central San Joaquin Valley. Tulare, Stanislaus, Merced, Fresno and Kings counties account for over 400,000 of California's dairy cows largely between Modesto on the north and Visalia and Tulare on the south. This is the heart of the irrigated fruit, vegetable and cotton country. Cow numbers have increased here by 157,000 in 12 years. There are other options for use of the land resource. Dairying has moved in because dairymen have considered it to be a good alternative.

Costs of Production by Region

USDA has recently released 1981 cost of milk production estimates by region. These estimates are based on survey data in each of the regions and budgets developed for typical dairy farm situations in each of the regions. These cost of production estimates indicate something about the current cost-return situation for average producers in each of the regions (Table 5). As would be expected, there is a substantial amount of variation around each of these averages in each region.

FIGURE 3

PROPORTION OF TOTAL MILK COWS IN HERDS OF 50 COWS OR MORE 1978 CENSUS

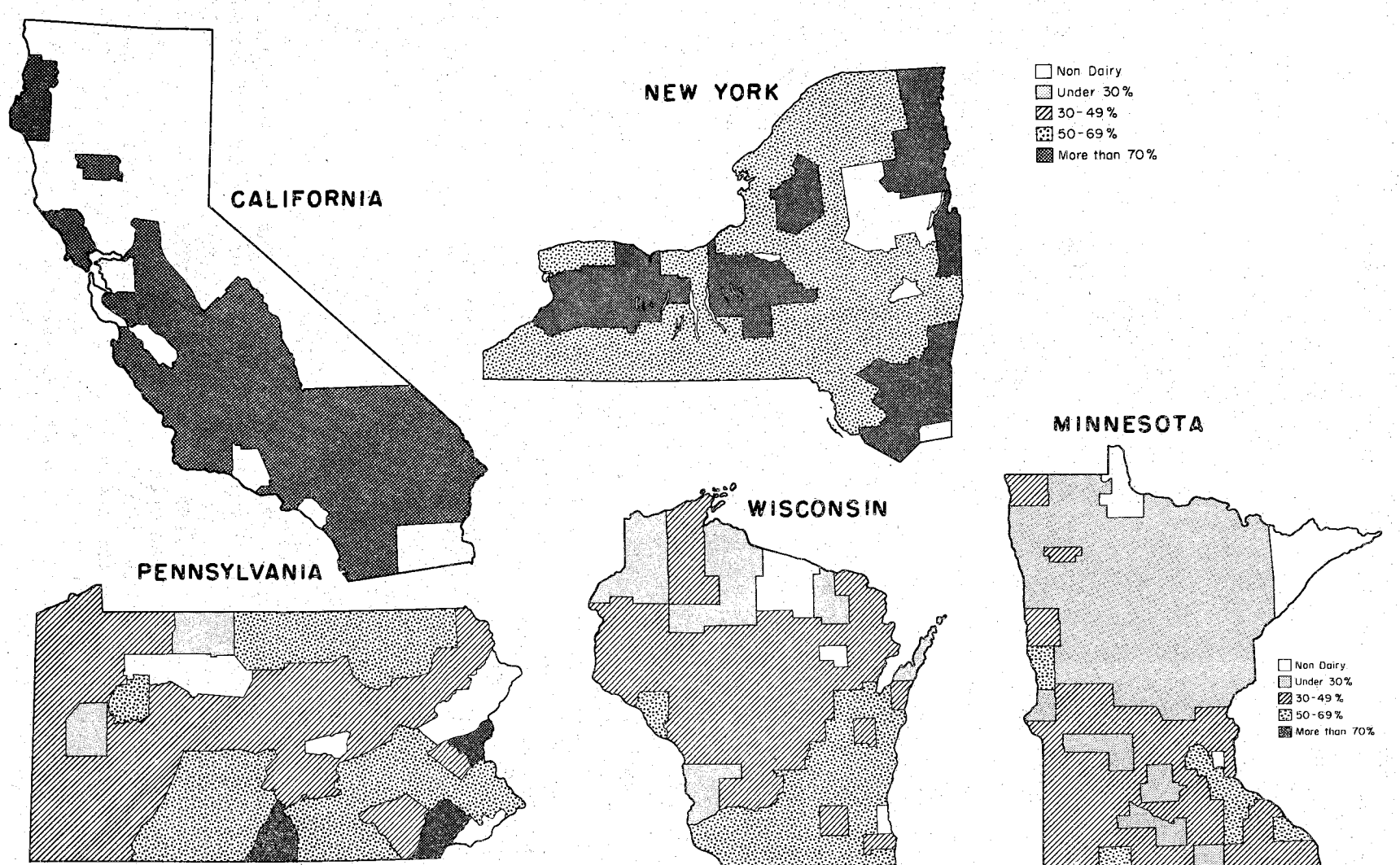


Table 5. Estimated Costs and Returns per Hundredweight of Milk on Specialized Dairy Farms by Region, United States, 1981.

Region	Milk	Returns Cull Cows, Calves	Total	All Direct and Ownership Costs	Return to operator's Labor and Management
	dollars/cwt				
1-Upper Midwest[a]	$13.37	$1.51	$14.88	$12.45	$2.43
2-Northeast[b]	14.08	1.20	15.28	12.97	2.31
3-Pacific[c]	13.47	0.93	14.40	12.34	2.06
4-So. Plains[d]	14.84	1.03	15.87	14.14	1.73
5-Corn Belt[e]	13.49	1.20	14.69	13.93	0.76
6-Appalachia[f]	14.17	1.02	15.19	14.49	0.70
National Average	13.72	1.25	14.97	13.00	1.97

Source: USDA. Economic Research Service.

[a] Minnesota, Wisconsin, Michigan, and South Dakota.
[b] New York, Pennsylvania, Ohio, and New England.
[c] California and Washington.
[d] Texas.
[e] Indiana, Illinois, Iowa, and Missouri.
[f] Kentucky, Tennessee, Virginia, North Carolina, and Georgia.

These estimates are helpful in assessing both the geographic structure of prices and returns for milk in 1981, and the nature of direct and ownership costs associated with production. Prices for milk within the United States are now quite uniform, and relative differences between regions have narrowed during the last decade. The three regions with the most concentrated areas of milk production have the lowest costs and the greatest returns to operator's labor and management. The cost estimates and the relative returns to labor and management by region suggest further concentration of production in the Upper Midwest, Northeast and

Pacific regions over time. At the same time it appears that the number of dairy farms and dairy production will decline in Appalachia, the Corn Belt and the Southern Plains.

Future Changes in Cow Numbers

In trying to look at the experience of the last 10 to 12 years to consider future changes in location of dairy production in the United States, it may be helpful to look again at Figure 1 and Tables 1-4 showing the current distribution of cows across the country. If rates of milk production per cow continue to increase because of advances in animal breeding, nutrition, herd health, and improved technology, then cow numbers must decrease nationally if supply and demand are to come into balance. Many of the small herds of less than 30 cows have already been "squeezed" out of production. Less than 12 percent of the cows remain in such herds. That means important reductions must come from among full-time family operations where milk sales are the primary source of family income. Undoubtedly some of this can come from the wheat, corn, soybeans and sorghum states of the Plains and Corn Belt. But crop prices to date have provided little incentive to shift to dairying, and dairying is commonly on the rougher, less tillable land in these states. There may be further reductions in Kentucky, Tennessee, North Carolina and Virginia following the pattern of the last 12 years, particularly on farms with less than 50 cows. Big changes could occur in California if there are important changes in incentives in terms of prices and costs for alternative agricultural enterprises. Large investments are already in place which in most cases means continued operations. On the other hand, the same kind of aggressive management that moved large blocks of capital into dairying could also move it out if other alternatives become more profitable.

In the Northeast, the reductions in dairy farms associated with urbanization, growth of metropolitan areas, and increases in agricultural land prices, because of expected future sales for urban uses, are largely behind us. Selling out to a developer seems a less likely option to most dairymen in the region. While there are substantial differences in soils, climate, markets and resources within the region, the majority of dairy farms and dairy farmers have few good alternatives inside or outside agriculture. Shifts will come slowly. The farms on the better soils and where substantial numbers of farms are reasonably close together on good, all weather roads will have a competitive advantage. The smaller units, farthest from other farms or at the margin of bulk tank routes will face stiff challenges both in the Northeast and in Wisconsin, Minnesota and Iowa as well.

CHAPTER IV

FUTURE PRICE/COST EFFECTS ON FAMILY LIVING INCOME IN DAIRY

W. Grisley, G. Frick and G. B. Cilley*

Northeast dairy farmers experienced favorable cash flows and net cash operating incomes during the late 1970s and through 1981. Even 1982 proved reasonably good for dairymen in the Northeast, although the threat of reduced milk prices was on the horizon. For the New York CAMIS[1] farms, the difference between cash operating receipts and cash operating expenses was $390 per cow in 1979, $385 per cow in 1980 and $392 per cow in 1981. In 1982 this difference was $349 per cow. New England farms in the ELFAC[2] farm business management program had annual cash receipts less cash operating expense of $360 per cow in 1979, $337 per cow in 1980, and $385 in 1981. These cash flows, coupled with a prevailing expansionary philosophy encouraged increased indebtedness on many dairy farms. For example, the 55-69 cow herd farms included in the New York Dairy Farm Management Business Summary[3] increased debt per cow from $1,375 in 1976 to $2,400 in 1982. Expected decreases in cash flows in 1983 will dictate a much less expansionary situation and less reliance on debt financing.

An approach to the evaluation of short-run dairy price programs which uses family living income as an indicator of pressure for adjustment will be presented in this chapter. The "maintained hypothesis" asserts that farmers will make adjustments in an effort to maintain recent standards of living.

The analysis estimates annual family living incomes as a result of current and expected milk price policies. Individual farm income records for 1981 incorporated in a simulation model were used to

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[1] CAMIS is the Cornell Agricultural Management Information System.

[2] ELFAC is the Electronic Farm Accounting System at the University of New Hampshire.

[3] S. F. Smith, Dairy Farm Management Business Summary, A.E. Res. 82-84. Department of Agricultural Economics. Cornell University. September 1982.

estimate annual incomes for 1982 through 1984.[4] These records included information on net cash operating income, sales and purchases of dairy livestock, total debt, and number of cows per farm. Sales and purchases of dairy livestock were used to adjust net cash operating income to reflect cash available for such purposes as current debt retirement, family living, or additional new debt retirement. The net income information reported in this chapter represents annual return to the farm family for consumption or investment purposes. It does not include income from farm enterprises other than dairy nor income earned from off-farm sources.

Methodology and Assumptions

The data base for individual farm information was for the year 1981. Average farm income and expense information was developed for three farm sizes in Vermont, eight farm sizes in Pennsylvania, and nine farm sizes in New York for a total of 20 representative farms. Each of the 20 representative farms were analyzed with a farm income-expense simulator to estimate net cash operating income for 1982 through 1984. The static simulation model used assumed the farm structure to be constant over the three years of the simulation period and the same as in 1981. Two production parameter changes were made each year. On the output side, milk per cow was assumed to increase at the rate of 200 pounds per year. Grain concentrates. on the input side, were assumed to increase at the rate of 60 pounds per cow per year. With these two production assumptions and appropriate cost adjusters, the model indicates how price assumptions in future years would affect net cash operating income. Thus, the model describes how expected prices for 1983, for example, would influence costs and returns if the farm were to be operated as it was in the base year of 1981. The price and cost indices used to estimate costs and returns over the simulation period are shown in Table 1.

The analysis ignored such long-run costs as depreciation and returns to unpaid family labor and farm equity. These must be met in the long run, but can be postponed in the short run. The analysis here was cash-oriented with cash receipts and cash expenses adjusted for livestock purchases and sales. The result, called adjusted net cash operating income, is the amount of cash available for the farm operator to use for family living and for debt retirement. The amount of money available for family living and

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[4] Individual farm records were obtained through cooperation with the Pennsylvania Farmer's Association, The Pennsylvania Agriculture Records Program of the Cooperative Extension Service, the Cornell Agricultural Management Information System (CAMIS), and the Electronic Farm Accounting System (ELFAC) of New England.

Table 1. Prices and Indices Assumed for Estimating Farm Costs and Returns.

Item	1981	1982	1983	1984
	dollars			
Blend Price for Milk/cwt				
Series A Prices	14.08	13.41	13.79	14.17
Series B Prices	14.08	13.77	13.08	13.34
Dairy Cow Replacements/head				
With Series A Prices	1,200	1,150	1,000	900
With Series B Prices	1,200	1,150	900	700
Cull Cows/cwt	42.00	42.50	44.50	47.00
Dairy Concentrate/ton	192	175	176	181
	indices			
Consumer Prices	100	106	112	117
Feed	100	90	92	94
Feeder Livestock	100	102	107	114
Seed	100	101	100	104
Fertilizer	100	101	102	107
Agricultural Chemicals	100	108	113	119
Fuel and Energy	100	98	106	116
Farm and Motor Supplies	100	104	111	119
Auto and Truck	100	111	121	130
Tractor and Power Mach.	100	108	116	124
Other Machinery	100	109	117	124
Building and Fencing	100	101	107	113
Farm Services and Rent	100	107	114	121
Interest	100	112	122	132
Taxes	100	106	112	114
Wages	100	100	105	111

debt retirement was hypothesized to be a good indicator of current farm viability.

The Series A prices were developed as described in Chapter II in an effort to approximate "equilibrium" milk prices for the Northeast. The Series B prices were estimated to approximate the prices that would prevail under the policy adopted by the Omnibus Budget Reconciliation Act of 1982. Replacement cow prices were estimated to be consistent with the Series A and Series B milk prices. The 1981 individual farm records for the 20 representative farm size classes were adjusted annually by using yearly net cash operating income changes for the respective size classes as movers.

A sample of farms from the New York Farm Business Management Summary shows the trend in debt per cow and per farm for recent years (Table 2). While debt per cow has consistently increased over the past several years, the rate of change has varied considerably. In the analysis reported here, debt is treated as follows. The debt repayment amount, which is deducted from net cash operating income, was based on the recorded 1981 debt. The repayment schedule was assumed to average 10 years, so one-tenth of the debt was retired each year.[5] However, debt and debt cost was assumed to increase through 1984. The simulation model included interest payments as a part of costs (see Table 1). The interest indices used in the model (and, hence, the quantity of debt) were increased during 1982-1984 at about eight percent per year.[6] The interest cost of the increased debt was reflected in the computed net cash operating incomes, but no debt repayment was calculated for the additional debt. In summary, debt repayment was assumed to be based on the outstanding debt of individual farms in 1981. Debt during the analysis period was assumed to increase and the cost increase was reflected only through higher interest charges.

Results

Vermont

Eighty-three dairy farms from Vermont were sampled, with an average herd size of 66 cows. The average debt per cow was $1,335 for the 60 farms reporting debt.

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[5] Based on average loan repayment periods reported in New York. See S. F. Smith, op. cit.

[6] The quantity of debt is assumed to increase by the same proportion as interest costs if interest rates remain stable. Otherwise, an inverse relation would exist between interest rates and quantity of debt.

Table 2. Total Farm Debt and Debt Per Cow for Herds of 55-69 Cows, New York, 1976-1982.[a]

Year	Debt		
	Per Farm	Per Cow	Increase
	(dollars)	(dollars)	(percent)
1976	83,740	1,375	
1977	89,440	1,465	+ 7
1978	93,640	1,535	+ 5
1979	113,980	1,870	+22
1980	128,680	2,110	+13
1981	136,870	2,245	+ 6
1982	146,220	2,400	+ 7

[a] S. F. Smith. op. cit.

