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ARE THERE LIMITS TO HERD SIZE ON NEW YORK DAIRY FARMS?

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ARE THERE LIMITS TO HERD SIZE ON NEW YORK DAIRY FARMS?*

by

David P. McGuire and B. F. Stanton

In some states in the south and west there are a fair number of commercial dairy farms with 1,000 or more cows. Typically they are in warm, dry areas. Buying forage as well as concentrate feed is not difficult. In most of the northern part of the country, a dairy farm with more than 200 cows is still somewhat unusual. Herds of 1,000 cows are rare. Most commercial dairy farms still have less than 100 cows.

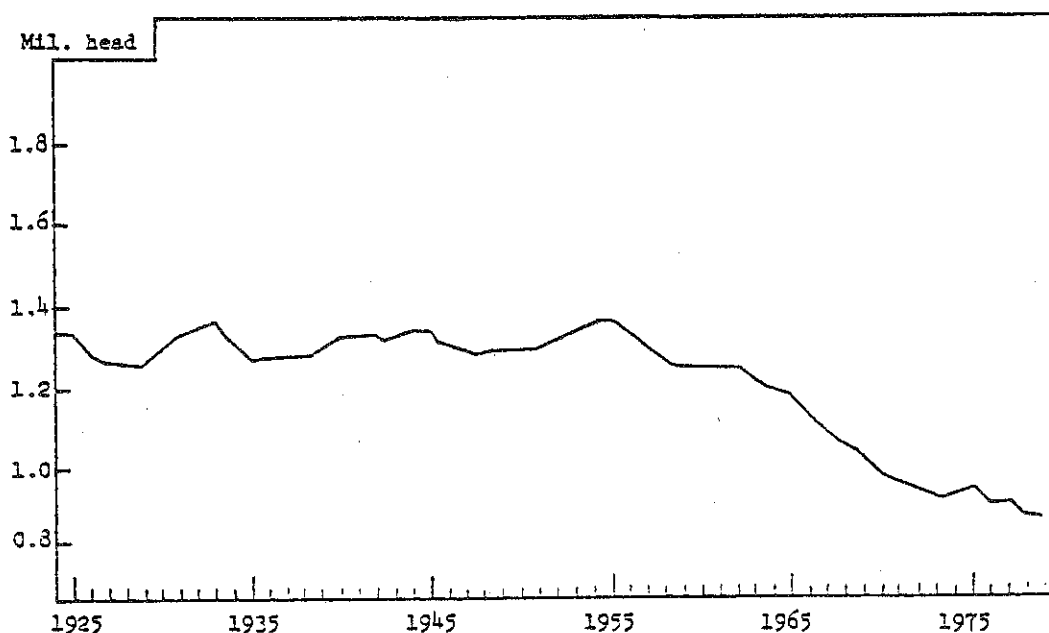
Objective

This study was made to learn more about the process of growth on some large dairy farms in New York State and to find out from the owners and managers of these farms, their perception about what limited the size of dairy farms. The objective was to investigate how some successful large farms had been put together and what they saw as limits to the growth process.

Dairying in New York

About eight to nine percent of the nation's milk supply is produced in New York State. Wisconsin is the leading dairy state. Recently California has moved into the second position ahead of New York. Minnesota is the fourth state on the list most years.

Figure 1. Number of Milk Cows, New York (1925 to date)

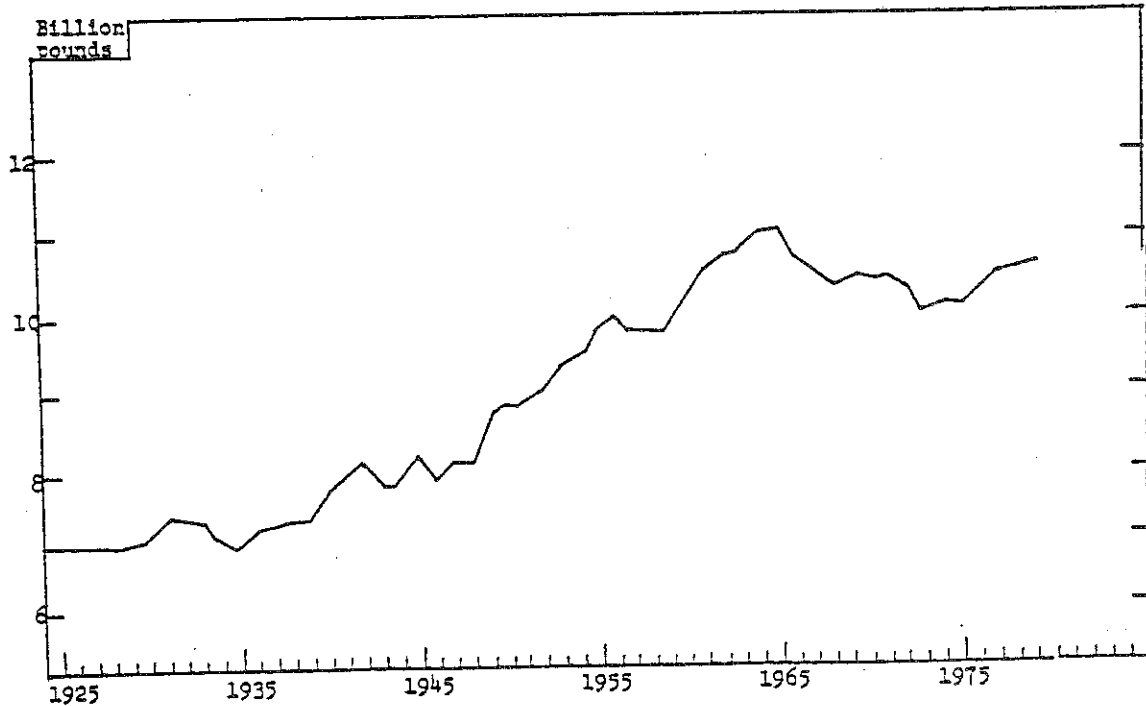


Source: New York Economic Handbook 1979, December 1978, A. E. Ext. 78-37.

* This publication is based on results presented in a Master's thesis entitled, "Farm Expansion and the Limits to Growth: Experiences of Large New York Dairymen," Department of Agricultural Economics, Cornell University, August 1979, by David P. McGuire.

Over the years the number of cows in New York has declined from a rather stable level of about 1.3 million until 1955 to approximately 900,000 during the late 1970s.

Figure 2. Total Milk Production, New York (1925 to date)



Source: New York Economic Handbook 1979, December 1978, A. E. Ext. 78-37.

Even though cow numbers have decreased, total milk production has stayed above 10 billion pounds in all but six years since 1955. Increases in milk production per cow have generally made up the difference as cow numbers declined. With cow numbers holding quite steady after 1973 total milk production has increased slightly in the past six years.

During the past 20 years there have been dramatic shifts in the distribution of herd sizes in the state (Table 1). A careful study of herd sizes in New York was made by Conneman in 1960-64. Using updated information from that panel of dairymen, projections have been made regularly since that time on the changing size distribution of dairy farms.

In 1963 there were more farms with 20-29 cows than any other size. Five years later in 1968 the largest number of dairy farms had 30-39 cows. In that short span of 10 years, 10,000 milk producers ceased shipping milk -- a very large and important change in the structure of dairying.

In each of the five year periods shown in table 1, there have been substantial changes. To compare 1963 with 1978, there were 30,000 dairymen in the state with 50 dairy cows or less shipping milk. Fifteen years later there were less than 8,000 herds of this size. At the other end of the spectrum there were about 4,500 dairymen with 50 cows or more in 1963 and nearly 8,000 with 50 cows or more by 1978.