The average annual family living income (hereafter referred to as income) on both a per cow and per farm basis by herd size and in the aggregate are shown in Table 3. In the base year, 1981, the overall average income on a per cow and per farm basis was $406 and $24,470 respectively. Income per cow was greater on those farms with less than 40 cows because of the smaller levels of debt per cow. Farms with 80 cows and over had the smallest income per cow.

The incomes estimated for 1982 through 1984 under both price assumptions show a reduction compared to the base year, but those under Series B prices were notably less than under Series A prices.[7] On a per farm basis, average income fell to $19,865 in 1982, but then increased to $21,476 in 1983 and to $22,330 in 1984. As a percent of the 1981 average income, the 1982 income was 81 percent while in 1984 it was 91 percent.

[7] Series A prices were defined as those resulting from the equilibrium model described in Chapter II and in the Technical Appendix. Series B prices were estimated to approximate those established by the policy adopted in the Omnibus Budget Reconciliation Act of 1982.

Table 3. Annual Family Living Income Per Farm, Vermont, Actual 1981 and Estimated for 1982 Through 1984, Assuming a Ten-Year Average Debt Retirement.

Herd Size	1981		1982		1983		1984	
	Per Cow	Per Farm	Per Cow	Per Farm	Per Cow	Per Farm	Per Cow	Per Farm
	dollars							
SERIES A PRICES								
Less than 40	564	19,900	504	17,900	546	19,270	575	20,290
40-79	405	22 600	338	18,860	362	20,200	376	20,980
80 and over	259	34,810	187	25,130	206	27,690	213	28,630
All Farms	406	24,470	339	19,860	325	21,480	381	22,330
(As % of 1981)		100		81		88		91
SERIES B PRICES								
Less than 40	564	19,900	566	19,970	447	15,770	460	16,230
40-79	405	22,600	397	22,160	264	14,730	260	14,508
80 and over	259	34,810	249	33,470	104	13,980	91	12,230
All Farms	406	24,470	399	23,940	266	14,770	264	14,380
(As % of 1981)		100		96		61		59

For Series B prices, the sample average income on a per farm basis was $23,940 in 1982, $14,770 in 1983, and $14,380 in 1984. The 1982 figure was 96 percent of that in 1981. In 1983 and 1984, however, incomes dropped to 61 and 59 percent of 1981 levels, respectively.

The distribution of income per farm is shown in Table 4 for Series A and Series B prices. Importantly, this table shows the number of farms that have positive or negative incomes. Again, Series A prices had little depressing influence on income. In 1981, eight percent of the farms had negative incomes. This percentage remained essentially the same for the estimated incomes in the years 1982-84. Under Series B prices, however, the percent of farms with negative incomes increased to 12 percent in 1983 and 1984. At the upper income levels, 28 percent of the farms had an income of $30,000 or more in both 1981 and 1982. By 1983, however, only 12 percent of the farms had incomes of $30,000 or more.

Table 4. Distribution of Annual Family Living Income for Vermont Farms, Actual 1981 and Estimated for 1982 through 1984.

Annual Income for Family Living	Actual 1981 Farms	Estimated 1982 Farms	Estimated 1983 Farms	Estimated 1984 Farms
	percent			
SERIES A PRICES				
Negative	8	10	8	9
0 to $9,999	12	15	13	12
$10,000 to $29,999	51	55	57	55
$30,000 or more	29	20	22	24
Average Income/farm	$25,470	$19,860	$21,480	$22,330
SERIES B PRICES				
Negative	8	8	12	12
0 to $9,999	12	13	20	24
$10,000 to $29,999	52	52	56	52
$30,000 or more	28	28	12	12
Average Income/farm	$24,470	$23,940	$14,770	$14,380

New York

Six hundred and three farms from New York were sampled with an average size of 78 cows per herd. The average debt per cow of those reporting debt was approximately uniform over all size classes. With the exception of the 150 and over cow herds, debt per cow ranged between $2,488 and $2,123.

Table 5 gives the family living income on both a per cow and per farm basis. The income per cow for 1981 ranges from $66 to $297 with an average of $220. The variability in the income per cow and the relatively small variation in average debt per cow suggests that most of the variability in per farm income is derived from the income side of farm costs and returns. The 26 farms in the 115-129

cow class, however, appear to be quite different from the farms in the other size classes and should be treated accordingly. It is difficult to explain the difference in income for this size class without a more detailed analysis.

The Series A prices had the effect of significantly lowering incomes in 1982-84 compared to the base year 1981. On a per farm basis, the overall average incomes were $10,230, $11,500, and $12,190 in 1982 to 1984, respectively, as compared with $16,050 in 1981.

The Series B prices had a more dramatic effect on incomes, however. Annual family living incomes in 1983 and 1984 dropped considerably below the average levels in 1981 and 1982. Significant decreases occurred in all farm size categories, but were more pronounced on farms with herd sizes of 115 and over. The overall average incomes on a per farm basis were $14,960 in 1982, $4,320 in 1983, and $3,280 in 1984. These values are only 93, 27, and 20 percent, respectively, of the overall average income in 1981. Compared to the results under Series A prices, incomes for 1983 and 1984 were dramatically reduced.

The per farm distributions of income for 1981 through 1983 are shown in Table 6 for both price series. The Series A prices had relatively little effect on the distribution of income over all size classes. In 1981, 145 (24 percent) of the farms had a negative family income. This percentage increased to 30 percent in 1982 and then showed small decreases in 1983 and 1984. On the other hand, the Series B prices had considerable influence on the distribution of incomes in 1983 and 1984. Where 24 percent of the farms had negative incomes in 1981, 39 percent had negative incomes by 1984. On the upper income scale, 25 percent of the farms had incomes of $30,000 or more in 1981. By 1984 only 10 percent of the farms had incomes over $30,000. This analysis indicates that more than 60 percent of New York dairymen would have severe financial problems by 1984 under Series B prices.

Pennsylvania

A sample of 1,169 dairy farms was used in the Pennsylvania portion of the study. Those farmers reporting debt had an average debt per cow of $2,336, with little variability across farm sizes. For all farms with debt, 24 percent had less than $1,000 debt per cow and 28 percent had over $3,000 debt per cow.

The annual income for family living on both a per cow and per farm basis is shown in Table 7. The values in Table 7 were estimated using the same method as for the Vermont and New York farms.

Table 5. Annual Family Living Income Per Farm, New York, Actual 1981 and Estimated for 1982 through 1984, Assuming a Ten-Year Average Debt Retirement.

Herd Size	1981		1982		1983		1984	
	Per Cow	Per Farm	Per Cow	Per Farm	Per Cow	Per Farm	Per Cow	Per Farm
	dollars							
SERIES A PRICES								
Less than 40	221	7,470	148	5,000	168	5,680	182	6,150
40-54	220	10,320	134	6,290	131	6,180	158	7,410
55-69	246	15,000	161	7,820	176	10,730	181	11,040
70-84	230	17,680	172	13,760	202	15,530	211	16,220
85-99	297	27,030	205	18,660	215	19,570	220	20 020
100-114	209	22,300	123	13,130	140	14,940	145	15,480
115-129	66	7,960	-28	-3,380	-25	-3,020	-31	-3,740
130-149	275	38,390	159	22,200	176	24,570	170	23,730
150 or more	144	29,510	114	23,360	123	25,200	123	25,200
All Farms	220	16,050	143	10,230	155	11,500	166	12,190
(As % of 1981)		100		64		72		76
SERIES B PRICES								
Less than 40	221	7,470	206	6,960	74	2,500	69	2,330
40-54	220	10,320	191	8,960	57	2,680	47	2,210
55-69	246	15,000	216	13,170	87	5,300	77	4,670
70-84	230	17,680	221	16,990	132	10,150	132	10,150
85-99	297	27,030	261	23,750	113	10,280	98	8,920
100-114	209	22,300	179	19,100	51	5,450	39	4,160
115-129	66	7,960	30	3,620	-126	-15,210	-155	-18,710
130-149	275	38,390	236	32,950	46	6,500	19	2,650
150 or more	144	29,510	171	35,040	20	4,100	1	210
All Farms	220	16,050	199	14,960	68	4,320	57	3,280
(As % of 1981)		100		93		27		20

Table 6. Distribution of Annual Family Living Income for New York Farms, Actual 1981 and Estimated for 1982 through 1984.

Annual Income for Family Living	Actual 1981 Farms	Estimated 1982 Farms	Estimated 1983 Farms	Estimated 1984 Farms
	percent			
SERIES A PRICES				
Negative	24	30	29	27
0 to $9,999	19	23	21	21
$10,000 to $29,999	32	29	31	32
$30,000 or more	25	18	19	20
Average Income/farm	$16,050	$10,230	$11,500	$12,190
SERIES B PRICES				
Negative	24	26	38	39
0 to $9,999	19	19	25	24
$10,000 to $29,999	32	32	27	27
$30,000 or more	25	23	10	10
Average Income/farm	$16,050	$14,960	$4,320	$3,280

As in the case of the Vermont and New York results, both Series A and Series B prices had a negative impact on incomes, with Series B prices having the more dramatic impact. On a per farm basis, the overall average incomes were $12,930 in 1982, $14,590 in 1983, and $15,380 in 1984 as compared with the 1981 base of $17,840. On a percentage basis, these incomes were 72, 82 and 86 percent of that realized in 1981. Except for herd sizes of less than 40 cows, the size category averages exceed $11,000 in each of the three years.

Table 7. Annual Family Living Income Per Farm, Pennsylvania, Actual 1981 and Estimated for 1982 through 1984 Assuming a Ten-Year Average Debt Retirement.

Herd Size	1981		1982		1983		1984	
	Per Cow	Per Farm	Per Cow	Per Farm	Per Cow	Per Farm	Per Cow	Per Farm
	dollars							
SERIES A PRICES								
20-29	164	4,380	84	2,320	117	3,190	148	3,980
30-39	278	9,630	197	6,840	232	8,060	251	8,720
40-49	340	14,940	258	11,320	290	12,720	306	13,440
50-59	300	16,340	215	11,730	238	12,970	246	13,400
60-69	302	19 630	218	14,160	249	16,190	264	17,140
70-89	305	23,770	215	16,740	238	18,540	246	19,110
90-109	293	28,270	195	18,720	228	21,900	241	23,160
110 or more	288	38,080	229	29,920	250	32,920	263	34,670
All Farms	294	17,840	212	12,930	241	14,590	255	15,380
(As % of 1981)		100		72		82		86
SERIES B PRICES								
20-29	164	4,380	132	3,550	17	600	44	1,310
30-39	278	9,630	253	8,780	146	5,080	153	5,330
40-49	340	14,940	315	13,820	200	8,770	202	8,900
50-59	300	16,340	271	14,760	147	8,010	139	7,550
60-69	302	19,630	277	17,940	158	10,270	159	10,380
70-89	305	23,770	272	21,150	147	11,380	139	10,720
90-109	293	28,270	255	24,570	135	12,870	136	12,980
110 or more	288	38,080	267	35,170	188	24,320	190	24,600
All Farms	294	17,840	267	16,150	152	9,410	154	9,410
(As % of 1981)		100		91		53		53

Under the Series B prices, the overall average incomes on a per farm basis were $16,150 in 1982, $9,410 in 1983, and $9,410 in 1984 as compared with $17 840 for the 1981 base year. These income figures are 91, 53, and 53 percent of that realized in 1981. The incomes for the latter two years are indeed significant decreases in dollar value terms. Importantly, farm sizes with less then 60 cows had an average income of less than $10,000. Some of these herds are only slightly smaller than the average herd of 62 cows in the sample.

The distributions of income per farm for 1981 through 1984, assuming a 10-year debt retirement schedule, are shown in Table 8. In 1981, for Series A prices, 21 percent of the farms had negative incomes and 28 percent had incomes of $30,000 and larger. Under Series A prices, the percent of farms showing negative incomes were 26, 24, and 23 respectively for 1982 through 1984. On the upper end of the income scale, 25 percent of the farms realized incomes of $30,000 or greater. Series A prices, then, did not greatly alter the distribution of income.

The distributions of income per farm under Series B prices, however, indicate that a larger percentage of the farms would have negative incomes in the latter two years. The percentage increased from 22 percent in 1981 to 29 percent in 1983 and 1984. On the upper end of the income distribution, 27 percent realized incomes of $30,000 and over in 1981, but by 1983 and 1984 only 15 percent would be expected to have incomes of $30,000 or more.

An alternative analysis not shown here yielded estimated incomes using the actual annual principal payments reported in 1981. The availability of data for Pennsylvania enabling such an analysis provided an opportunity to examine the correspondence between results of the 10 year debt retirement assumption and the actual principal payment schedule. A comparison of the two debt repayment bases for the Series A prices showed relatively little difference in impacts over the projection period. However, the distribution of farms among income classes differed both in 1981 and, in a consistent manner, for the period 1982 through 1984. In general, the alternative method using the 1981 actual debt retirement schedule yielded larger annual income values. This would suggest that the ten-year average debt retirement method may overestimate the impact of the Series A prices on incomes.

When a comparison was made for the Series B prices, similar results were noted. With both approaches, however, rather substantial decreases were noted in the proportion of farms in the higher income classes and a corresponding increase in the proportion in the lower income groups. For example, both approaches provided nearly identical estimates (15 versus 16 percent) for the proportion of farms in the $30,000 and over income class and 50 percent versus 43 percent for the farms in the $10,000 or less income class.

Table 8. Distribution of Annual Family Living Income for Pennsylvania Farms, Actual 1981 and Estimated for 1982 through 1984.

Annual Income for Family Living	Actual 1981 Farms	Estimated 1982 Farms	Estimated 1983 Farms	Estimated 1984 Farms
	percent			
SERIES A PRICES				
Negative	21	26	24	23
0 to $9,999	16	20	18	18
$10,000 to $29,999	35	34	35	34
$30,000 or more	28	20	23	25
Average Income/farm	$17,840	$12,930	$14,590	$15,380
SERIES B PRICES				
Negative	22	23	29	29
0 to $9,999	16	18	21	21
$10,000 to $29,999	35	33	35	35
$30,000 or more	27	26	15	15
Average Income/farm	$17,840	$16,150	$9,410	$9,410

In summary, it appears that estimates of income impacts based on the two approaches to debt retirement differ significantly when Series A prices are used, but do not differ greatly when Series B prices are used.

Costs of Production

The individual farm record data for the three states can also be used to estimate variable costs per hundredweight of milk. Total cash operating receipts were divided by the price of milk to estimate hundredweight of milk equivalents per farm.[8]

The simulation model produced an annual cost index as part of the output. This cost index is dependent on the input cost assumptions used and shown in Table 1. Variable costs of production were developed for the Series B prices for 1981 and 1983 which enabled a comparison of costs in the base year with projected costs in subsequent years.

Cash operating expense per hundredweight of milk produced on each farm in 1981 was estimated by dividing total farm cash operating expenses by the hundredweights of milk equivalent produced. Hundredweights of milk equivalent produced was estimated as the ratio of total farm cash operating receipts to price of milk per hundredweight.

To estimate farm operating expenses per hundredweight for subsequent years, two adjustments must be made. First each farm's total farm operating expenses must be adjusted to reflect the difference in costs from 1981 based on the cost assumptions employed (see Table 1). Secondly the hundredweights of milk equivalents must be adjusted to reflect any increase in productivity over time. Here we assumed a productivity increase of 2.5 percent per year which is equivalent to an increase of 200 pounds of milk per cow per year.

The results of this analysis are shown in Table 9 for four size categories of farms for each of the three states.

Vermont

A total of 83 farms had valid information for use in estimating cash operating costs in Vermont. Table 9 shows the distribution of farms by cost for 1981 and 1983. For the four size classes of farms for both years, the proportion of farms with costs less than $10.00 per hundredweight was 40 percent for herds of under 40 cows while for herds of 120 or more cows, all had costs of more than $10.00 per hundredweight. As herd size increased, operating expenses per hundredweight also increased to reach $12.10 for the herds with 120 or more cows. Average cost for all farms in 1981 was $11.02. Per

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[8] Using total cash operating receipts assumes that the costs for the products produced jointly with milk have the same production costs. Using only milk receipts or hundredweights of milk would entail cost allocations for non-milk items which are difficult to do and justify for conditions of joint production.

hundredweight costs for 1983 increased only $0.03 over that for 1981 for all farms. Almost no changes were observed in the proportion of farms in each cost class from 1981 to 1983.

New York

Farm cash operating expenses per hundredweight for 603 New York farms are shown in Table 9. As with the Vermont records, the cost per hundredweight increased with increases in number of cows per farm. Farms with under 40 cows averaged $10.50, increasing to $11.47 per hundredweight on farms with 120 or more cows. The average costs for all farms in 1981 was $10.85.

Adjusting for expected 1983 cost and production changes resulted in a cost per hundredweight increase to $11.08 --- roughly two percent higher than in 1981. Farms with under 40 cows had average costs of $10.66. Those with 120 or more cows had average costs of $11.77 per hundredweight.

Pennsylvania

The distribution of farm cash operating expenses per hundredweight by herd size for the 1,169 sampled Pennsylvania farms is shown in Table 9. On the average, the level of expenses was fairly uniform across all herd sizes, with a sample mean of $10.25 per hundredweight. Eighty-five percent of all herds had costs per hundredweight of less than $12.00.

In comparison to New York, the sample average in Pennsylvania was $0.65 per hundredweight less. Three inputs could be responsible for most of the difference. Purchased feed was 30 cents higher, labor was 23 cents higher, and taxes were 19 cents higher per hundredweight of milk on the average in the New York sample as compared to the Pennsylvania sample.

Adjusting the individual farm data for expected 1983 cost and production changes resulted in an overall sample average cost per hundredweight increase to $10.37, which was roughly one percent higher than 1981. The increase was approximately uniform across all herd sizes.

Table 9. Cash Operating Expenses Per Hundredweight by Size of Farm on Sample Farms, 1981 and 1983.

	Herd Size									
	Under 40		40 to 79		80 to 119		120 and Over		All	
	1981	1983	1981	1983	1981	1983	1981	1983	1981	1983
	percent									
Vermont										
$6.00 to $7.99	13	13	4	4	0	0	0	0	4	4
$8.00 to $9.99	27	27	18	18	10	10	0	0	18	17
$10.00 to $11.99	40	53	48	48	50	50	58	58	48	52
$12.00 to $13.99	20	7	28	28	40	40	28	28	28	25
$14.00 and over	0	0	2	2	0	0	14	14	2	2
Average Costs	$10.14	$10.04	$11.01	$11.07	$11.60	$11.66	$12.10	$12.17	$11.02	$11.05
Std. Deviation	$ 1.80	$ 1.78	$ 1.40	$ 1.41	$ 1.45	$ 1.46	$ 1.76	$ 1.77	---	---
New York										
Under $6.00	0	0	0	0	0	0	1	1	0	0
$6.00 to $7.99	8	7	5	4	0	0	0	0	4	3
$8.00 to $9.99	33	32	31	25	26	18	15	14	27	23
$10.00 to $11.99	37	36	48	51	54	55	61	58	50	51
$12.00 to $13.99	20	23	14	16	19	23	20	20	17	19
$14.00 and over	2	2	2	4	1	4	3	7	2	4
Average Costs	$10.50	$10.66	$10.62	$10.84	$11.26	$11.84	$11.47	$11.77	$10.85	$11.08
Std. Deviation	$ 1.92	$ 1.95	$ 1.72	$ 1.75	$ 3.44	$ 3.53	$ 3.82	$ 3.92	---	---
Pennsylvania										
Under $6.00	2	2	2	2	0	0	0	0	1	2
$6.00 to $7.99	15	15	13	11	7	7	6	5	12	11
$8.00 to $9.99	37	36	38	37	36	35	34	26	37	35
$10.00 to $11.99	26	27	35	37	38	37	46	48	35	35
$12.00 to $13.99	12	12	9	10	16	18	8	13	10	12
$14.00 and over	8	8	3	3	3	3	6	7	5	5
Average Costs	$10.41	$10.44	$10.13	$10.27	$10.35	$10.51	$10.52	$10.73	$10.25	$10.37
Std. Deviation	$ 3.28	$ 3.28	$ 3.69	$ 3.75	$ 1.80	$ 1.82	$ 1.71	$ 1.71	---	---

Debt Retirement and Cash Operating Expenses

For each of the three states, 1981 debt was assumed to be amortized over ten years. The annual amortization for 1983 was then divided by the milk equivalents expected for each farm in 1983 to obtain the debt repayment per hundredweight. Table 10 shows the distribution of annual debt repayment per hundredweight by size of farm and for all farms. There is considerable variation within states and between states. Vermont farmers appear to maintain the most conservative posture with only a $0.65 per hundredweight debt repayment load compared to $1.46 for New York and $1.60 for Pennsylvania.

Table 11 combines annual debt repayment with farm cash operating expenses per hundredweight. Using this table one can, for a given milk price, identify what proportion of farms would be unable to cover their obligatory cash expenses. For example, in Table 11 if the 1983 price of milk was $12.00 per hundredweight, about 58 percent of the New York farms would have no cash returns left for family consumption. At a $14.00 per hundredweight milk price, about 21 percent of the farms would have no money left for family living. In reality, most of these farms would make one or more adjustments. They might postpone principal payments, create new loans, sell inventory of assets such as animals or feeds, use savings, use retirement plans, postpone purchase of inputs such as fertilizer and machinery, change farm practices, or look at alternative enterprises. These types of adjustments could then soften the price/cost impact in the short run. In the long run, they cannot escape adjusting resource allocations to price.

Figure 1 shows the distribution of hundredweight costs combining debt costs with estimated farm cash operating expenses for the three states in graphic form.

Concluding Remarks

The objective of the analyses reported in this chapter was to determine the effect that reduced milk prices would have on family living incomes for the years 1982 through 1984 under two sets of milk prices and assumptions concerning future costs and debt repayment. These estimates of per farm incomes and costs per hundredweight provide insights regarding the economic viability of dairy farms in the three states in the near future under alternative milk price situations.

The analysis indicates that the Series A prices would have a less negative impact on incomes than would the Series B prices. Using

Table 10. Debt Repayment per Hundredweight by Size of Farm Vermont, New York, and Pennsylvania, 1983.[a]

Debt Payment Per Hundredweight of Milk	Herd Size				
	Under 40	40 to 79	80 to 119	120 or more	All
			Percent		
Vermont					
Under $1.00	80	76	70	43	74
$1.00 to $1.99	13	18	30	43	21
$2.00 to $2.99	7	4	0	14	4
$3.00 and over	0	2	0	0	1
Average	$0.57	$0.63	$0.45	$1.28	$0.65
Std. Deviation	$0.60	$0.77	$0.58	$0.85	---
New York					
Under $1.00	37	36	37	45	37
$1.00 to $1.99	28	36	41	40	36
$2.00 to $2.99	26	19	19	12	20
$3.00 and over	9	9	3	3	7
Average	$1.51	$1.55	$1.33	$1,27	$1,46
Std. Deviation	$1.13	$1.55	$0.83	$0.73	---
Pennsylvania					
Under $1.00	44	42	35	38	41
$1.00 to $1.99	24	27	29	37	27
$2.00 to $2.99	13	16	21	14	16
$3.00 and over	19	15	15	11	16
Average	$1.71	$1.55	$1.66	$1.48	$1.60
Std. Deviation	$1.75	$1.36	$1.25	$1.12	---

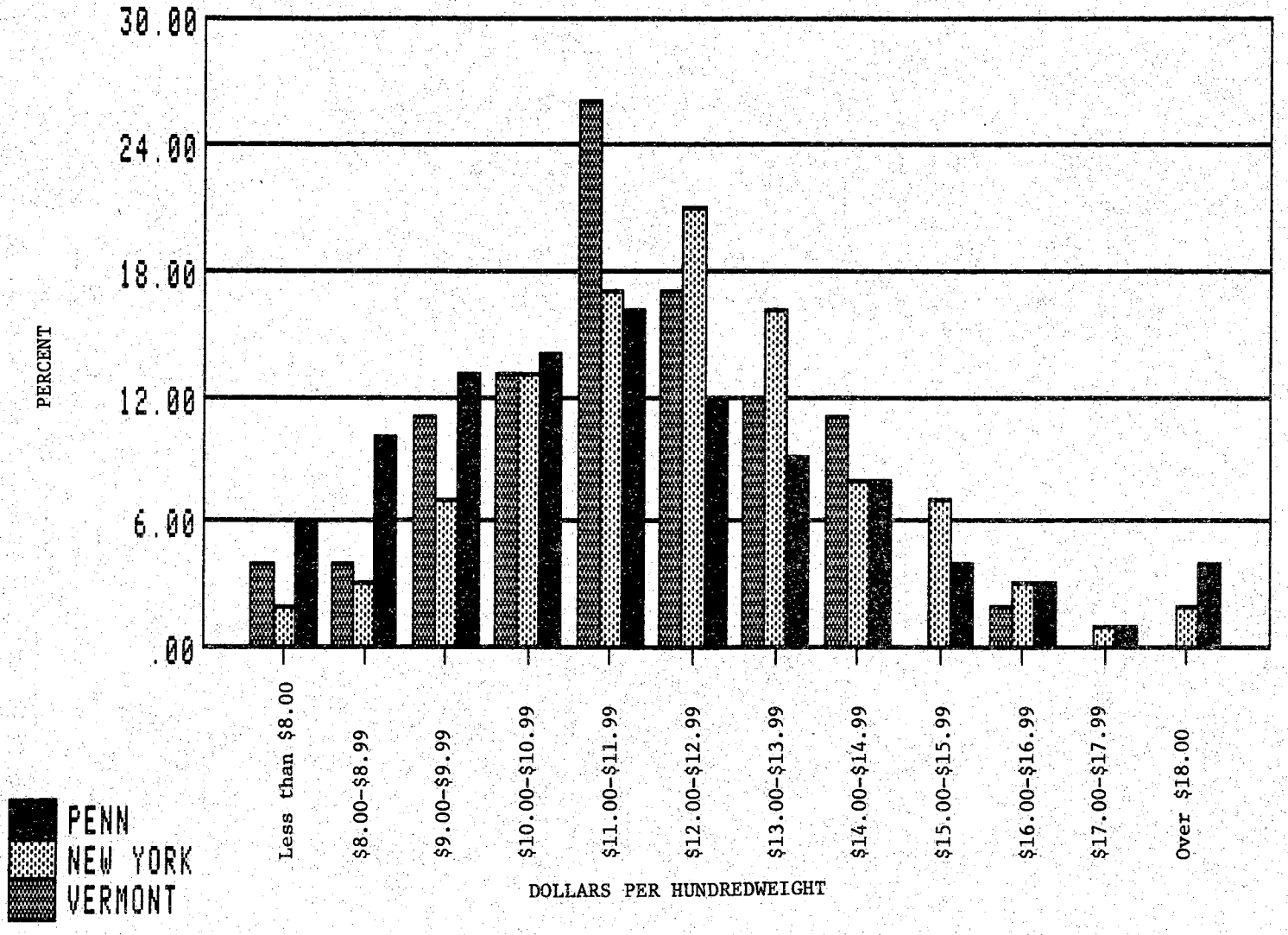
[a] Debt repayment was estimated for each farm by taking the 1981 debt, assuming a ten-year amortization and dividing by the estimated milk equivalents.

Table 11. Cash Operating Expenses Plus Debt Repayment Per Hundredweight by Size of Farm, Vermont, New York, and Pennsylvania, 1983.

Cash Operating Expenses Plus Debt Repayment	Herd Size				
	Under 40	40 to 79	80 to 119	120 or more	All
			Percent		
Vermont					
Under $10.00	40	16	10	0	19
$10.00 to $11.99	33	45	30	29	39
$12.00 to $13.99	20	27	60	14	29
$14.00 and over	7	12	0	57	13
Average	$10.60	$11.69	$12.11	$13.45	$11.69
New York					
Under $10.00	25	12	6	9	12
$10.00 to $11.99	22	33	33	25	30
$12.00 to $13.99	31	35	41	46	37
$14.00 and over	22	20	20	20	21
Average	$12.17	$12.40	$12.85	$13.03	$12.54
Pennsylvania					
Under $10.00	32	29	23	17	29
$10.00 to $11.99	28	30	28	39	30
$12.00 to $13.99	17	22	25	20	21
$14.00 and over	23	19	24	24	20
Average	$12.15	$11.82	$12.17	$12.21	$11.97

Series A prices, cost and income distributions did not change significantly. Approximately 90 percent of the farms in Vermont, 70 to 76 percent in New York, and 74-78 percent in Pennsylvania had positive incomes over the four years analyzed. In the aggregate, the percent with negative incomes increased from 22 to 24 percent from 1981 to 1984. Thus, the Series A prices should not

Figure 1. Farm Cash Operating Expenses Estimated for 1983 Summed with 1981 Debt Repayments Per Hundredweight, for Pennsylvania, New York and Vermont



significantly alter the percent of farms with negative or positive incomes.

A useful reference would be to determine the percent of farms that have family living incomes above or below some acceptable benchmark level. For example, if $10,000 is used as a benchmark, in the base year 1981, 39 percent of the farms had an income less than this amount. Thus, in 1981 it would appear that a large percentage of farms may have been relying on outside income to supplement or support their income for family consumption. Using Series A prices did not greatly alter the percent below and above this $10,000 benchmark. By 1984, 43 percent of the farms had estimated incomes below the $10,000 level.

Series B prices, however, increased the percentage of farms with negative incomes and with incomes of $10,000 or less. The percent of farms in the three states with negative incomes over the period 1981 to 1984 increased from 22 to 32 percent. Restated, by 1984, 32 percent of the sampled farmers in the three states would have negative family incomes. Importantly, those farms will neither be able to meet their debt commitments nor provide reasonable income for family living. Without significant reductions in the cost of production, increases in output per cow, or the renewal of outstanding debts, a number of these farms will not be in operation by 1984 without substantial non-farm income subsidy. In the short run, appropriate adjustments may be made to continue in operation, but in the long run it will be necessary for farms to repay existing debt commitments as well as provide an income for family living. Farmers in Vermont will have less problems than those in either New York or Pennsylvania because of their lower debt loads.

The percent of farms with family incomes of $10,000 and above also decreases significantly under the Series B prices. For all farms sampled, 54 percent are projected to have an income of less than $10,000 in 1984. If Series B milk prices become a reality, a large number of farmers will find it necessary to seek outside employment income or exploit additional income generating activities on the farm just to provide an acceptable level of income for family consumption.

Summing the debt costs and the estimated cash operating expenses per hundredweight gave an estimated total cost per hundredweight as described in the preceeding section. Assuming a figure of $12.00 per hundredweight as a benchmark value, an estimated 52 percent of the farms in the states sampled would not break even in 1983. Farms in Vermont and New York would fare slightly better than those in Pennsylvania. Total costs exceeding $12.00 per hundredweight indicates that those farms would not be able to meet all debt, and in some cases operating costs. For a price of $13.00 per hundredweight, about 31 percent of the farms in the three states would be unable to generate positive incomes for family living after payment of cash expenses and debt amortization. These farms, 575 in our sample, will find it necessary to make significant adjustments

in order to remain in operation. While a wide variety of expense and output adjustments can be made on a year-by-year basis, those with large debt costs will find it difficult to remain in operation without higher milk prices or subsidizing these costs from non-farm income resources.