Table 1. DAIRY FARMS BY SIZE OF HERD*
New York State, 1963, 1968, 1973 and 1978**

Cows per farm	Number of dairy farms			
	1963	1968	1973	1978
Under 20	7,700	3,800	1,700	450
20 - 29	9,600	4,700	2,800	1,300
30 - 39	7,700	6,100	4,600	3,300
40 - 49	5,000	4,600	4,000	2,500
50 - 59	2,100	2,200	2,250	2,600
60 - 99	1,800	2,400	2,600	3,750
100 - 149	400	400	575	750
150 - 199	150	200	300	400
200 and over	50	100	175	200
TOTAL	34,500	24,500	19,000	15,250

* Source: Cornell Producer Panel of Dairymen.

** Estimates for 1973 and 1978 by G. J. Conneman.

One might describe this change in farm structure as a quiet resolution. Few, if any farmers in this state now have a little dairy herd as a small enterprise or a diversified farm. Generally you have a good size dairy enterprise and sell milk year-round or you don't have dairy cows. But the bulk of the cows in New York State are still on farms with less than 100 cows. Herds of 50 to 100 cows are most common. About half of the milk cows are in herds of this size. One quarter are on farms with 100 cows or more.

Sources of Information

A summary^{1/} of farm business records for account keeping dairymen in the state is prepared in cooperation with Extension agents by C. A. Bratton. In 1977 there were 37 cooperators who provided records who had herds with 150 cows or more. It was decided to ask this group of dairymen, who had already turned in record summaries, to cooperate in a study of the growth process and possible future limits to herd size. A total of 38 farms were visited during the fall and winter months of 1978-79 including 34 of those in the account summary and four other large units with 300 or more cows. The location of these farms throughout the state is shown in figure 3.

Any sample of farms chosen in this manner could not be described as truly representative or random. On the other hand they are not strikingly different from other large well operated dairy farms of a similar size. The fact that most had allowed their business summaries to be included in a state-wide account-summary indicates their openness and willingness to discuss their business operations.

All of the farms had 150 or more cows in 1977. As suggested in table 2, more than half had less than 200 cows. There were seven with 200 to 300 cows and only five of the 38 had 400 or more milking cows. To the best of the author's knowledge there was no herd in New York in 1977 with more than 1,000 cows being milked.

^{1/} Bratton, C. A., "Dairy Farm Management Business Summary, New York, 1977," Department of Agricultural Economics, Cornell University, A. E. Res. 78-8, July 1978.

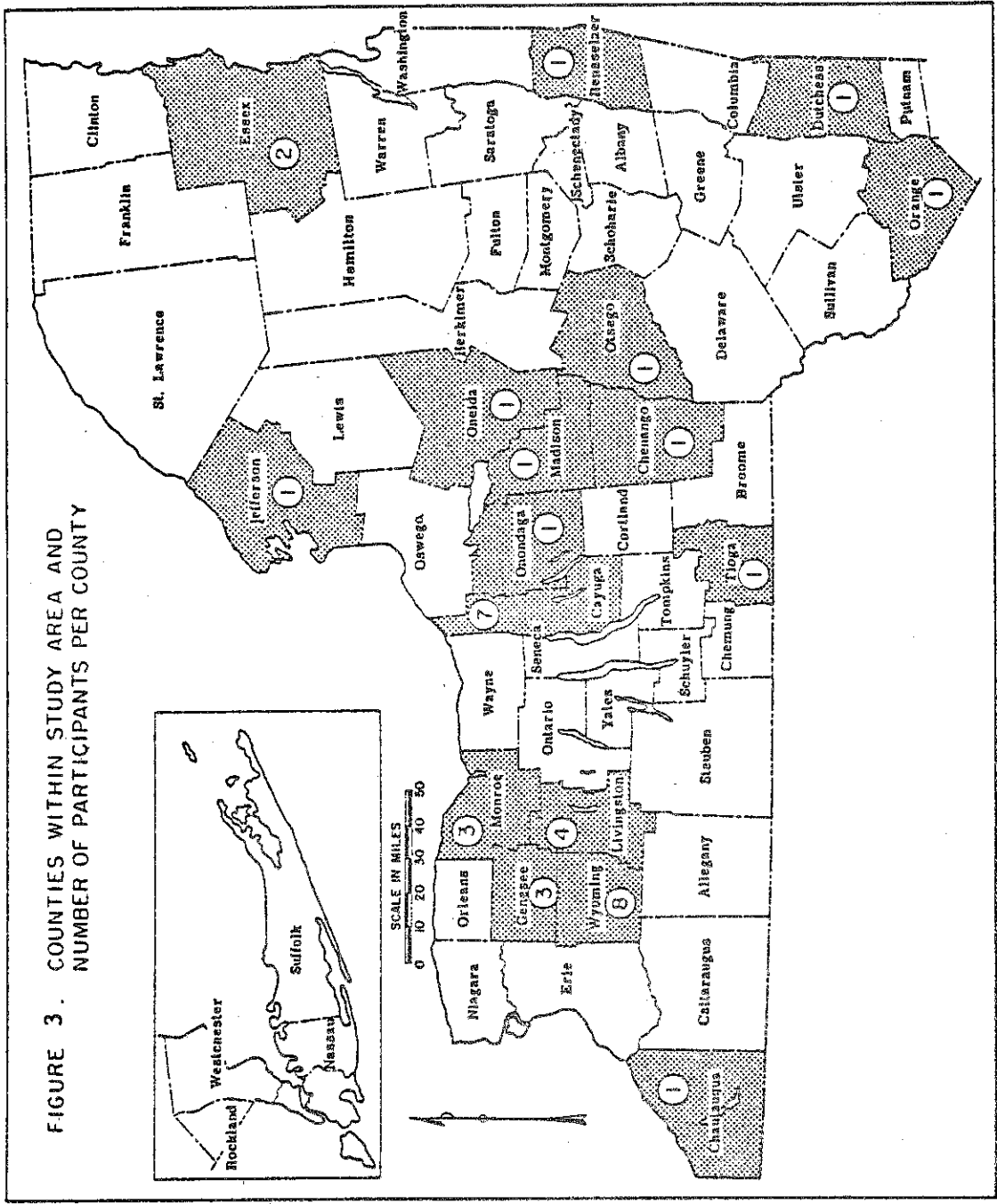


Table 2.

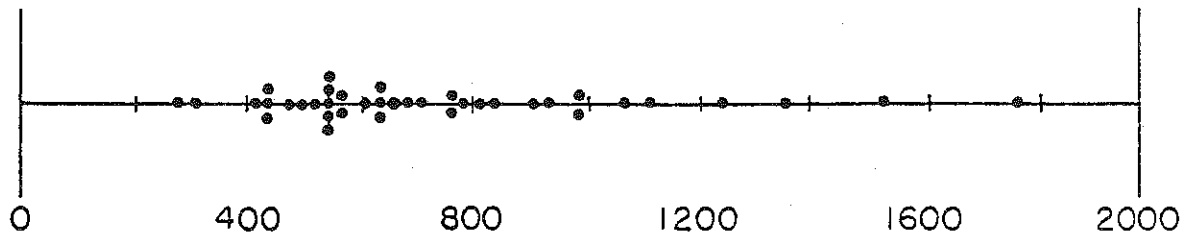
HERD SIZE
38 Large New York State Dairymen, 1977

Size	Number
150 - 159	10
160 - 169	4
170 - 179	5
180 - 189	3
190 - 199	1
200 - 299	7
300 - 399	3
400 - 499	3
500 - 599	1
600 - 699	1

Farm Characteristics

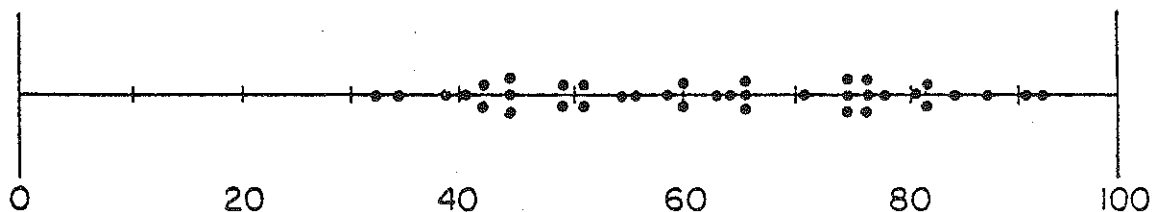
The amounts of other resources used on these generally specialized dairy farms tended to vary directly with herd size. An average of 532 crop acres were used primarily for forages and feed grains for the dairy herds. A few sold cash grain. Most had to buy substantial amounts of concentrates. The average number of man equivalents was 5.6 for this group of farms with the labor force increasing with herd size. Rates of production were high. Milk sold per cow averaged over 14,000 pounds for this group of farms. Milk sold per man exceeded 450,000 pounds on the average.

Figure 4. VARIATION IN CAPITAL INVESTMENT
(thousands)



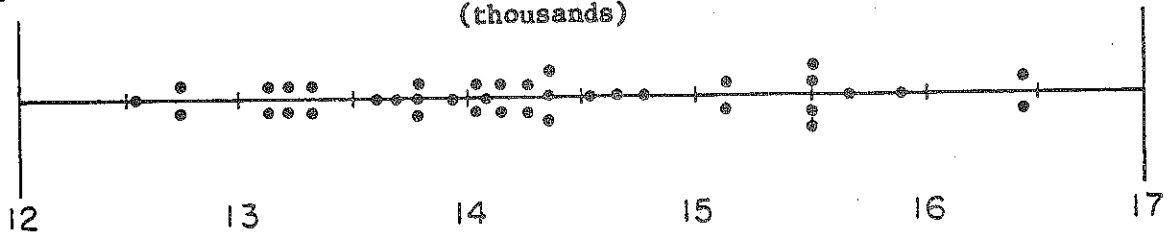
There was substantial variation in capital investment, from \$270,000 to \$1,750,000. Some of this reflected differences in quality of resources, like land. Some reflected different expectations about sale values of cropland. Most of the dairymen valued their resources in a range between \$400,000 and \$800,000.

Figure 5. VARIATION IN PERCENT EQUITY



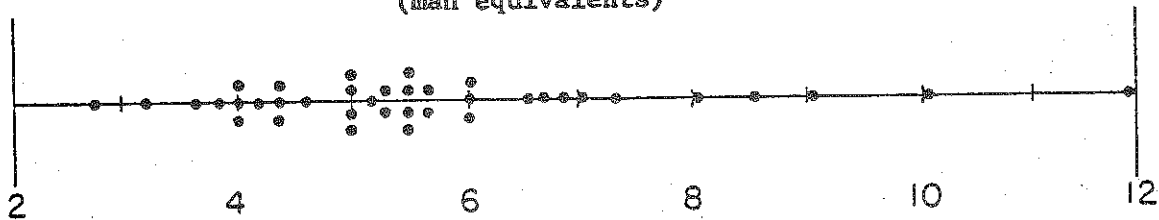
The percent of equity in the business that had been achieved by each of the dairymen was quite evenly spread over the range. Most had 50% equity or more. The low value was 34% and the high was 91%. These differences partly reflected ages of individual operators, and how recently they had expanded their businesses.

Figure 6. VARIATION IN RATES OF PRODUCTION
(thousands)



All of these relatively successful large farms sold more than 12,000 pounds of milk per cow in 1977. Average sales were 14,140 pounds, well above the state average. Moreover, 10 of the 38 large herds were able to sell over 15,000 pounds per cow in 1977 and two were above 16,000 pounds.

Figure 7. VARIATION IN SIZE OF LABOR FORCE
(man equivalents)



Most of the businesses were operated with a labor force of four to six men. The larger businesses had the most men and the smaller ones fewer workers. Average size was between five and six men for 175 to 210 cows.

Business Organization

These farm business enterprises were organized as follows:

Individual Proprietorships	20
Partnerships	15
Corporations	3

Thirteen of these farms were active father-son businesses, while an additional five were operated by brothers.

Based on the notion that the general organizational form does not necessarily reflect the way management decisions are made, each farm was classified by the number of individuals involved in the primary management decisions for the business. As indicated in table 3, more than half of the operations seemed to be in the hands of a single decision maker. An additional 29% involved two people in the management process. Only four farms had more than two people involved in the primary management decisions of the farm business. In some cases full partnerships were not yet realized insofar as operations and management were concerned.

Table 3. PRIMARY MANAGERS IN THE BUSINESS
38 Large New York State Dairy Farms, 1977

Primary Managers	Number
1	23
2	11
3	3
Over 3	1

Technology

In general, there were more similarities in technology than there were differences among the 38 farms in the study. For the milking herds, loose housing and free stalls were used almost exclusively. On only one farm was a conventional stanchion barn currently in use. Facilities for raising young stock however, were much more variable. While one operator had a completely automated feeding barn where young calves were housed up until six months of age, most operators used more conventional means such as small indoor pens combined with individual outdoor boxes or hutches in the summer. Many of the dairymen interviewed felt calf raising facilities were one of the weakest parts of their operation, and needed to undergo change before substantial increases in herd size would be possible.

All 38 farms in the sample used milking parlors as the sole method of milking. These parlors were of two main types: 1) Herringbone and 2) Side-opening. Herringbone parlors outnumbered side-openings, 36 to 6. Four operators used more than one parlor. The size of the parlors ranged from double-3's to double 10's (Table 4). Ten parlors were equipped with automatic take-offs.

Table 4. SIZE DISTRIBUTION OF MILKING PARLORS
38 Large New York Dairy Farms, 1977

Size	Number
D-3	3
D-4	12
D-6	17
D-8	9
D-10	1

Hay and silage were the chief sources of forage used on most farms. Pasture was relatively unimportant in feeding the milking herds. Thirty of the 38 farms had some sort of upright silos, while 25 had at least one trench silo. Nineteen, or 50%, had a combination of both. Twenty-seven of the operators used a variety of forms of mixing wagons to bring feed to the cows. The remaining 11 fed using automatic overhead conveyors and feeding bunks. All of the operators reported that they grouped their cows for feeding grain and milking in some manner according to production levels. Although some dairymen used automatic grain feeders, they were in the minority, as were those who fed grain in the milking parlor.

Table 5. TYPES OF WASTE STORAGE FACILITIES USED
38 Large New York Dairy Farms, 1977

Type	Number
Liquid pits beneath barn	6
Outside structures	4
Lagoons	9

Waste removal systems were classified in two ways: 1) farms that spread daily; and 2) those that stored their waste in some fashion. The data showed that an even 50% of the operators used each of these two general systems. Of the operators that stored wastes, table 5 shows that lagoons were the most prevalent method of storage. Liquid pits beneath the barn and other types of structures outside the barn were also used.

The capacity of storages were highly variable partly depending on the type. More than half had a capacity of four months accumulation or less. Some were designed to hold a full year's output. A great deal depended on the location of the facility and ease of access to areas where spreading was desired.

Growth in Herd Size

In all but one case, some growth in herd size occurred on these 38 dairy farms between 1967 and 1977. Moreover, on the majority of these farms, the operators project additional growth within the next five years.