CHAPTER V

OPPORTUNITIES FOR RESOURCE ADJUSTMENT IN NORTHEAST DAIRY PRODUCTION

John W. Malone, Jr.*

The current surplus problem in the dairy industry, as documented in earlier chapters of this report, has spurred renewed interest in the opportunities for adjusting some resources out of dairy production and into other productive activities. It is clear that a number of farm alternatives to dairying in the Northeast may exist. These alternatives are not likely to be as profitable as dairying has been in the past several years. However, neither is dairying expected to be as profitable in the future (see Chapter IV). Hence some dairy farmers may need to consider one or more of such alternatives.

The potential for adjusting some resources out of dairying in the Northeast will be addressed by examining three types of adjustments: (1) those internal to the continuing dairy farm, (2) those consisting of shifting resources completely out of dairying and into some other farm enterprise, and (3) those relating to the transfer of resources from dairy to employment outside of agriculture. Where applicable, this examination will include a discussion of the potential for public policies directed at assisting with resource adjustment. The dairy industry has for decades been a major producer of farm income in the Northeast because of its relative advantage over other agricultural enterprises. Climate, soil, topography and proximity to large markets provide fluid milk production in the Northeast with this advantage. Government price and income support programs have enhanced and provided some stability to dairy producers' income since the 1930s.

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Resource Adjustments Internal to the Dairy Enterprise

Internal adjustments may be carried out through (1) more efficient resource or input use in current operations, and/or (2) by a reduction of resources used in milk production and the transfer of those resources into other farm enterprises.

In the first case, determination of the least cost mix of inputs going into the production of milk (or any other commodity) is one of the basic conditions necessary for maximizing profit. The economizing process includes production at a constant level with reduced inputs.[1] Dairy farmers need, as do all business managers, to continually adjust resource use in response to changing conditions in product and input markets. Continual attention to the improvement of management practices is essential to firms in an industry involved in a resource adjustment process. The previous chapter suggests, for example, that per unit cost reductions are possible on many dairy farms in the region.

As alluded to in earlier chapters, many dairy farmers have increased their size of operation through equipment and land purchases in an attempt to maintain or increase net income. In doing so, loan payments on such purchases have become a large proportion of farm expenses and have created cash flow and debt repayment problems for some operators. For new entrants into dairy farming and for those contemplating expansion, some form of leasing and/or rental agreements with operators exiting the industry may be a more feasible approach.

A second possible resource adjustment within the individual dairy farm might consist of shifting some resources currently employed in milk production to other farm enterprises. Such shifting of resources by dairy farmers will necessarily involve careful consideration of a number of economic and physical factors which vary considerably between areas within the Northeast region. Climate, soil type, topography, capital, land, labor requirements, economic size of the enterprise, and farmer preference for a particular enterprise are major factors. Some enterprises that might be considered include grains (corn, wheat, oats, and soybeans), forage crops, beef cattle, hogs, sheep, dairy replacement heifers, vealers, poultry and eggs, and a variety of vegetable crops.

The data in Table 1 show the total value of sales for selected products for eleven Northeastern states. Sales of dairy products clearly dominate in the region. These data provide some insight into the diversity of agricultural activities in the region,

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[1] There are some dairy farmers who will find limited expansion profitable where fixed resources are currently underutilized.

Table 1. Value of Agricultural Products Sold in the Northeast by States, 1978.[ab]

Product	Conn.	Del.	Maine	Md.	Mass.	N.H.	N.J.	N.Y.	Pa.	R.I.	Vt.	TOTAL[c]
					(Product Value in Million Dollars)							
Hay	2		3	6	2	1	9	31	48		3	105
Wheat				8				5	30			43
Corn Grain		23		69			11	42	160			305
Soybeans		41		65			37		16			160
Dairy	71	14	73	172	67	38	59	1,086	1,165	6	240	2,992
Cattle and Calves	13	4	15	50	10	8	14	141	283	1	37	537
Hogs and Pigs	2	9		22	8	1	8	18	80	1	1	149
Broilers		182	94	241					127			644
Eggs	52	7	101	17	19	12	18	71	180	3	8	489
Potatoes	3	5	80		5		8	49	28	4	1	183
Sweet Corn	2			3	4		6	14	8			37
Tobacco	23			34	9				16			59
Tomatoes				5	3		16	7	9			40
Snapbeans				3			5	22				30
Peaches				3			16		15			35
Apples	6	1	11	9	13	7	12	93	76		6	227

[a] No entry in a column of the table indicates zero or less than one million dollars of sales.

[b] Sales of other products of one million dollars or more consist of (sales in millions of dollars are in parentheses):

Oats.....N.Y.(9),Pa.(9)
Cucumbers..Md.(4),N.J.(5)
Onions.....N.Y.(31)
Cherries....N.Y.(20)
Cabbage.....N.J.(7),N.Y.(24)
Escarole....N.J.(4)
Peppers.....N.J.(7)
Grapes.....N.Y.(46),Pa.(10)
Cauliflower N.Y.(5)
Lettuce.....N.Y.(7),N.J.(6)
Cranberries Mass.(21),N.J.(4)

[c] Total value of agricultural products sold in the region.

Source: U.S. Census of Agriculture, 1978.

as well as what might serve as potential enterprises in the Northeast if resources employed in milk production were reduced.

Grains and Forage Crops

The Northeast is a grain deficit region. Most feed grains and forage produced by dairy farmers are utilized for milk production. Numbers of cash grain farmers in the area are small. Some potential may exist for local grain production to replace some imported grain. Any consideration by the dairy farmer of producing grains and forage for cash markets and/or other livestock enterprises on the farm must include careful assessment of a number of physical and economic factors. In many areas of the Northeast, climate, soil, and topography are major limiting factors. Other constraints include capital and land availability for sufficient economic size of operation and market access for products.

Beef Cattle and Hogs

Pennsylvania is the major meat animal producing state in the Northeast, and accounts for about 53 percent of cash receipts in the region from the marketing of meat animals.[2] Although beef and hog production in Pennsylvania has increased during the last five years, the number of marketing and slaughter facilities has been reduced drastically because of the lack of sufficient volume to operate at economically efficient levels. Development of such market outlets are a necessity for expanded meat production in the Northeast.

The production of grass fed and lightly finished beef may be a feasible additional enterprise for some dairy farmers, assuming consumer preference continues to tend toward less finished beef. The Northeast, however, has traditionally been a market for highly finished beef. Some highly finished beef cattle feeding as an additional enterprise to dairy may be economically feasible during certain time periods. The beef cow-calf enterprise may be feasible in the region for some farmers, but climate, feed availability, land requirements, and lack of sufficient markets for feeders may place limitations on this enterprise.

Hog production may be an enterprise to which some resources might be shifted from milk production. Grain input per pound of pork production is less then for beef, and pork may have a relative

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[2] U.S. Department of Agriculture. "Economic Indicators of the Farm Sector, State Income and Balance Sheet Statistics." Economic Research Service. 1981.

advantage over highly finished beef in a grain deficit area. In addition, land requirements would be less than for beef. Some existing facilities used for dairy operations might be employed in hog production, but additional facilities and equipment would likely be required. Adequate marketing and slaughter facilities also pose a problem for hog production.

Sheep

The Northeast region has been a major market for lamb. However, the per capita consumption of lamb nationally is extremely low relative to other red meats and poultry. The market for wool has faced stiff competition for many years from imports and synthetic materials. A shift of some resources such as feed and physical facilities out of milk production to the sheep enterprise might be an alternative for some. The sheep enterprise may be more adaptable in terms of some physical factors (e.g., soil, topography, and climate) to the northern section of the Northeast than a number of other agricultural enterprises. As with the beef and hog enterprises, market access in terms of marketing and slaughtering facilities would be a problem confronted by the sheep raiser.

Dairy Calves for Veal Production and Dairy Heifer Replacements

Veal calf production may utilize a number of resources already possessed by the dairy farmer. The nature of veal production requires a high level of skilled management and could prove a challenging additional enterprise for many dairy farmers. Per capita consumption of veal is low in the United States relative to other meats and poultry. Market outlets for new producers may be a limiting factor since veal is consumed primarily in the hotel and restaurant trade.

The milk producer has an alternative in shifting some resources such as feed and physical facilities into the production of replacement heifers for other dairy farm operators. Market demand for fluid milk and dairy products, and numbers of dairy cows required to satisfy such demand, will be a limiting factor to the economic feasibility of the heifer replacement enterprise.

Poultry and Egg Production

Poultry and/or egg production does not appear to be very feasible as an additional enterprise for the dairy farmer. The broiler industry is highly integrated and concentrated, with the market being difficult "to crack" for the independent producer. The start-up costs for facilities and equipment would seem prohibitive for the producer in those frequent cases where one is paid only for his labor under a contractual arrangement with a feed or processing firm.

The high degree of capital investment, the size of operation required, and the decline in per capita egg consumption limits the egg enterprise as a viable alternative. The trend toward increasing vertical integration in the egg industry presents problems similar to those which would be encountered in the broiler enterprise.

Vegetable Crop Production

Dairy farmers in certain areas of the Northeast might find some types of vegetable production feasible in utilizing some of the resources of the dairy enterprise. Some land and equipment could be transferred from forage to the production of vegetable crops. Irrigation equipment is likely to be essential, and labor and management requirements are high in this type of enterprise. Access to markets is a major consideration along with the determination of production for fresh markets versus processed markets. Production for the fresh market appears to be most advantageous in the Northeast given the comparative advantage other regions have for producing vegetables for the processed market.

Shifting Resources Totally From Dairy Farming to other Farm Enterprises

It is rather unlikely that large numbers of dairy farmers in the Northeast would shift completely out of dairy production into another new farm enterprise. Past studies indicate that the majority of operators having left dairy farming either retired or

sought non-agricultural employment.[3] Some older dairy farmers did shift to other farm activities during the transition period prior to retirement.

A possible reduction in resources employed in the dairy industry may come about by a decrease in the number of potential new entrants and the shifting of these resources into other feasible farm enterprises. Public policy aimed at assisting new entrants and current dairy operators into farm enterprises other than dairy may take the form of research and education, or loans and compensation.

Resource adjustment involving the transfer of resources out of the dairy industry and into other farming activities may be achieved through three major approaches or some combination of three approaches. A policy of reliance on the marketplace will gradually encourage resources to shift within as well as out of the dairy industry, but may result in economic and social hardship for some, at least in the short run. A public policy of education and research may be directed toward a goal of resource adjustment in the dairy industry. Finally, a policy of loans and/or direct compensation to producers might be developed to assist current dairy farmers or aspiring dairy farmers to employ their resources in alternative farm enterprises.

Public Policy Programs

Federal, state, and local governments have long supported education and research programs related to agricultural production and marketing. Increased programming which focuses specifically on the dairy problem in the Northeast may be economically, socially, and politically desirable. Research efforts would include identifying and evaluating (1) the economic feasibility of alternative enterprises to the dairy operation, or of farming systems which combine dairy farming and alternative enterprises, and (2) the economic, social and institutional barriers to resource adjustment in the dairy industry (e.g., finance, labor mobility, lack of markets, individual and family values, etc.). Extension education efforts could be aimed at assisting farm families to cope with issues related to resource adjustments on dairy farms and in shifting resources to other farm enterprises.

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[3] See L. W. Zuidema. "A Study of the Withdrawal of Farms and Farmers from Dairying in Two Areas of New York State Between 1958 and 1963." M.S. Thesis, Cornell University. June 1964, and J. R. Cummings. "Structural Adjustment in the Ontario Dairy Farm Sector, 1971-76." Economic Working Paper. Agriculture Canada. December 1980.

Government agencies might be directed to offer long term, low interest loans to potential farmers interested in alternative farm enterprises identified as economically feasible. Compensation payments may be provided to dairy farmers opting for retraining and/or for losses sustained when disposition of assets employed in dairying do not provide a "fair" return. Such programs may also be employed in supporting the transfer of resources from dairying to non-agricultural employment.

Transfer of Resources From Dairy Farming to Non-Agricultural Employment

Resources have been exiting from agricultural to non-agricultural employment in the United States during most of the 20-th century. In the dairy industry, as pointed out earlier in this report, numbers of dairy cows in the United States have been reduced by one-half over the last 25 years. Increased production per cow, however, has offset the decrease in numbers of dairy farmers and cows. In the Northeast, numbers of dairy farms and of dairy cows have decreased, but herd size has increased.

The marketplace has been influencing resource adjustments within the Northeast dairy industry since the 1930s. Adjustments have also taken place in the form of resource transfer from the dairy industry to non-agricultural employment.

Dairy Operator Characteristics and Their Influence On Resource Transfer Out of Agriculture

Past studies have identified a number of factors which affect the resource adjustment process. Age of farmer, educational level, skills, economic viability of the current farm operation, off-farm employment opportunities, and preference for farming and individual farm enterprises have been major factors.

Changes in number of farm operators and in the number of operators between age groups over time have important implications for resource adjustment in the future. The total number of dairy farm operators in the three major dairy states in the Northeast --- New York, Pennsylvania, and Vermont --- has declined dramatically, indicating that resource adjustments have been taking place (Table 2). Dairy farm operators with sales of more than $2,500 in each of the states in 1959 were: 38,091 in New York, 30,774 in Pennsylvania, and 7,551 in Vermont. In 1978, the number of operators for each of these states was: 15,462 in New York, 14,135

in Pennsylvania, and 3,198 in Vermont.[4] Recognizing the lack of direct comparability for some of the Census data between 1978 and 1959, the data should still provide generally meaningful comparisons over time. There has been a reduction of operators in each age group in all three of the states between 1959 and 1978 with the exception of the "under 35" age group between 1974 and 1978. It is difficult to sort out how much of the increase was due to "new entrants" into dairying, or may have been the result of the 1978 Census obtaining counts of small farms (farms with sales of less than $2,500) which were not accounted for in the 1974 Census.[5]

The change in the percentage distribution of dairy farmers for the three states in the "under 35" age group between 1959 and 1969 reflects what had been occurring at the national level for this group of farm operators since the 1920s. The "under 35" age group for the three states decreased from 15.8 percent of all dairy farm operators to 13.8 percent. The "65 and over" age group for the period, however, decreased from 11.5 percent to 10.3 percent. The "35 to 44" age group decreased from 24.3 percent to 23.2 percent, while the percentage distribution of dairy farm operators in age groups "45 to 54" and "55 to 64" increased from 27.2 percent to 29.5 percent and from 21.1 percent to 23.1 percent, respectively.

There has been some change in the percentage distribution of dairy farmers by age groups between 1969 and 1978. Again, one must consider the possible impacts of the adjustment for small farms in the 1978 Census. From 1969 to 1978, operators "under 35" increased from 13.8 percent to 18.3 percent of all dairy farmers in the three states. Dairy farmers "65 and over" continued to be a decreasing proportion of total dairy farm operators, declining from 10.3 percent in 1969 to 8.3 percent in 1978. The percentage distribution of operators in the "35 to 44" age group declined slightly from 23.2 percent to 22.4 percent. The "45 to 54" age group declined from 29.5 percent to 27.9 percent while the "55 to 64" age group percentage distribution remained constant at 23.1 percent.