Table 6. PERCENT INCREASE IN HERD SIZE, 1967-77
38 Large New York Dairy Farms, 1977
(base year, 1967)

Percent increase	Number (farms)
0 - 34	2
35 - 69	10
70 - 104	7
105 - 139	5
140 - 174	4
175 - 209	4
210 - 244	2
245 - 279	1
280 - 309	3

Growth from 1967 to 1977 in percentage terms, took place at highly variable levels on individual farms between 1967-77. The distribution of percentage increases over the 10 years for all 38 farms is shown in table 6. In three cases, the dairy enterprise grew approximately 300% during the 10 year period

between 1967-77. Transforming these percentage increases to an annual basis, 27 of the 38 grew somewhere between 2-10% each year, on average. Mostly those that grew at annual rates of 10 percent or more started on the smallest herds.

From a different perspective, the rates of growth for different size groups show that the smallest 1/3 of the herds in 1967 increased an average of 196%. The middle 1/3 of the herds increased by 91% over 10 years and the largest herds in the study increased an average of 80% over their 1967 herd sizes. Despite these percentage increases, table 7 indicates that actual cow numbers did not increase the most on the smallest farms. In fact, the largest 1/3 of the herds in 1967 grew an average of 132 cows per farm, while the smallest 1/3 grew about 100 cows per farm. These figures show that growth on the larger farms was not slowing down relative to the smaller farms, but was increasing steadily during this period.

Table 7. ACTUAL INCREASE IN HERD SIZE, 1967-77
38 Large New York Dairy Farms
(Base year, 1967)

Herd size	Number (cows)
Smallest 1/3	110
Middle 1/3	121
Largest 1/3	132

One way to get an overall perspective on how many cows the individual farms studied had in 1967, how many there were in 1977, and their expectations for 1982 is shown in figure 8. Each farm is represented by an individual dot in the vertical space for 1967, 1977 and 1982. In 1967, these 38 herds ranged in size from 40 cows to 296 cows, with the average being 108. In 1977, 10 years later, these same herds ranged in size from 150 cows to 656, with the average increasing to 225. The operators' projections for 1982 include a low of 90 cows and a high of 1,000 cows, with the average rising to 280. This is essentially a linear increase on the average over the 15 years of about 11 cows per year per farm.

If one looks at the projections of change between 1977 and 1982, the majority, or 30 of the 38 dairymen plan to expand modestly, that is, at annual rates of increase of six percent or less. Two expect to reduce their herd size. The other six plan to expand more dramatically.

If one looks at the group of dairymen with 150-168 cows (the smallest third) their projected increases average 51 cows in the five years through 1982. The middle third in terms of current size (170-230 cows) expect to increase by an average of 69 cows. The largest dairy herds now will be increased the most on the average but they also have the greatest variation among them including a number who expect to change very little.

Figure 8.

HERD SIZE 1967, 1977, 1982
38 Large New York Dairy Farms

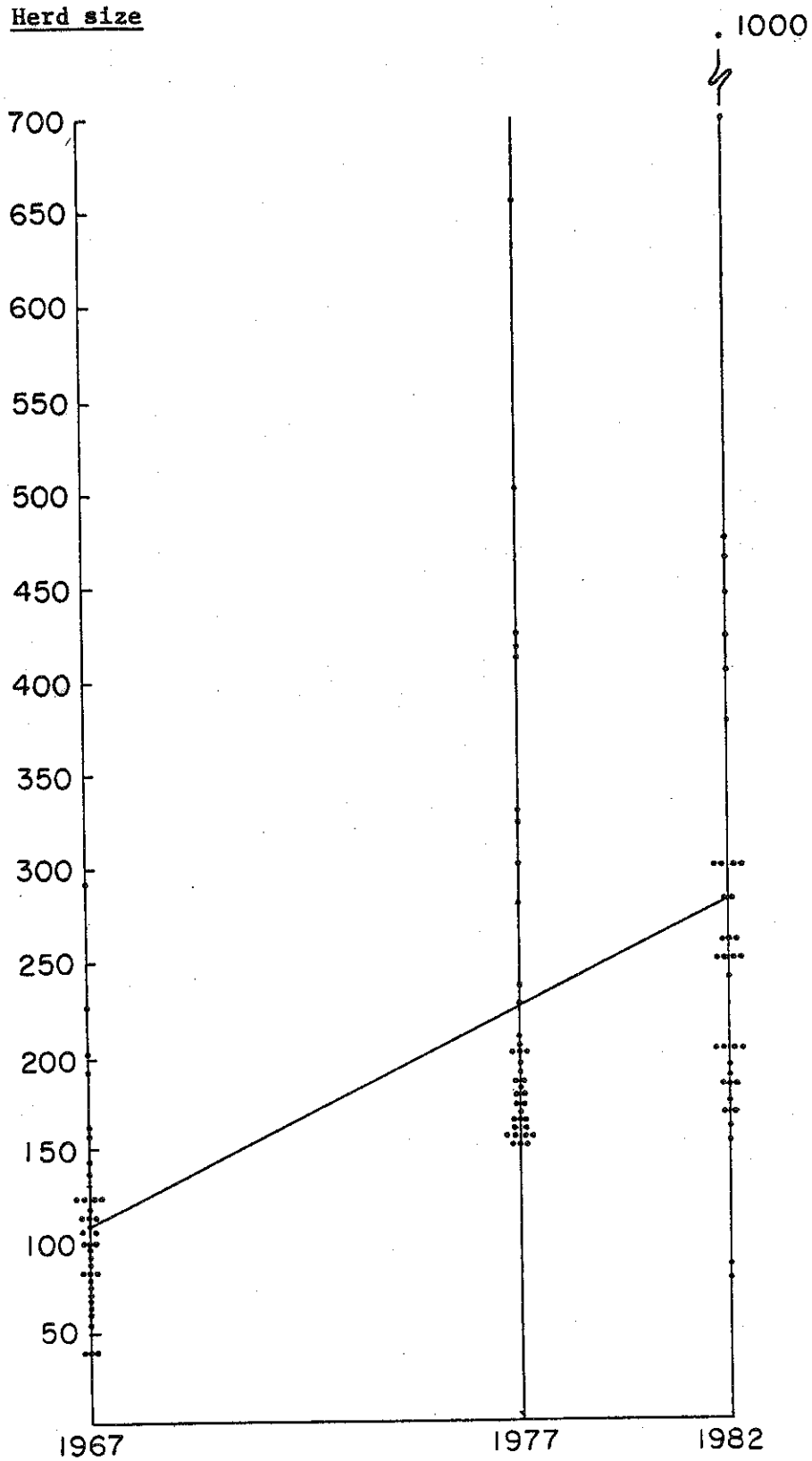
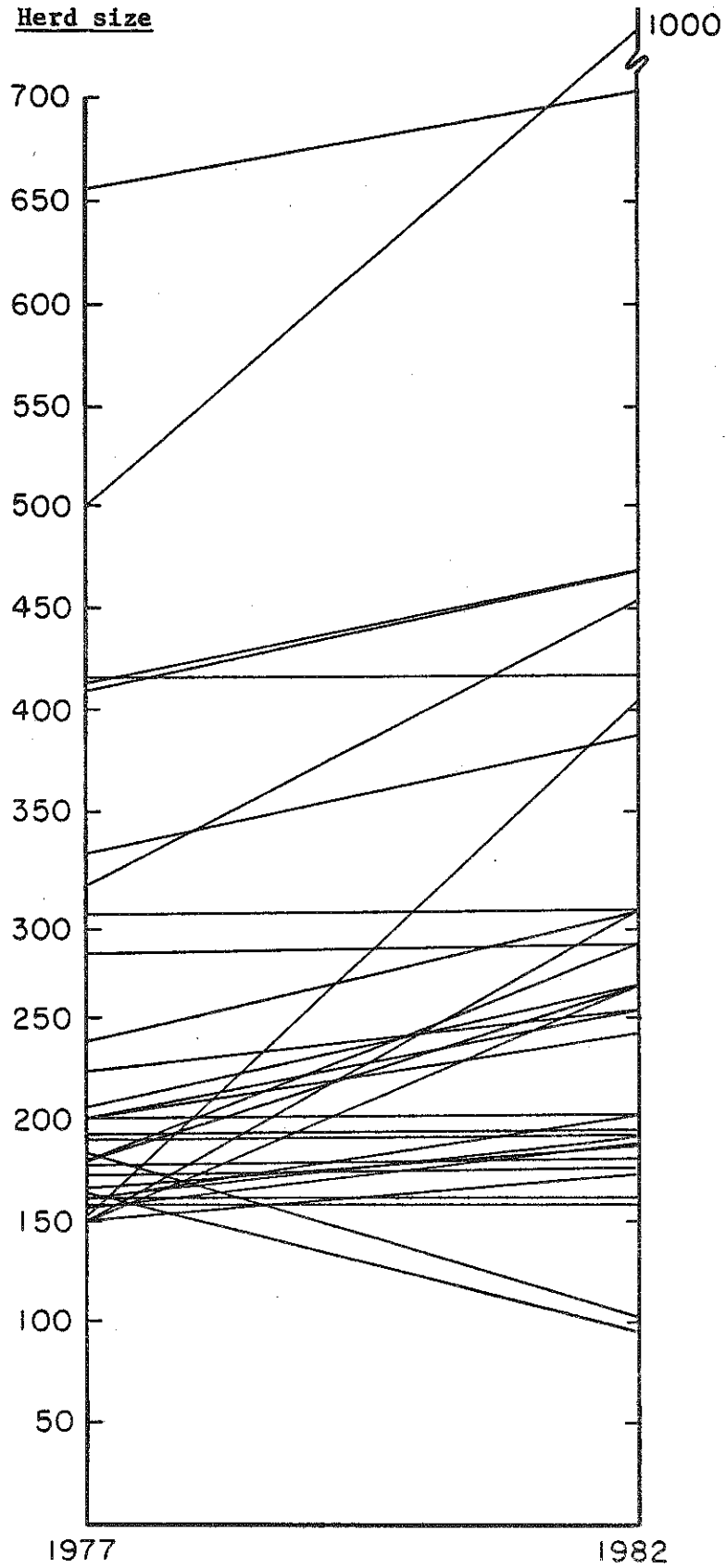


Figure 9. VISUAL PATTERN OF INDIVIDUAL PROJECTED GROWTH IN HERD SIZE, 1977-1982, 38 Large New York Dairy Farms



Each dairyman's projection of changes in cow numbers between 1977 and 1982 is presented in figure 9. As is suggested by the parallel lines mostly in the lower half of the diagram, 12 dairymen plan no expansion whatsoever. Two others plan to reduce the size of their herds. Of the remaining 24, there seems to be no general or consistent pattern of growth that can be identified clearly. While the majority of the dairymen project increases somewhere between 50-150 cows, the range extends all the way from a decrease of 70 to an increase of 500. Those who have obtained considerable experience in integrating a substantial number of cows together in a "large" herd of more than 150 cows are not making major plans for further rapid expansion. Only one talks seriously about 1,000 cows in the near future.

Practices Followed in Increasing Herd Size

In addition to documenting growth in a quantitative sense, it was important to know how dairymen went about amassing the resources and then combining them into functioning units as they expanded their herds. The following questions and answers provided some insight.

1. In terms of growth, which came first? Herd size or land.

In every case but one, the operators either had enough land to support extra cows at the time they expanded, or felt they could gain control of it quite easily. From these responses, it was apparent that land, in most cases, was acquired before further expansion. Alternatively, operators were able to rent cropland or to insure some type of rental agreement so that forage supplies for the herd could be produced.

2. Was it necessary to buy livestock to facilitate expansion?

Twenty-one of the 38 operators said that livestock had to be bought at some point during expansion. Eight operators in fact, stated that they commonly bought livestock for replacements to maintain their herd size. Most relied on producing most of their replacements and some extra to increase cow numbers.

3. Did growth in herd size take place in the form of steady incremental expansion, or come in leaps and bounds?

Although the majority, 82%, indicated that growth had developed slowly and steadily, most acknowledged that in some years more growth occurred than in others. The six remaining operators stated that large leaps accounted for most of their growth and were associated with an important change in facilities.

From the data collected from the operators and personal inspections of the buildings on each farm, it appeared that on 28 of the farms, growth in the past 10 years had taken place by constructing additions to the then present housing, feeding and milking setups. Only on 10 farms had the operator moved into a complex new setup or new buildings to facilitate growth. Of these, three were actually existing farms that were bought at satellite operations to the home farm. In total, four farms had separate milking facilities and herds at two locations.

4. Have you substantially changed the crops that you grow because of growth?

Although most did not state that substantial changes had been made, some noted that they had gone to more corn for grain, while others, mostly notably on the poorer soils, had shifted away from corn for grain to corn for silage and hay-crop silage. The only other real trend noted was greater use of haylage and less use of dry hay. A shift to mechanized feeding systems has led to more silos and bunk feeders to be built on these farms.

5. During the 10 year span examined, have you been able to grow all your own roughage?

The answer was a universal yes, except for a few spot shortages. Farmers regularly planned to meet forage needs first from cropland available and then to have some reserves on hand in case of a poor growing or harvesting period.

6. Do you grow any of your own grain?

Seventy-six percent responded yes. In the majority of cases, this was in the form of corn for grain. The location and quality of cropland available was an important determinant of their decision. Generally, the farms in the western part of the state grew more of their grain than did those in hill-valley situations. Oats was no longer an important crop on most of these farms.

Reasons for Growth and Possible Limits

Although this sample of dairymen with large herds shows that substantial growth has taken place on these farms over the last 10 years, it does not indicate that there are many dairies with more than 500 cows in New York State at the present time. Neither does it show that many of the farmers expect to expand to this extent in the near future. There was one farm with 500 cows in 1977 and one with 656 cows. While these dairymen expect to increase herd size to 700 and 1,000 cows respectively in the next five years, there were no others in this group that expect to expand to more than 500 cows. While this group of account-keeping large dairymen cannot be thought of as a random sample, they are quite widely distributed geographically and may well be reasonably representative of the outlook and attitudes of other owners of large dairy herds in the State currently.

Factors Limiting Growth: What Previous Researchers Have to Say

In past studies, several reasons have been cited for the tendency to limit and discourage growth in farm size. One of those often cited has been the management resource. Raup^{2/}, at the University of Minnesota summarized this point as follows:

As farm size increases, management becomes a critical cost item. Management skills must be learned, and producing a superior manager is expensive. To discuss the efficiency of farms of alternative sizes without allowing for the differential costs of producing a manager, plus the costs of management error, feedback, and growth in skill, is to ignore one of the most important aspects in transition in size of farm.

2/ Raup, Philip. "Economies and Diseconomies of Large Scale Agriculture." Amer. J. Agr. Econ. 51 (1969): 198-232.

As Raup points out, primary management skill must continually grow and develop on a dairy farm that is expanding. Many believe the process of adjusting to the management of more and more hired labor is one of the most critical parts of this transformation.