A look at net entries and withdrawals of dairy farm operators in New York, Pennsylvania, and Vermont for 1959, 1969, and 1978 (Table 3) may be helpful in assessing the resource adjustment process which has been taking place. There were 20,779 dairy farmers in the "45 to 54" age group in 1959. By 1978, the "65 and over" age group had

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[4] The 1978 Census of Agriculture includes data for all farms classified by specific characteristics. In earlier censuses, comparable data were tabulated only for farms with sales of $2,500 or over. Data for farms with sales of less than $2,500 in 1969 and earlier censuses are not directly comparable to 1974 and 1978 data because of changes in the definition of a farm.

[5] The 1978 Census of Agriculture for Pennsylvania recorded 166 dairy farm operators in the category with sales of less then $2,500. There were 2,780 dairy farm operators in Pennsylvania in the age group "under 35".

Table 2. Number of Dairy Farm Operators by Age Group in New York, Pennsylvania, and Vermont for Census Years 1959, 1964, 1969, 1974, and 1978.

	1978	1974	1969	1964	1959
All Age Groups					
New York	15,462	17,025	21,711	30,841	38,091
Pennsylvania	14,135	15,536	19,162	26,025	30,774
Vermont	3,198	3,328	4,017	5,769	7,551
Total	32,795	35,889	44,890	62,635	76,416
Under 35 Age Group					
New York	2,609	2,409	2,884	4,312	5,559
Pennsylvania	2,780	2,332	2,754	4,024	5,445
Vermont	603	549	540	759	1,106
Total	5,992	5,290	6,177	9,095	12,110
35 to 44 Age Group					
New York	3,580	3,666	4,852	7,348	8,974
Pennsylvania	3,020	3,325	4,588	6,844	7,973
Vermont	746	711	985	1,368	1,694
Total	7,346	7,702	10,425	15,560	18,641
45 to 54 Age Group					
New York	4,248	5,063	6,323	8,595	10,380
Pennsylvania	4,022	4,837	5,824	7,466	8,217
Vermont	874	970	1,130	1,680	2,182
Total	9,144	10,870	13,277	17,741	20,779
55 to 64 Age Group					
New York	3,701	4,164	5,142	6,832	8,402
Pennsylvania	3,195	3,580	4,246	5,157	6,031
Vermont	682	731	957	1,284	1,655
Total	7,578	8,475	10,345	13,273	16,088
65 and Over Age Group					
New York	1,324	1,723	2,510	3,754	4,776
Pennsylvania	1,118	1,462	1,751	2,534	3,108
Vermont	293	367	405	678	914
Total	2,735	3,552	4,666	6,966	8,798

Source: U.S. Census of Agriculture.

Table 3. Net Entries and Withdrawals of Dairy Farm Operators in New York, Pennsylvania, and Vermont in 1959, 1969, and 1978.[a]

1959		1969		1978	
Age Group	Operators	Age Group	Operators	Age Group	Operators
45 to 54	20,779	55 to 64	10,345	over 65	2,735
35 to 44	18,461	45 to 54	13,277	55 to 64	7,578
under 35	12,110	35 to 44	10,425	45 to 54	9,144
		under 35	6,177	35 to 44	7,346
				under 35	5,992

[a] Includes dairy farm operators with sales of $2,500 or more for 1959 and 1969.

a total of 2,735 operators. There were also withdrawals of dairy farmers by 1978 for the other age groups farming in 1959 and 1969 with the exception of the "under 35" age group in 1969. In 1969, there were 6,177 dairy operators "under 35" and by 1978 that group reflected an increase to 7,346 operators.

The "under 35" age group entering dairy farming declined considerably from 1959 to 1969. The change from 1969 to 1978, however, does not appear to be significant when compared with that of the previous decade.

A question of significance is what will happen in the future relative to entries into and withdrawals from dairy farming between and within age groups. Of the 32,795 operators in 1978 in three of the major dairy states and for all dairy operators in the Northeast, how many are likely to (1) continue in dairy farming at a constant or increased size, (2) become involved in farm enterprises other than dairying, or (3) retire or find new employment in the non-agricultural sector? Age, education, level of skills, off-farm employment opportunities, etc. will be important determinants. Two studies concerning resource adjustment related to dairying (one in the 1960s and one in the 1970s) provide some insights on the importance of these factors.[6]

[6] Zuidema and Cummings, op. cit.

In the Canadian study 15,000 dairy farmers left dairying between 1971 and 1976. Forty-seven percent of these dairy farmers took up a non-dairy farm enterprise and 53 percent exited from farming. Of the 53 percent who exited from farming, the author indicated that 18 percent were probably retiring from farming while the remaining 35 percent were seeking full-time off-farm employment. Dairy farmers adjusting out of dairy farming were offset to some degree by some 5,000 new dairy farmers. Some specific findings of the study relative to the farmers studied were:

1. Between 1971 and 1976 almost 8,000 dairy farmers exited completely from farming. Their average age in 1971 was 53 years. Of these, 51 percent and 42 percent had dairy cow herd sizes of 3-17 and 18-47, respectively.[7] Eight percent of exiting dairy farmers were under 35 years of age, over 40 percent were between 35 and 55 years of age, 32 percent were between 55 and 64 years of age, and 18 percent were over 64 years of age.

2. For those staying in dairy production in all herd sizes, it was generally the younger age groups who expanded herd sizes over the period 1971-76. These dairy farmers had fewer days of off-farm employment as well.

3. The most numerous farm enterprises entered into by farmers adjusting out of dairy were by rank order, beef cattle (the most prevalent among the smaller dairy operators), small grains (most prevalent among the larger dairy operators), and hog production. These three alternatives accounted for 89 percent of the exiting farmers. The smaller dairy farmers (those in the herd size categories of 3-17 and 18-47 cow herds) accounted for over 96 percent of the farm enterprise changes noted.

4. For new entrants into dairy in 1976, the majority of operators (58.4 percent) were in the smallest herd size group.

5. Over 58 percent of the exiting dairy farmers giving up farming entirely or moving into alternative farm enterprises were in the smallest herd size group.

6. Dairy farmers expanding their dairy enterprise or adjusting to a non-dairy enterprise which would generate sales comparable to a constant or expanding dairy enterprise were younger than those farmers reducing the size of dairy enterprise or adjusting to a non-dairy enterprise with a

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[7] Other herd size groups delineated in this study were 48-92 cows and 93 cows and over.

lower level of sales.

7. Days of off-farm work declined during the study period for expanding and constant sized dairy farmers while days of off-farm work increased for farmers reducing the size of their dairy operation or adjusting to another farm enterprise.

The New York State study was conducted on a much smaller scale. It looked at the characteristics of 118 former dairy farmers in two areas of New York for the period 1959-63. Some specific findings of this study were:

1. The decline in dairy farms was, for the most part, comprised of small farms with low per cow milk yields.

2. Eighty-four percent of the dairy operators who ceased milk production for physical reasons were over 54 years of age while over one-half who gave economic reasons for ceasing milk production were between 35 and 54 years of age.

3. The majority of discontinuing farmers owned, managed or rented out the farm for crops and pasture with about 25 percent selling the farm.

4. About two-thirds of the "adjusted out" farmers secured other employment, 28 percent retired from farming, and 8 percent were unemployed at the time of the study.

5. Approximately 20 percent of the former dairy farmers were employed as unskilled laborers. Of those who had 8 years or less of formal education, over one-half were unemployed or were employed as unskilled labor. Those who had specific job experience, either while dairying or before, were more easily absorbed into the job market.

6. After discontinuing dairy farming, the family income of the former dairy farmer was greater than or the same as while engaged in dairy farming in 91 percent of the cases.

7. In terms of the current (1963) use of resources employed by former dairy operators, 75 percent of the land was being used for crop production, about two-thirds of the barns were being used for various purposes but mainly for farming, and about one-half of the equipment and tools had been sold.

Non-Agricultural Employment Opportunities In the Northeast

Currently, unemployment is a major problem in the United States economy. In the Northeast region, the growth of total employment and manufacturing employment has lagged behind other regions during the sixties and seventies.[8] Fuller's findings on total employment, manufacturing employment, and unemployment in the Northeast during the 1960s and 1970s has implications for potential resource transfers from the dairy industry to non-agricultural employment.

There was a slowdown in the growth rate of total employment in the Northeast relative to the national rate during the 1960s and 1970s. Further, the lag in employment growth was greater in the Middle Atlantic States (New Jersey, New York, and Pennsylvania) than in New England. New York, Pennsylvania, and Vermont are the three major states in the Northeast in terms of milk production and cow numbers.

During the 1960s and 1970s, total employment in the Northeast showed a higher annual rate of growth in nonmetro areas (areas with less than 50,000 population), than in metro areas. Again, differences between areas of the Northeast were apparent. Total employment growth in nonmetro areas in New England during the 1970s exceeded the national rate while nonmetro areas in the Middle Atlantic States experienced slower growth. New York and Pennsylvania showed average to slow growth in nonmetro areas and mostly slow growth in metro areas from 1971 to 1978. Vermont showed average to fast growth in nonmetro total employment during the same period.

Another consideration in evaluating potential employment opportunities in a region is the mix of slow and fast growth industries as compared to the national average. Fuller's analysis indicates that New England in the 1960s and 1970s had an above average proportion of employment in fast growing industries while this proportion for the Middle Atlantic States was average to below average. Any appraisal of non-agricultural employment opportunities for exiting dairy farmers and/or farm family members and for those who adjust to other farm enterprises will require a more specific look at nonmetro and metro regions between and within states of the Northeast. Also, the ability to take advantage of off-farm employment opportunities may be a function of the size of the dairy

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[8] Theodore E. Fuller. "The Northeast: Two Decades of Slow Employment Growth." Northeast Regional Center for Rural Development. Publication #31. May 1982. Fuller's analysis excluded Delaware, Maryland, and West Virginia because the employment structure and/or the employment growth rate in these states were considerably different than in New England or in the Middle Atlantic States.

herd, since larger size dairy farmers tend to have little or no days of off-farm employment.

The potential for non-agricultural employment opportunities can be illustrated by several specific examples. In Vermont, for example, nonmetro areas have exhibited average to above average growth in employment. Orleans County in Vermont had an above average growth rate in employment from 1971 to 1978. This county had a dairy cow population of 26,000 in 1978 with 69 percent of the cows in dairy herds of 50 or more cows. A potential may exist in a county such as Orleans for non-agricultural employment for some dairy farmers or farm families. But, in Schoharie County, New York where there were 15,000 dairy cows in 1978 with 60 percent in herds of 50 or more cows, there was a decline in growth of total employment. A number of nonmetro counties in New York state with a significant number of dairy cows experienced slow growth in total employment. Lancaster County, Pennsylvania --- a metro area with 82,000 dairy cows and 46 percent in herds of 50 or more cows --- showed an average rate of growth in employment. But surrounding metro counties in southeast Pennsylvania with dairy cow populations ranging from 15,000 to 20,000 experienced slow growth in total employment. Five nonmetro counties in Central Pennsylvania with a total population of 43,000 dairy cows experienced slow growth in employment. The percentage of cows in herd sizes of 50 or more cows in these latter counties ranged from 31 to 62 percent. Windham County, Connecticut located in a nonmetro area, had 11,000 dairy cows 90 percent in herds of 50 or more cows. Its experience has been opposite that of Orleans County, Vermont having a slow growth in employment during 1971-78.

From the above examples it is clear that generalizations about non-agricultural employment potentials applicable to all counties in the region cannot be made. Each county needs to be examined in detail and as a special case.

Implications

Resource adjustment in United States agriculture has generally been a gradual process over time. Price and income support for dairy farmers as afforded by federal dairy policy of the past has at times hindered the process. It does not focus on the human resource adjustment problems. Federal, state and local support has been available for research and education for the dairy sector. Its major emphasis has been on matters of efficiency, although some attention has been given to resource adjustment issues by agricultural scientists.

Census data clearly indicate that resources have in the past transferred out of the dairy industry in the Northeast. The number of dairy operators in all age groups except the "under 35" age group

dropped noticeably from 1969 to 1978. The number of operators in the "under 35" age group dropped only slightly over that decade. It would appear that the number of operators under 35 has stabilized.

The supply of milk, however, continues to exceed demand requirements. Currently, political and economic pressure is being directed toward reduced price and income maintenance. Over the long haul, five to ten years, a policy to reduce milk prices will induce more resources to leave the industry. A society with a goal of reducing milk production during the next few years may want to consider a policy of assistance not only for those dairy operators who would be the "withdrawals" from the industry, but also for those operators in the young age group and the new entrants who will need to replace some proportion of the operators leaving the industry. In the young age group are found those dairy farmers who are beginning the expansion stage of the "dairy age cycle". Many of these operators are faced with cash flow and equity problems. Assistance may also be necessary for those dairy farmers "adjusting in" to other farm enterprises and for those "adjusting out" of farming altogether.

Two studies reviewed in this chapter have provided some insight into how dairy farmers with different attributes have adjusted to change in the industry --- some sucessfully and some not so successfully. Most shifting of dairy farm resources to alternative farm enterprises was from smaller size dairy operations. Most of the continuing dairy farmers who were expanding were in the younger age groups. A number of dairy farmers leaving farming entirely experienced some difficulty finding non-agricultural employment. Age, and educational and skill levels appear to be important factors in their rate of success. Finally, a major portion of the land and equipment of exiting dairy farmers continued to be employed, primarily in crop production. The above factors will most likely impact on adjustment in the Northeast dairy industry in the future. Programs of research, education, and financial assistance through use of loans and/or various incentives may ease the human resource adjustment process which will continue during the remainder of this century.

CHAPTER VI

IMPACT OF REDUCED MILK SUPPLIES ON DAIRY PROCESSING AND SERVICE INDUSTRIES

David E. Hahn
Andrew Novakovic
James Pratt*

Dairy farmers in the Northeast rely on input suppliers, particularly feed dealers, and milk processing plants for the production and marketing of milk and dairy products. Economic changes affecting dairy farmers also affect the input suppliers and milk processing firms. The purpose of this chapter is to examine the potential impact of lower milk prices at the producer level, and hence lower milk supplies, on the dairy processing and service industries.

Feed Industry

In addition to the milk processing industries, several input industries are closely related to milk production. Among the numerous expenditures made by dairy farmers today, those for livestock feed are the largest. The production of feed varies considerably from one region to another. Three major feed producing regions are (in order of importance) the Corn Belt, the Southern Plains, and the Northeast. The Corn Belt is the major producer of hog feed whereas the Southern Plains is the major producer of feed for beef cattle and sheep. Dairy feed is produced primarily in the Northeast and the Lake States. The feed industry is dominated by manufacturing firms which handle a large volume of feed. However, about 20,000 retail feed dealers in the United States account for only about 60 percent of retail feed sales.

No comprehensive study of the feed manufacturing and distribution industry in the Northeast has been conducted, although a study of the New York feed and fertilizer industries has recently been

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completed.[1] It is assumed that the structure and characteristics of the New York feed industry is representative of the Northeast. This study reports that the bulk of the feed used in New York State is consumed by milk cows. This feed was distributed primarily by small feed firms (Table 1). Of the 345 firms participating in this study, approximately two-thirds sold less than 5,000 tons.

Table 1. Distribution of Feed Firms by Sales, New York, 1979.

Sales in Tons	Number of Feed Firms
1 - 5,000	223
5,001 - 10,000	70
10,001 - 15,000	18
15,001 - 20,000	4
20,001 - 25,000	4
25,001 - 30,000	2
30,001 - 35,000	3
35,001 - 40,000	2
40,001 - 45,000	1
45,001 - 50,000	3
over 50,000	15
TOTAL	345

Source: Anderson, Bruce L. op. cit.

[1] Anderson, Bruce L. "The New York Feed and Fertilizer Industries: Structure, Characteristics and Input Movements." Department of Agricultural Economics, Cornell University. AE Res. 81-26. October 1981.