Others have focused on various forms of risk and uncertainty as the most important limits to growth. As the farming operation becomes larger and more complex, the number of unpredictable situations requiring attention and prompt decisions may become burdensome because the manager must relate each decision to all the other decisions that have been made or are going to be made. One of these major uncertainties is the regular availability and dependability of hired labor, family members, and off-farm day laborers on which the farmer must rely. Scheduling of work responsibilities becomes more important as more labor is used. Supervision cannot be left to chance or the management time unused for other "more important" activities.

A second uncertainty involves technology. An evaluation must be made of new methods of production and capital equipment relative to what is now in use and what can be expected to emerge as superior technology. Still other risks and uncertainties involve yields and prices due to disease and weather and decisions on how to respond to each. Lastly, institutions may change, creating new management problems. Recently, interest rates and government regulations have required new evaluations of positions previously taken for granted.

A further limit to growth often recognized has been the time required to supervise and maintain control of production operations over large physical areas. Exercise of control in a financial context may become limiting. It has also been pointed out that the costs of assembly of crops and distribution of wastes and supplies over ever larger areas as well as the increasing costs of sanitation and disposal of waste production is a recognized cost and thus limits further expansion.

Finally, from an economic point of view, there is the possibility that production costs per cow associated with some factors of production actually increase as size increases. A limit must exist after which higher costs of production associated with lower productivities per unit of resources begin to appear. Thus milk production per cow may decline as supervision or care is reduced. Herd health may be reduced and problems of breeding arise.

While most dairymen want to make money and accumulate net worth over time, there are quite important differences among individual families in the question of how much net income or net worth is enough or satisfactory. At some point, having more time to spend with one's family or leisure may become important as a trade off with profit. Capital and risk surface as issues more and more as the complexity of business decision increase.

Dairymen's Impressions About Increasing Herd Size

To get some first hand impressions about why dairymen have increased their herd sizes and what they saw as limits to future expansion, each farmer was asked to respond to a series of statements, indicating whether the item was a "very important" consideration, an "important consideration," or "not an important consideration" in their decisions about herd size. No limit was placed on the number of times farmers could use each category in describing their decision framework.

Reasons for Increasing Size in the Past

There was relatively wide variation in thinking regarding the relative importance of individual factors causing one to increase herd size. The desire for growth in net income was at the top of the overall list. All 38 operators felt that this factor was either "very important" or "important". As a way to secure this additional income, emphasis was placed on obtaining greater efficiency in use of facilities and equipment. Thirty-five of the 38 sampled, stated that increased efficiency was either "very important" or "important" in the expansion decision. In many instances, this increased efficiency was found by converting from a conventional barn to a free stall barn with a milking parlor.

Table 8. RANKING OF REASONS FOR GROWTH IN DAIRY HERDS
38 New York Dairymen, 1977

Reason	Relative work		
	Very Important	Important	Not Important
	(number of farmers)		
To provide more net income	23	15	0
Obtain greater efficiency in use of facilities and equipment	20	15	3
To reduce physical effort	15	17	6
To facilitate bringing someone into business	18	6	14
To improve timeliness	12	15	11
To be up-to-date and modern	4	20	14
To utilize available and unused cropland	9	8	21
To invest some of your own available capital	3	4	31
To gain status in the community	3	3	32
To use readily available credit	0	6	32

In terms of numerical standing, these two factors stood out at the top of the list. Although all of the farmers in the study found it necessary that expansion turn a profit, in many cases, there were important secondary reasons to increase herd size as well. One of these important reasons was to reduce physical labor and exertion. Most farmers felt that by becoming larger, labor saving equipment could be acquired to replace that being currently used, providing more free time to do other things. Although 32 of the 38 in the study valued this as an important reason for expansion, few indicated that this goal had been achieved over time. The more common response was that although labor saving equipment did replace some physical labor, the added livestock more than made up the difference, especially in terms of their own time commitments to the business.

In many instances, these farmers stated that growth took place to facilitate bringing someone else into the business with them, most commonly a son. Eighteen, or almost one-half of those sampled said this was a "very important" reason why they expanded herd size.

Directly following this in degree of importance was the factor of timeliness. As the business expanded, it was more important to do the milking, feeding and field work on time and not have unwarranted delays. Increased size meant greater capacity of machinery and equipment which allowed improved field operations and greater timeliness in planting and harvest.

Of slightly less relative importance, was the observation that growth took place to allow being up-to-date and modern. In the sense that this was related to economic efficiency it was important. However, very few believed that this goal by itself accounted for a great deal of growth in the past. Some commented that being up-to-date could be expensive if one tried every new idea or technology that was suggested.

Ranked seventh among the ten statements, the 38 farmers had mixed reactions to the statement that they grew to take advantage of available and unused cropland. Over 1/2 of the farmers responded that this factor was "not important" to their growth decisions in the past. They stated this feeling despite earlier acknowledging that they had enough land to support extra cows when they expanded. Most recognized the need for more stored forage when more cows were added. They found it difficult to admit that cropland might be underused or not handled to gain full productivity.

The last three reasons suggested for growth in order of numerical rank, were seen as substantially less important than the first seven factors listed. For example, very few felt that one of the primary reasons they decided to expand was because they had extra capital to invest. In point of fact, few had this luxury. Likewise, the factor of status was dismissed as being unimportant by 32 of the 38 operators. Lastly, the mere fact that capital was available to be loaned to them for expansion purposes affected only six in their ultimate decisions on whether to add more cows or not.

Table 9. WEIGHTED SUMMARY OF REASONS FOR GROWTH
 38 New York Dairymen, 1977

Reason	Numerical Rank (4-2-0)
1. To provide more net income	122
2. Obtain greater efficiency in use of facilities and equipment	110
3. To reduce physical effort	94
4. To facilitate bringing someone in business with you	84
5. To improve timeliness	78
6. To be up-to-date and modern	56
7. To utilize available and unused cropland	52
8. To invest some of your own available capital	20
9. To gain status in the community	18
10. To use readily available capital	12

Factors Limiting Growth in the Future

Farmers participating in the study were also asked to identify reasons for limiting future growth and to identify what they saw as potential problems if herd size continued to increase. Using the same procedures followed in discussing why dairy herds were expanded, farmers were asked to consider why future growth might be limited. Their responses are summarized in tables 10 and 11.

Table 10. RANKING OF REASONS FOR LIMITING GROWTH IN HERD SIZE
38 New York Dairymen, 1977

Reason	Relative rank		
	Very Important	Important	Not Important
	(number of farmers)		
The headaches of labor management and supervision	23	8	7
Problems of control as business becomes more spread out	15	16	7
Lack of added management help	18	7	13
Lack of added cropland nearby	10	12	16
Growth of wastes and sanitation problems	9	13	16
Age of operator	10	11	17
Added financial risks and uncertainties	8	10	20
Limited availability of own capital	6	8	24
Risks and uncertainties related to disease	4	9	25
Reductions in crop yields and milk production	2	6	30
Limited availability of borrowed capital	3	4	31
Negative community reaction to growth	1	6	31
Uncertainty about market for milk	0	2	36

Some of the more talked about and quoted limits to growth, such as concern over the acquisition of capital and fear of reductions in crop yields and production levels were generally not at the top of the list for this group of large dairymen. What emerged from the discussions as the number one factor limiting growth was "the headaches of labor management and supervision." Clearly, this problem was viewed in a classification all by itself. Twenty-three farmers viewed this as a "very important" limiting factor. An additional eight found it to be "important." The individual responses, if compared to information supplied on the Business Summary shows that to some extent, those farms with the lowest percentage of family labor to the total labor force (31%), were the ones that felt they had the most severe problems managing labor.

Ranked second to "labor management problems", were problems involved in control as the business becomes more spread out. Many of the farmers felt that as herd size increases, thus causing land use, building use, the labor force and the financial management aspects of the business to expand as well, management would be taxed beyond its coordinating capabilities, especially as the land area covered was increased and the parcels were separated by larger distances.