Fluid Milk Processing Industry

The structure of the fluid milk processing industry has undergone considerable change during the past 30 years. As shown in Table 2, the number of fluid milk processing plants decreased by nearly 90 percent from 1948 to 1980. However, the increased volume processed per plant has compensated for the loss in plant numbers. Nationally, average volume per plant increased from 1 593 gallons daily in 1952 to 12 053 gallons daily in 1976.[2]

The relationships between plant volume and survival in the Northeast were consistent with national trends during this same period. Currently, 450 fluid milk processing plants are packaging fluid milk in the Northeast. The locations of these plants are shown in Figure 1. Of these 450 plants, approximately one-third process less than 500,000 pounds per month. These plants account for approximately one percent of the fluid milk processed in the region. Twenty-seven large plants in the Northeast package more than 20 million pounds of milk per month, and account for nearly 40 percent of the milk processed in the region.

Manufacturing Milk Industry

The primary function of manufacturing milk plants is to provide manufactured dairy products for consumers. In addition, manufacturing milk plants also perform a balancing function in various periods throughout the year. Grade A supplies of milk are substantially in excess of fluid milk requirements. This is particularly true through the May-June period, but it is also a weekly occurrence as Friday, Saturday and Sunday producer milk deliveries must be accommodated even while fluid milk processing plants are shut down for the weekend. Furthermore, holidays interrupt the normal flow of market milk. Occasional strikes at processing plants require that surplus handling facilities be available when normal outlets for milk are not available.

The structure of the manufacturing milk industry has also undergone considerable change. The number of operating butter plants decreased from 1,152 in 1963 to 238 by 1981. The number of cheese plants followed the same trend. In 1965 there were 1,207 cheese plants in the United States, and by 1981 this number had decreased to 725.

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[2] Williams, Sheldon, and James W. Gruebele. "Structural Changes with Some Implications for Behavior and Performance for Fluid Milk Processing Firms, Illinois, 1950-1980." North Central Journal of Agricultural Economics. 4 2:64. July 1982.

Table 2. Number of Fluid Milk Processing Plants Operated by Commercial Processors, United States, 1948-1980.[a]

Year	Number of Plants	Percent Decrease From Preceding Year
1948	8,527	---
1949	8,299	2.7
1950	8,195	1.3
1951	7,867	4.0
1952	7,508	4.6
1953	7,238	3.6
1954	6,979	3.6
1955	6,726	3.6
1956	6,472	3.8
1957	6,187	4.4
1958	5,888	4.8
1959	5,571	5.4
1960	5,328	4.4
1961	4,959	7.0
1962	4,683	5.6
1963	4,442	5.1
1964	4,103	7.6
1965	3,743	8.8
1966	3,379	9.7
1967	2,978	11.9
1968	2,656	10.8
1969	2,473	6.9
1970	2,216	10.4
1971	2,096	5.4
1972	1,859	11.3
1973	1,627	12.5
1974	1,484	8.8
1975	1,408	5.1
1976	1,361	3.3
1977	1,284	5.7
1978	1,215	5.4
1979	1,135	6.6
1980	1,076	5.2

[a] Source: Manchester, Alden C. "Market Structure, Institutions, and Performance in the Fluid Milk Industry." Economic Research Service, USDA. A. E. 248. January 1974 and private conversation with Alden C. Manchester.

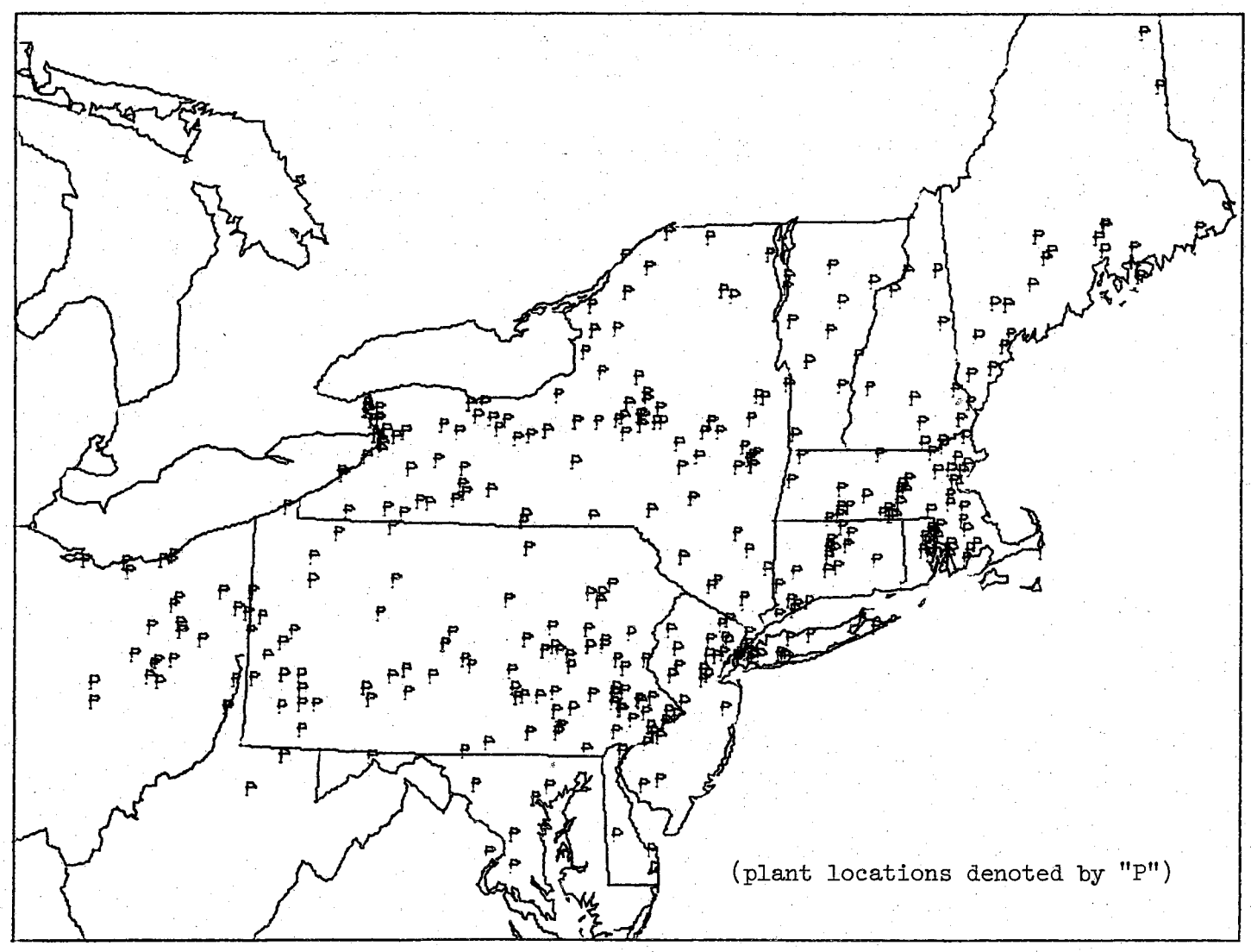

Figure 1. Geographic Location of Fluid Milk Product Processing Plants in the Northeast, 1982.

Source: Published and unpublished data from State Departments of Agriculture and Federal Milk Marketing Orders.

Plant survival in the Northeast followed this same trend. In 1965 there were 102 butter plants and 171 cheese plants operating in the Northeast. Currently there are only 106 butter and cheese plants combined. In addition, there are 39 plants manufacturing soft, or Class II, products for a total of 145 plants. The locations of these plants are shown in Figure 2.

Plant Costs

The producer price for milk in dairy products is only one part of the final retail price. To put these costs in perspective, processing costs are presented for fluid milk and butter in Table 3. The farm share accounts for only 55 percent of the retail store price for fluid whole milk and two-thirds of the retail price of butter.

New technology and the subsequent economic forces have been the primary factors in causing a milk processing structure of fewer firms and plants distributing milk over larger and larger marketing areas. Size economies dictate that current fluid milk capacity should start with a processing capacity of 5 million pounds per month (see Table 4 and Figure 3).

Table 3. Farm Value, Marketing Costs by Function and Retail Prices for Grade A Whole Milk and Butter, in the United States, 1981.

Market Function or Level	Whole Milk Sold in Stores	Butter
	(cents/half gal)	(cents/lb)
Farm Value	61.8	132.5
Procurement	4.1	4.7
Processing	14.9	20.2
Wholesaling	15.0	11.4
Retailing	16.0	30.5
Retail Price	111.8	199.3

Source: Webster Jones. "Costs and Margins for Fluid Whole Milk and Butter", Dairy Outlook and Situation. USDA. March 1982. pps. 23-27.

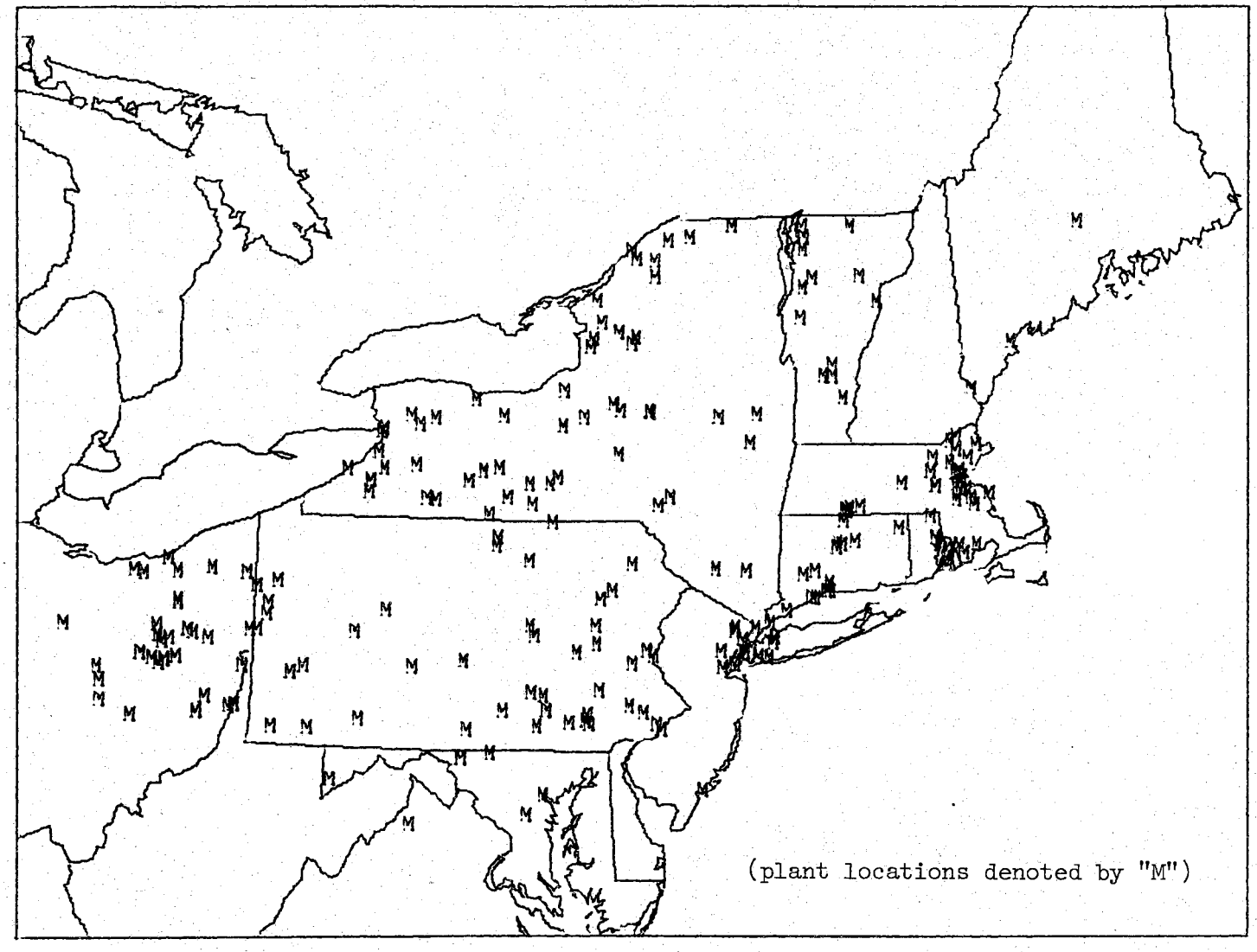

Figure 2. Geographic Location of Dairy Product Manufacturing Plants in the Northeast, 1982.

Source: Published and unpublished data from State Department of Agriculture and Federal Milk Marketing Orders.

Table 4. Fluid Milk Processing Costs in the Northeast, 1980.[a]

Monthly Volume of Milk Processed	Cost Per Cwt.	Monthly Volume of Milk Processed	Cost Per Cwt.
(pounds)	(cents)	(pounds)	(cents)
250,000	487	20,000,000	253
500,000	418	25,000,000	249
1,000,000	364	30,000,000	246
2,500,000	313	35,000,000	244
5,000,000	286	40,000,000	243
10,000,000	267	45,000,000	241
15,000,000	258	50,000,000	240

[a] B. J. Smith. Unpublished report. The Pennsylvania State University. 1982. The costs shown here are based on the following functional relation:

$$APC = 217.98581264 - 115.63021309V^{-1} + 498.62107029V^{-1/2}$$

where:

APC = Cost of processing milk, cents per cwt., and
V = Volume of milk processed per month in thousand pounds.

At monthly volumes greater than 50,000,000 pounds, processing costs remain constant at 240 cents per hundredweight of milk processed.

This function pertains to the year 1980 and to a plant with a full line of fluid milk products.

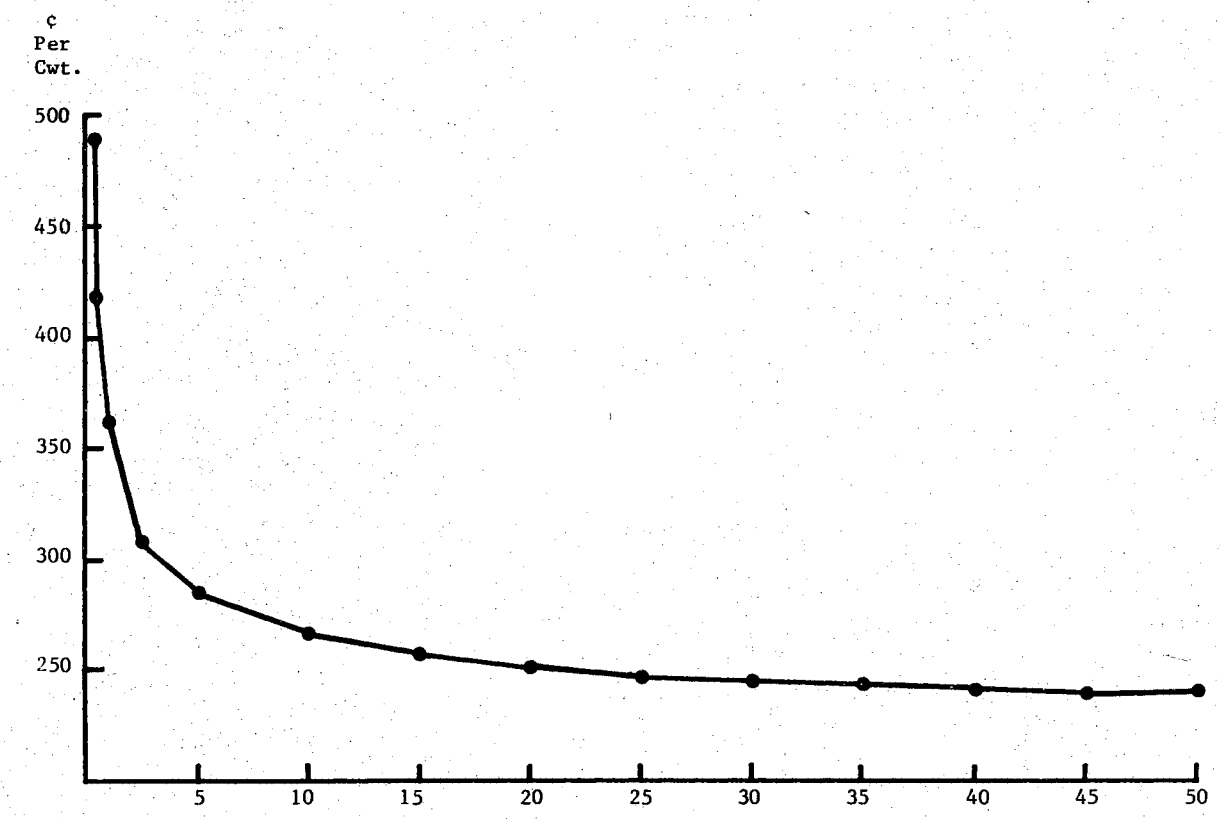

Figure 3. Fluid Milk Processing Costs, Northeast Region, 1980.