Directly related to the control of the business, and next in terms of rank as limiting in the future, was the lack of additional management help on many of these farms. Eighteen, or nearly 1/2 of all the operators viewed this as a "very important" limit to the future growth of their farm business. This indicates a recognition that both supervision and time for management decisions can be scarce at peak periods. The 13 dairymen who saw this as unimportant were directly in contrast to the 18 who gave this high priority. It appears that some had been more successful both in obtaining management assistance and then using it, than had others over time.

Table 11. WEIGHTED SUMMARY OF REASONS FOR LIMITING GROWTH OF HERD SIZE
38 New York Dairymen, 1977

Reason	Numerical Rank (4-2-0)
The headaches of labor management and supervision	108
Problems of control as business becomes more spread out	92
Lack of added management help	86
Lack of added cropland nearby	64
Growth of wastes and sanitation problems	62
Age of operator	62
Added financial risks and uncertainties	52
Limited availability of own capital	40
Risks and uncertainties related to disease	34
Reductions in crop yields and milk production	20
Limited availability of borrowed capital	20
Negative community reaction to growth	16
Uncertainty about market for milk	4

Of lesser relative importance than the factors just cited was the question of future availability of cropland. Sixteen of the 38 dairymen saw the availability of cropland in the future as "not important" to their growth plans. This may reflect differences in competition for cropland in different regions. Of those that did show concern over the availability of land, most stated that the rental rates or purchase prices were reasonable. In many cases however, these acreages were too far away to be used effectively in their operations. To some farmers, two to three miles was too far to travel, while for others, up to 10 miles was acceptable.

Concern over handling wastes and sanitation problems received a mixture of responses. Of the nine who cited it as "very important" and the 13 who felt it was "important", concern took several forms. In a few cases it resulted because of proximity to urban areas. For others, the costs and problems associated with storing and distributing animal wastes nearby posed the greatest concern. For the remainder, concern persisted because of fear of what rules and regulations might be enacted by local, state, and federal governments in the near future.

Viewed as equally as important as waste and sanitation problems was the age of the operator. Although perceived as a human characteristic, the variability of the responses reflected not only age of present management, but

expectation of future management help as well. It also indicated how some dairymen reacted to the future of the business at the time present management would retire or cease operations.

Ranked seventh among the 13 statements was the added financial risks and uncertainties involved in further expansion. Although a minority of those interviewed felt this was important, those that did were hesitant to take on further debt loads for the possible attainment of a higher income, at least until current net worth positions were strengthened.

Many of the same people who were concerned about financial risks, were also concerned about the limited availability of their own capital to finance expansion.

The risks related to disease and animal health were ranked surprisingly far down the list of limiting factors. Although most of the farmers realized this kind of problem would not be reduced with growth in cow numbers, many felt they could handle this problem or at least had so far and therefore would not be limited in this regard in the future. However, the nine who viewed this as an "important" problem and the four who felt it was a "very important" limit, saw otherwise. As one farmer with a large herd stated, "If we put 100 cows in that barn, we can count on 5 being sick next week. If we put 200 cows in that barn, we can count on 15 being sick next week." Here, experience with the nature of the potential problem may have limited perceptions on the size of this potential for trouble.

The last four factors as listed, quite obviously were not seen as major limits to growth by most of these farmers. Although much lip service has been given in past years to the general notion that milk production levels sometimes decline as herd size increases, very few of these farmers feared this happening on their farm given their past experience and current herd size.

Similarly, few felt they would be limited in expansion plans because of difficulty in borrowing adequate amounts of capital. On the contrary, some farmers expressed concern that capital was being loaned too freely and that possible expansion might come "too fast" to be integrated into a management system, especially by "others" in the community.

Ranked near the bottom of this list, only scattered importance was attached to the statement that future growth would be limited because of negative community reaction. Although some noted there might be some resentment by other dairymen, they did not expect their decisions to be influenced severely by their neighbors' opinions or by the rest of society. As one said, "By any standards we are not close to being big business."

Lastly, almost no one seemed to be concerned about a market for his milk in the future. Most thought having a large, regular supply was a help in finding a market and insured good treatment in any period of instability.

Summary

What can be concluded about the responses gathered in the questionnaire? First of all, the answers given were diverse. With the exception that no one doubted having a future market for their milk, every statement posed was seen

as a "very important" reason limiting growth by someone. For example, while the risks associated with disease was not of major importance to all, it was a "very important" concern for some. While the costs and problems associated with waste disposal were of significant proportions to some, to many it was not yet seen as a likely problem. Lastly, while most of those sampled were not worrying about where the next loan would come from, it was of extreme importance to a small minority.

Nevertheless, some factors stood out as important or unimportant to most all. One such factor was the belief that crop yields and production levels would not decrease with increases in size. Thirty of the 38 interviewed saw this as unimportant. When subsequently asked whether they thought other production costs such as labor and machinery costs per cow would increase as herd size expanded, their responses were mixed. Although most felt technical diseconomies were not inherently associated with the growth and expansion they had planned to date, many felt that given the set of resources they had available on their own farm, expansion could only be profitable at certain herd size intervals. Most had grown gradually, not adding more than 30 to 50 cows in any one year. Their perception of future incremental change was of the same character.

The Structure of Costs and Size

One way to look at the effect of size on production costs is to examine farm record data for units of different sizes. Inevitably this approach is filled with problems. Farms of the same size have different resources. The capacity of the managers is different. The productivity of the soils and the cows is different. The record keeping systems, depreciation rates and time of purchase of buildings and equipment are highly variable.

Average Production Costs and Size

Farm record data, nevertheless, does provide actual experience under farm conditions of what happens in milk production. Despite all the variability built into the data, further analysis of these records can suggest something about the differences that do exist among commercial farms of a given size and whatever tendency there is for costs to change as size changes.

A quick examination of the evidence presented in table 12 suggests that differences in costs for each of a series of important production items are only modestly related to size of herd if at all. Only farms with free stall operations were considered so that one major source of variability was held constant.

Labor costs per cow decreased on the average when comparing farms with 55 cows or less and those with 55-69. On the average, after this, costs for labor increased for each successive size category. The highest labor costs per cow were sustained in 1977 on farms with 150 cows or more.

There is no obvious pattern to machinery costs per cow in relation to the five herd size categories. Essentially, one concludes that size is not an important determinant of either increasing or decreasing costs, at least looking at this table. Clearly, the amount of machinery and equipment, the time it was purchased and the depreciation schedules used affect these numbers very

strongly. Logic suggests that machinery costs should be somewhat less on large farms than small ones, but the appetite to buy more and new equipment may offset the natural economies in practice.

Table 12. HERD SIZE AND PRODUCTION COSTS
191 Free Stall Operations, New York Business Summary, 1977

Herd size	Number of farms	Production cost per cow:			
		Labor	Machinery	Veterinary	Feed and Crops
Under 55	16	\$230	\$267	\$17	\$416
55 - 69	29	204	283	23	480
70 - 99	60	213	250	24	504
100-144	50	228	258	25	509
150 and over	36	246	257	30	493

Source: Bratton, C. A., A. E. Res. 78-8, July 1978, p. 40.

Veterinary expenses increased on the average for each size category. This is a small item in total and may well be incorrectly recorded or categorized on some farms. Some expenses for medicines and supplies may well have been put with some other items. Moreover the impact of veterinary expenses in terms of herd health, death loss and reproductive efficiency is not shown. Nevertheless, what little evidence there is available shows that in practice large farms spend more for this item than smaller units.