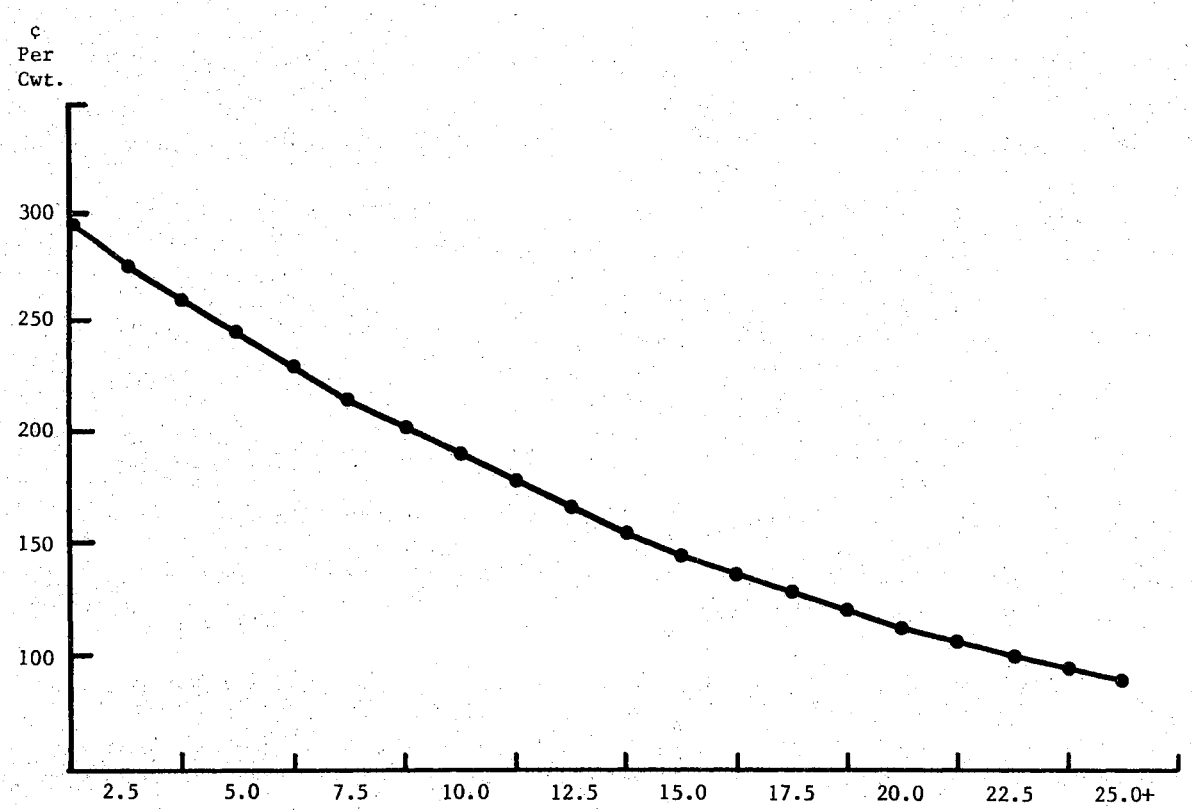

Figure 4. Hard Products Manufacturing Costs, Northeast Region, 1980.

Butter, Non-Fat Dry Milk, and Cheese Processing Costs

The current "make allowance" established by the price support authority for butter and non-fat dry milk is $1.22 per hundredweight of milk processed --- approximately 10 8 cents per pound for non-fat dry milk and 7.2 cents per pound for butter. The current "make allowance" for cheese is $1.37 per hundredweight of milk processed --- approximately 13.6 cents per pound of cheese. (see Table 5 and Figure 4). Only manufacturing firms with very large volumes can profitably manufacture cheese or butter and non-fat dry milk with the current "make allowances".

Transportation

The movement of raw milk from the firm to the processing plant and then to the ultimate consumer are important links in the marketing system. The unique characteristics of milk (its perishability and bulkiness) increases the importance of this marketing function.

The costs of moving milk and dairy products have increased substantially during the past several years. For example, one recent study of the hauling of bulk milk shows that between 1969 and 1979, fixed costs increased approximately 120 percent (Table 6). Increases in equipment costs and related insurance costs account for this large increase. During this same period, variable costs increased by approximately 178 percent. Variable costs in all categories increased. As might be expected driver labor and fuel costs increased the most. As truck costs and labor and fuel costs continue to increase, transportation costs become an even more important segment of the marketing complex. A recent study, however, indicates the potential exists for significant reductions in miles traveled in farm-to-plant milk assembly[3], and hence in transportation costs.

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[3] Jean Sehulster. "Potential for Increasing Efficiency in Milk Assembly: A Case Study in Cortland County New York". Unpublished M.S. Thesis. Cornell University. 1983.

Table 5. Manufactured Products Processing Costs in the Northeast, 1980.[a]

Monthly Volume of Milk Processed	Cost Per Cwt.	Monthly Volume of Milk Processed	Cost Per Cwt.
(pounds)	(cents)	(pounds)	(cents)
1,250,000	294	13,750,000	155
2,500,000	277	15,000,000	145
3,750,000	261	16,250,000	136
5,000,000	245	17,500,000	127
6,250,000	230	18,750,000	119
7,500,000	216	20,000,000	112
8,750,000	202	21,250,000	106
10,000,000	190	22,500,000	100
11,250,000	178	23,750,000	95
12,500,000	166	25,000,000	90

[a] B. J. Smith Unpublished report. The Pennsylvania State University. 1982. The costs shown here are based on the following functional relation:

$$APC = 311.50087426 - 1.43978930V + 0.00221754V^2$$

where:

APC = Cost of processing milk, cents per cwt., and
V = Volume of milk processed per month in thousand pounds.

At monthly volumes greater than 25,000,000 pounds, processing costs remain constant at 90 cents per hundredweight of milk processed.

This function pertains to the year 1980 and to a plant with a manufactured product mix of 60 percent cheddar cheese and 40 percent butter and non-fat dry milk powder.

Table 6. Transportation Costs for Hauling Bulk Milk in 6,000 Gallon Bulk Tankers, 1969, 1975, and 1979.

	1969[a]	1975	1979
Fixed Costs per year			
Depreciation:			
Tractor[b]	$ 320	$ 358	$ 770
Trailer[c]	1,120	1,261	1,680
Interest[d]	1,225	1,375	3,450
Road Tax (1.5 cents/mile and 40,000 miles/yr.)	600	600	600
Licenses	650	1,056	1,056
Insurance[e]	500	1,662	2,100
Total Annual Fixed Cost	$4,415	$6,312	$9,656
Average Daily Fixed Cost	$14.15	$20.23	$30.95
Variable Costs per mile			
Diesel Fuel[f]	$0.0600	$0.1000	$0.2000
Tires	0.0346	0.0488	0.0600
Repair and Maintenance	0.0342	0.0520	0.0800
Driver Labor[g]	0.0825	0.1788	0.2600
Depreciation[h]	0.0360	0.0403	0.0866
Total Variable Costs	$0.2473	$0.4199	$0.6866

[a] Adapted from M. C. Conner and T. D. McCullough. "Transfer and Distribution Costs for Milk to Distant Markets". Agricultural Economics Research Report #2. Virginia Polytechnic Institute and State University. June 1970.

[b] Based on purchase prices of $19,000 in 1969, $21,250 in 1975, and $45,000 in 1979. Ten percent of the capital is recovered on a straight line depreciation schedule for 5 years. The remaining 90 percent of capital is recovered through variable charges.

[c] Based on purchase prices of $13,000 in 1969, $14,600 in 1975, and $20,000 in 1979.

[d] Computed at 7 percent in 1969 and 1975, and 10 percent in 1979 on the average amount of unrecovered capital (investment) per tractor-trailer rig.

[e] $100,000/300,000 bodily injury; $100,000 property damage; fire, theft; and $500 deductible on collision.

[f] Fuel costs were $0.27 per gallon in 1969, $0.45 per gallon in 1975, and assumed to be $1,00 per gallon in 1979. Fuel mileage was 4.5 miles per gallon in 1969 and 1975, and 5 miles per gallon in 1979.

[g] Wage rate of $3 plus 10 percent fringe benefits per hour in 1969, $5.50 plus 25 percent fringe benefits per hour in 1975, and $8.00 plus 30 percent fringe benefits per hour in 1979.

[h] Ninety percent of depreciation schedule for tractor to provide for capital recovery over 400,000 miles.

Plant Ownership

In addition to plant and transportation costs, changing plant ownership also affects the structure of the industry. During the past two decades, plant ownership has shifted from national and regional chains and local proprietary firms to farmer cooperatives and food chains.

Between 1958 and 1970, the aggregate market share of the four largest national milk processors dropped from 25.8 to 18.8 percent of total milk sales, and that of the eight largest declined from 31.0 to 25.1 percent. Similarly, between 1964 and 1970, the proportion of the nation's fluid milk sold by national and regional firms declined from 32.3 to 31.0 percent; and that sold by local firms from 53.5 to 47.2 percent. The proportion sold by plants of integrated food chains increased from 4.5 to 10.3 percent, and that by farmer cooperatives from 9.7 to 11.5 percent.

In general, cooperatives view the handling of surplus milk as a high priority marketing function because market outlets are essential in order to guarantee their membership a market, and surplus handling facilities are necessary to strengthen their bargaining position. For the most part, cooperatives in the Northeast have individually pursued their own surplus handling strategy. With the current milk surplus, several cooperatives have acquired additional processing capacity. Of the 450 fluid processing plants in the Northeast, 27 are owned by farmer cooperatives, and 18 of the 145 manufacturing plants are owned by farmer cooperatives.

Retailers

Approximately 70 percent of all fluid milk products is currently sold through foodstores --- ten percent is sold through home delivery, and the remainder is sold to wholesale institutional accounts such as restaurants, schools, hospitals and factories. Prior to World War II, home delivery of fluid milk accounted for 70 percent of all fluid milk sales.

The marketing of fluid milk through foodstores, primarily supermarkets, has resulted in a change of market control from the processor to the supermarket. Supermarkets represent large volume accounts. These accounts frequently require private labelled containers. Management of the supermarkets have control over the shelf space for competing brands and of the prices paid by customers. Sometimes these prices are set at levels below cost to generate more store traffic. Larger supermarket chains also have sufficient volume to vertically integrate backward into fluid milk processing. Currently, 20 percent of the fluid milk in the United States is processed in plants operated by food chains.

Conclusions

As dairy farms become fewer in number and less dense geographically, the number of input suppliers will decrease. Added transportation costs, and the competition to serve a smaller population of farmers, will force many smaller supply firms out of business. Generally, these firms are not as specialized as are milk processing plants. This results in a smaller capitalized investment and more readily transferable resources for alternative uses.

The trend of fewer fluid processing plants will continue, and the small volume plants will be most vulnerable. As dairy farms become more dispersed, milk assembly costs will increase causing additional financial stress for these plants. Fluid processing plants generally contain very specialized equipment. This equipment frequently has little resale value. The plant buildings sometimes can be converted to other uses by food manufacturers. Some alternative uses for these resources do exist.

Maximum efficiency in butter and cheese plants usually is realized only when operating at or near capacity. However, plants handling the reserve supply for fluid markets seldom realize the efficiency possible from producing at capacity. Volume variability is regarded as the most significant factor influencing manufacturing costs. Therefore, manufacturing plants handling the reserve supply for the fluid markets in the Northeast frequently operate at a loss.

It should be noted that with the current surplus situation, more of the manufacturing plants are operating at capacity year round. This situation is causing many cooperatives in the region to acquire additional manufacturing capacity. Some of this additional capacity is being acquired through joint venture arrangements between dairy cooperatives through the acquisition of existing facilities currently owned by proprietary firms. If the government support price should decrease and supply more nearly match demand, the cooperatives may find that they have generated too much excess capacity. This could result in financial stress for the cooperatives and for their farmer members.

The trend toward cooperative and supermarket chain ownership of dairy processing plants will continue. Dairy cooperatives will be forced to acquire facilities to guarantee a market for members' milk. The larger supermarket chains have sufficient volume to vertically integrate backward into fluid milk processing.

CHAPTER VII

SUMMARY AND IMPLICATIONS

F. C. Webster*

It has been said many times that the marketing system for milk and dairy products is unique. Nearly everyone in our society uses dairy products, and milk is produced in every state of the union. Milk is perishable being a good medium for bacterial growth. Dairy marketing is highly regulated. Quality controls are strict. Economic controls reach almost every aspect of the dairy industry.

At the same time, dairy farmers have a tradition of independence. They struggle to keep their costs low and compete to produce more milk so as to increase the profitability of their farming operations. With the exception of limited areas under state orders, quotas have generally not been well accepted by dairy farmers. Base-excess plans have achieved considerable popularity to level out seasonal production. But the dog-eat-dog approach of producing for profit or going broke is almost universal in the United States dairy industry despite the underlying stability provided by price supports and marketing orders.

As a result of this situation, production per man and production per cow have jumped dramatically. Productivity per man in the last 30 years has increased ten-fold. Milk production per cow has nearly tripled.

Total United States milk production has increased, but the number of farms has dropped drastically. Yielding to the law of comparative advantage, some areas of the country reduced milk production while other areas increased their production. Generally, dairying has been sharply reduced in grain producing areas and in the Old South. Dairying has increased on the specialized farms of the Northeast, the Upper Midwest, and the Far West.

On the consumption side, United States population increased over 50 percent in the last 30 years, but consumption of dairy products per capita fell 30 percent. The net effect was a small increase of about ten percent in total consumption as against a 13 percent increase in milk production. In the Northeastern part of the United States, population increased only one percent in the last decade while milk production increased ten percent.

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Several dilemmas face the dairy industry because of this situation. The most pressing problem is that production has outpaced increases in consumption. Further, the decline in number of cow herds has not resulted in decreased output. In fact, the animals remaining in production generally have a higher genetic potential and are managed by farmers with better ability to achieve higher production.

Secondly, per capita consumption of dairy products is down. The exact amount of dairy products which have been displaced by substitutes or by competing products is hard to define. Some estimates indicate that dairy products have lost at least one-third of their market. It is clear that other beverage industries spent a great deal more than did the dairy industry in promoting their products, and have been successful in increasing their share of the market. Margarine, synthetic cheese, and replacements for dried skim milk have come onto the market in recent years. One can only guess at the amount of dairy products which could be sold if dairy products were priced more competitively or promoted more aggressively and imaginatively instead of being priced by price supports and sold as homogeneous products. The fact is that the per capita consumption of most dairy products has declined under current pricing systems.

Thirdly, the price support policies set up by the federal government were designed to follow inflation very closely. However, price supports did not follow costs of production. The result is that when some inputs to the dairy industry (notably feed) became relatively cheap and new technology reduced costs per unit of production, these changes were not reflected in price support adjustments

Because milk production occurs on many individual farm units, production decisions are not centralized. When changes occur in cost relationships or technology, each farmer must adjust in an almost perfectly competitive market. The choices often consist of only two real alternatives --- cease production or expand operations. With new technology, the survivors tend to be large farmers with very high capital costs on which the debt service claims a high proportion of farm income. Adding to this, the large cash outflows for purchased feed and energy means that farmers are faced with very high cash costs. They are no longer able to "live off the fence posts" as many of their forebears are said to have done when prices of farm products dropped due to periodic surpluses or temporarily depressed markets.

Choosing Policies

Given the situation outlined above, this report asked, "What are the implications for Northeast dairy farmers of current attempts to alleviate the supply-demand problems of the dairy industry?" A second and related question is "What adjustment options are available to dairy farmers in the Northeast?"

The policy choices must fit multiple objectives. Therefore, the selection requires weighting For instance, one of the current objectives of government dairy policy is to bring the supply and demand for milk into closer alignment. Although the current problem is oversupply, measures designed to cut supplies sharply might cause a shortage in the future. Secondary problems are also important. Consumers are willing to pay reasonable prices for dairy products but don't want to pay unnecessarily high prices. Dairy farmers and dairy processors want reasonable market stability so as to provide reasonable income over a long period. Social issues about farm size and family businesses and monopolies become battle cries. Each of these policy questions or objectives raises a host of other thoughts which must be answered in both economic and political terms. Often, economics and politics will be in conflict, and compromises must be made.

Since the current problem is one of more milk than consumers are buying at the supported price, a number of demand expansion proposals have been made. These proposals range from increasing expenditures for milk promotion and research to outright subsidies for various disposal programs: domestic and foreign. Seldom favored by dairy farmers, but always lurking in the background, is the possibility of lowering prices to increase demand. Because the demand for dairy products is quite inelastic, price reductions would have to be sharp to bring about significant increases in demand.

The other possibility for bringing supply and demand into alignment is to cut production. Theory tells us that supply can be reduced by reducing market price, by direct control of production, or by encouraging producers to voluntarily shift resources into other activities.

Milk prices represent wages to dairy farmers. No one likes to see their wages cut or their costs increased. However, there can be no doubt that prices and costs are a strong incentive in a capitalistic society such as ours Higher milk prices attract more resources to the dairy industry. More resources mean more production. Higher input costs (costs of production) tend to discourage production.

Lower milk prices may have a somewhat perverse effect in the short run. Those who have already invested in the industry see their capital investment as sunk costs and may try even harder to produce more milk if prices drop. Indeed this is a popular response

among dairy farmers today. Nevertheless, in the long run every business must make enough money to attract labor and capital. Thus one should expect lower milk prices to be accompanied by less production in the long run, if not in the short run.

Just how much prices would have to be lowered to balance demand and supply is a difficult question to answer. Technology and costs of various inputs are constantly changing. The model estimated as part of this study suggests that, with current technology and demand for dairy products and assuming no previous accumulation of surplus milk, prices could balance demand and supply through 1984 at approximately 60 percent of parity. An adequate supply of milk and dairy products for the demand which would exist at these prices would be produced. Under price relationships used in the study for 1983, this would mean a manufacturing support price of approximately $13 per hundredweight or $13.50 per hundredweight for all milk. This figure could be outdated by a further drop in grain prices. Its effectiveness may also be suspect due to the currently limited alternatives open to dairy farmers (particularly in the Northeast) for both their land and their labor resources.

If, for political or economic reasons, milk prices are not reduced but are maintained at present levels, how else can resources be shifted out of dairy farming to reduce production? Dairy farming involves large capital investments and deals with animals requiring long life cycles Capital invested in dairying has limited transferrability into other lines of endeavor. For instance, a milking parlor has little use for anything other than milking cows. A silo designed to store moist roughage for cattle is poorly adapted to any other use. Going along with this are the human resources. A person trained to feed and care for dairy animals may not have a great deal of training in the care and feeding of sheep or in the production of vegetables and fruit crops on a commercial scale. In other words, those persons who have invested years developing their skills in managing a dairy herd may be poorly equipped to handle other agricultural enterprises. Thus, shifting resources out of dairy production requires a severe write-off of the resources invested in dairy farming. The reduced market value would apply to both human and material resources.

Some studies have shown that this fear of loss is not always real. Many people and many resources can be better utilized in other fields of endeavor. For instance, some land has higher economic value for nonfarm uses such as homes, factories, highways, or other developments. In certain parts of the country, field crops bring a better return than growing roughage for the dairy industry. The opportunities for such nonfarm uses vary widely with location, soil, climate, and other factors affecting the usefulness of these basic resources. As for the people, their ability to adapt also varies widely. Some farmers have found that their income improved when they left farming Farmers who have hung on with the hope of improving their income or because they like farming as a way of life, are sometimes able to increase their standard of living by going to employment which offers better returns for their effort.

A more direct method of supply reduction involves supply control by limiting the number of dairy animals or assigning quotas for marketing milk. The details of such plans vary widely. Among the most common are incentives to cull animals, and plans which provide a good milk price only for quota quantities of production.

Any supply limiting plan has its drawbacks. Perhaps one of the major drawbacks is that those with resources invested in the industry tend to receive a windfall benefit from the imposition of such controls. If the program involves culling of animals, it means that some farmers can remove animals from their herds with higher returns than would probably otherwise prevail. If the control involves some sort of marketing allotment, it means that those who have a history of milk production have a vested interest in any future production. Those who would come after or seek to compete later in the field find themselves at a disadvantage. Without a history of production or resources which they can sell off under some sort of incentive plan, their total income is less than is that of established producers.

A further and seldom discussed aspect of this sort of plan is that once it is in place those in the industry have a strong incentive to maintain the plan. If the plan is successful, they see it as a necessity for maintaining stability and prices in their industry. Any attempt to take away that plan is seen as destruction of their vested interest. A successful production control plan often means higher prices to consumers as compared to a system which would exist without controls.

In summary, policy objectives are fraught with many pitfalls and frequently require a very careful balancing act. Benefits and negative aspects of each plan need to be carefully weighed. Social, economic, and political factors will all have an influence on the plans which are finally adopted.

Interregional Competition in Dairy

Census data and United States Department of Agriculture publications have clearly shown that productivity per farm is up and that production has shifted to large, specialized dairy units. Furthermore, production has tended to shift out of the areas where dairying has a poor comparative advantage (such as the grain belts) into areas of the northern North Central States, the Northeast and certain areas of the West where specialized conditions make dairying profitable.

Aggregate data on these production shifts, however, tend to hide many of the details behind these changes. Even in the northern tier of states where dairying is preeminent, many counties have actually decreased milk production. Only the better adapted counties have increased their proportion of the milk supply. Marginal land or

land which is especially attractive to nonfarm use has been attracted to non-dairy uses. Dairy farmers do well in the north where land is of good quality, but dairying cannot compete where conditions are suited to growing specialized crops or the location is too attractive to urban and commercial development.

Some other myths are hidden behind the aggregate figures. For instance, it is often said that only small farmers have been forced out of business. Actually, most farmers have had to grow in size in order to stay in business. Economies of scale have caused the average size of dairy farm to increase. But some large farms of today grew from small units as their operator took over operation of a neighboring unit as well. Both large and small units have gone out of business where operating conditions or business management did not keep them competitive.

It has also been pointed out that some of the Northeastern and northern North Central States significantly increased their production of milk in the past few years. However, every state that has shown major increases in cow numbers is in the West or the Southwest. The only state east of the Mississippi River to show an increase in number of cows milked during the 1970s was Pennsylvania. There has thus been a major shift in cow numbers and in milk production toward the West.

Dairy farms in hot or dry areas generally require entirely different operations than the traditional dairy farms in the more temperate parts of the United States. With a warm climate and dependence on irrigated crops, the Southwest tends to have very large units of production. These units tend to bring all of the feed necessary for the milking cows to the animals and organize them in large production units of hundreds of dairy animals. These units obviously are a long way from the traditional family operated units of the Northern states where one, two, or three workers could handle the entire farm operation, including production and storage of roughage.

The law of comparative advantage mentioned previously in this chapter is well illustrated when one looks at the relative returns to the operator and manager in various parts of the country. Areas with higher returns have expanded milk production. Those areas with low net returns have decreased their milk production. According to a study of costs and returns of producing milk done by the United States Department of Agriculture for 1981, the three areas of the country yielding more than $2 per hundredweight for total returns to operator, family labor, and management were the Northeast, the Upper Midwest, and the Pacific Region. The Corn Belt, Appalachia, and the Southern Plains all yielded far lower returns to farmers producing milk in those areas.

A look at the areas expanding and contracting milk production correlates quite highly with these figures. Wherever returns for milk production are low, production has declined; where returns are favorable milk production has increased.

Impact of Lower Milk Prices on Dairy Farmers

The average debt per cow in 1981 on the farms studied by the authors of Chapter IV of this report ranged from zero to $2,560. In general debt per cow decreased with size of herd, but some glaring exceptions were noted. Many of the smaller herds had little or no debt load. A few of the larger, more recently enlarged operations had exceptionally high debt loads.

Cash operating costs on these farms ranged from about $5.00 per hundredweight to over $15.00 per hundredweight. Again on many of the smaller dairy farms, cash operating costs were relatively low which is probably a reflection of the fact that these dairy farmers can avoid the higher labor costs of year-round employees.

Many Northeastern dairy farmers found it necessary to seek off-farm employment or to exploit additional income generating activities on the farm in 1981, in order to provide an acceptable level of living for the farm family. Many more will be faced with the same prospect if milk prices are reduced sharply.

Quite clearly milk production will continue to be a lucrative business for many farmers --- for some small ones as well as for some large ones. It will be so because they are the efficient, relatively low cost producers. Those with high debt loads and high per unit costs will likely seek alternatives to dairy production. This will present serious problems to farmers in the many areas of the region where on-farm and (at the present time, at least) off-farm alternatives are severely limited.

Current Policy

Both government policy and the dairy industry change direction slowly. The United States government continued to raise dairy price supports in 1979 and 1980 despite danger signals that milk supplies were expanding too rapidly. When prices were stabilized in 1981, dairy farmers had already committed large resources to expansion, including the starting of huge numbers of heifer calves. A drop in grain prices completed the defeat of policy makers who sought to control production by holding milk prices constant in a period of inflation.

One bright spot should be noted. Dairy product consumption in the United States increased the equivalent of one and one-half billion pounds of milk in 1982 over the previous year. At least part of this increase must be credited to level prices during a period of inflation --- that is, lower real prices for milk.

Pressure to bring the supply and demand for milk into balance will continue. Under our present pricing system, milk production decisions are not made at any central location. The over 40,000 dairy farmers in the Northeast, their families, their hired workers, and the people who service their businesses have their individual goals, resources, and alternatives. As a result, averages mean little to each individual. Some farmers will show a profit even in hard times. Some farmers endure losses even when prices are generally favorable.

The examples shown in Chapter IV document the increase in costs per hundred pounds of milk likely to occur in the next two years. If milk prices remain static or drop, more and more farmers will show a loss or realize too little income to cover debt repayment.

Which farmers will go out? Farmers who leave dairying generally do so because of physical condition (age, health, etc.) or because they seek better alternatives.

Who will survive? If price/cost relationships remain relatively stable or decline moderately, farmers with well-managed businesses in favorable locations will survive. If prices drop sharply, farmers with high debt loads or low profit businesses will certainly have a difficult time to survive.

Loss of all price supports and market orders would bring about considerable change and uncertainty in the short run. A possible result would be rapid movement toward large integrated operations such as are now typical of the poultry industry. This might well be expected to be accompanied by corresponding adjustments in the milk processing and feed industries, and by a loss of economic activity and services to rural people in several areas.

TECHNICAL APPENDIX

Model for Determining Equilibrium Prices*

Consumer Demand

$$q_F = 986.77 - 0.0752P_F/CPI + 462.82AGE45 - 2710.31AGE50$$

$$q_M = 1122.21 - 0.4311P_M/CPI - 1699.31AGE20 - 1.9622TIME$$

where

q_F = per capita consumption of fluid milk, lbs.,

q_M = per capita consumption of manufactured dairy products, lbs. fluid milk equivalent,

P_F = price of fluid eligible milk at the farm, cents per hundredweight,

P_M = price of manufacturing milk at the farm, cents per hundredweight,

Y = per capita disposable income deflated by CPI, $,

AGE 20 = percent of population 20 years of age or less,

AGE45 = percent of population 20-45 years of age,

AGE50 = percent of population over 45 years of age,

TIME = variable having a value of 32 in 1981, 33 in 1982, 34 in 1983, etc., and

CPI = consumer price index (1967=100).

Fluid-Manufacturing Differential

$$P_M = P_F/1.095$$

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*The equations presented here are based on estimates given in M. C Hallberg. "Cyclical Instability in the United States Dairy Industry Without Government Regulations". Agricultural Economics Research 34:1:1-11. January 1982.

(This relation is based on the 1981 ratio of P_F to P_M).

Milk Supply

$$Q_S = 40575 + 58.80P_B - 14.09P_{FD} + 845.31TIME$$

where

Q_S = milk production, million lbs.,

P_B = blend price for milk, cents per hundredweight,

P_{FD} = price of 16% dairy ration, cents per hundredweight.

(This relation is based on assumed elasticities given below.)

Blend Price Relation

$$P_B = [q_F*P_F*POP + q_M*P_M*POP + GOV*P_M]/[q_F*POP + q_M*POP + GOV]$$

where

GOV = government purchases of dairy products, million pounds milk equivalent, and

POP = total United States population, millions.

Equilibrium Condition

$$Q_S = q_F*POP + q_M*POP + GOV - IMPORT$$

where

IMPORT = net imports of dairy products, million lbs. milk equivalent.

Elasticities (Long Run)

Demand

Fluid	-0.14
Manufacturing	-0.55

Supply:

Own price	0.50
Feed price	-0.10
Time	0.20

Exogenous Variables (Actual data for 1981, assumed for 1982-1984)

	1981	1982	1983	1984
CPI	2.724	2.878	3.017	3.174
AGE20	0.314	0.314	0.314	0.314
AGE45	0.375	0.374	0.374	0.373
AGE50	0.311	0.312	0.312	0.313
Y	3219	3257	3353	3447
POP	229.87	232.2	234.5	236.9
P_{FD}	960	970	993	1062
TIME	32	33	34	35
GOV	12,861	3500	3500	3500
IMPORT	2,400	2,400	2,400	2,400

Endogenous Variables (Predicted by the Model)

	1981[a]	1981	1982	1983	1984
q_F	230	228	223	222	218
q_M	342	329	334	336	338
Q_S	132,600	129,204	130,426	131,897	132,793
P_F	1274	1363	1390	1428	1468
P_M	1164	1244	1269	1304	1341
P_B	1208	1292	1316	1352	1389
$P_{B_{NE}}$[b]	1232	1318	1342	1379	1417

[a] With total milk output, Q_S fixed at 132,600 million pounds, and GOV and IMPORT fixed at 3,500 and 2,400, respectively.

[b] Blend price in the Northeast at $1.02P_B$ based on the actual 1981 ratio of the price in the Northeast to the United States average.