The largest item of cost in milk production is for purchased feed and the expenses like fertilizer and seed for growing crops to produce feed. The smallest herd size had substantially lower costs on average than did the other four groups. Average milk production levels were also higher on these farms so that the averages do not suggest very much about either economies or diseconomies on this very important component of production costs.

Variability from Farm to Farm in Costs

Further examination of experience on individual farms with herds of 100 cows or more was made for important components of production costs. This analysis was intended to look at the amount of variability in the costs reported through the farm account data for each size category and see if any trends or direction could be discerned. Scatter diagrams were prepared where the level of cost per cow was recorded in relation to herd size with a dot on a graph. The results of this effort are presented in figures 10, 11, and 12 for each of 92 farms included in the 1977 dairy farm management summary.

There is a great deal of variation in labor costs per cow reported among large farms in New York State as shown in figure 10. Although the greatest cluster of observations is in the \$200-\$300 per cow range, they range from less than \$140 to over \$400 per cow. When the largest of these farms is considered, there seems to be little firm evidence to support the idea that labor costs per cow must increase as herd size increases. What the diagram shows is that even among the largest farms, there is substantial variability from farm to farm. The chart also indicates that none of the farms studied with more than 250 cows were able to reduce labor costs as much as some of the smaller farms. At the

other end of the cost scale there were some large farmers whose labor costs were very high. If there is any trend in these data as size increases it is toward a small increase in labor costs per cow.

The same type of analysis for machinery costs per cow is presented in figure 11. This shows an even greater degree of variability than was noted for labor costs from farm to farm among those providing cost data. However, there is some suggestion that economies do occur as herd size increases on the very largest farms. An alternative hypothesis is that these numbers more nearly reflect how old the equipment and machinery inventory is and how depreciation is charged rather than true evidence that machinery costs actually fall in practice as herd size increases.

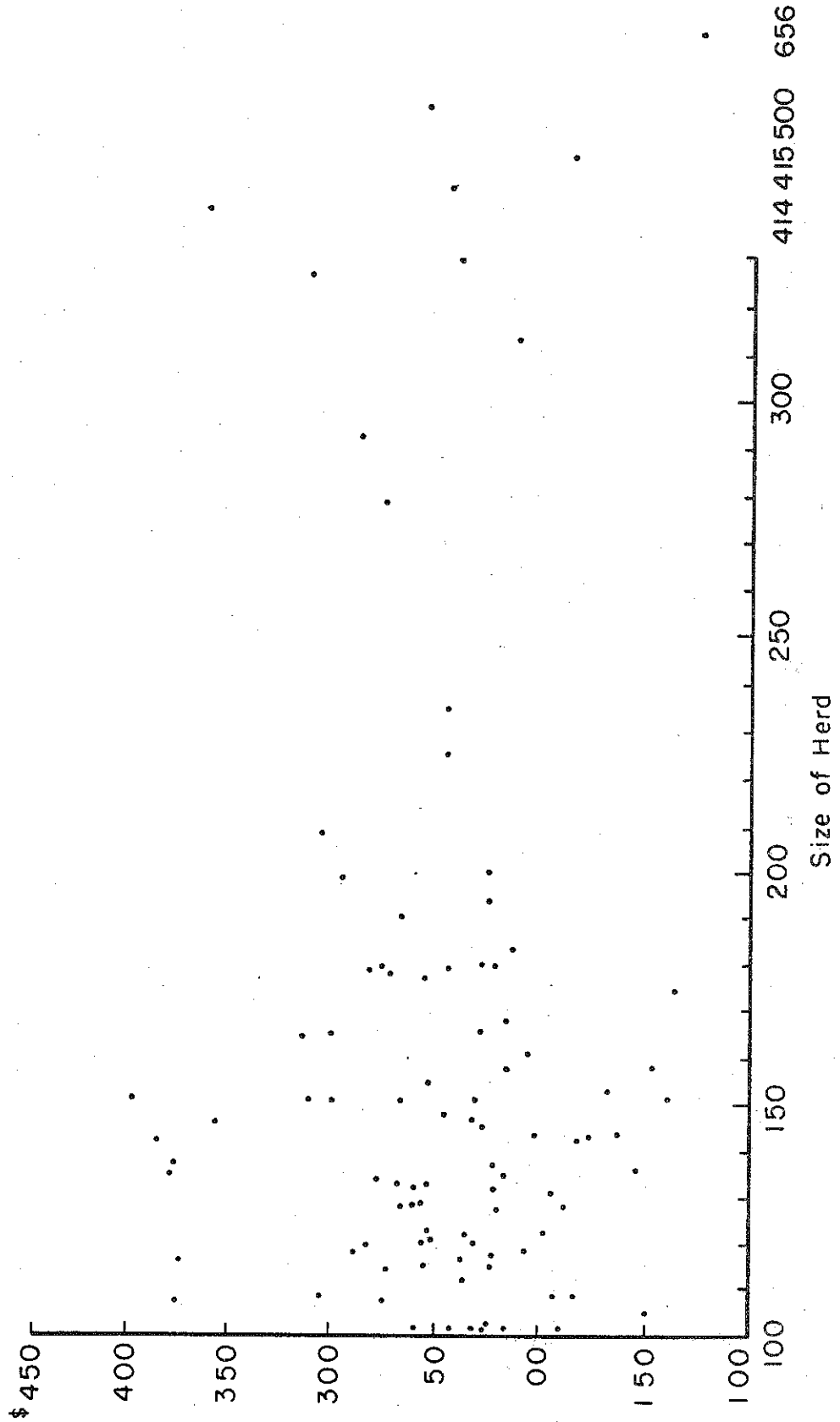
Veterinary expense per cow, including medicines or preventive treatments is related to size in figure 12. The pattern of showing a wide scatter of observations is continued. It is difficult to ascertain any tendency for these costs to increase or decrease as herd size changes. Moreover the impact of preventive medicine cannot be established. This type of analysis does not allow examining the personal philosophies among individual farmers concerning herd health and the expense involved. It is evident that veterinary costs can be an important variable. The raw data indicate the extent of variability but very little about production levels, herd health, calf mortality and all the other related issues for which the money is spent. It would be helpful to look at these costs over a span of years in trying to assess what these expenditures accomplished. Relative to labor and machinery costs, these costs per cow are quite small.

Although individual farms may experience increased production costs per cow during expansion, the above results in general, do not demonstrate clearly that diseconomies occur over the range between 100 and 300 cows or indicate where such diseconomies are most likely to occur. This limited examination of individual production costs does not indicate that a dairyman should necessarily expect his costs per cow to increase in this range of sizes, particularly for the kinds of management and other resources these farms have available. But he should also recognize that economies of size are far from automatic and it is very easy to increase costs per cow as well.

Summary Observations

Between the years 1967-77, growth in herd size among the 38 large dairy farms observed across New York State, increased more than 100% on the average. While the lumpiness of resources such as land and buildings dictated that growth occur unevenly, the majority of the operations grew slowly, in increments, rather than in one or two large steps. According to the top four responses of these dairymen, the primary reasons for growth in the past, were to: 1) provide more net income; 2) obtain greater use of facilities and equipment; 3) reduce physical effort; and 4) to facilitate bringing someone else into the business. While the majority of the large farmers interviewed stated that further modest growth was likely to occur on their farms in the near future, 30 of the 38 projected that their herd size would not increase to as many as 300 cows by the year 1982.

FIGURE 10. LABOR COSTS PER COW (NEW YORK DAIRY FARMS OVER 100 COWS, 1977)*



*Four observations for farms with more than 400 cows were obtained from farmers not included in the regular summary but participating in this special study.

FIGURE 11. MACHINERY COSTS PER COW (NEW YORK DAIRY FARMS OVER 100 COWS, 1977)

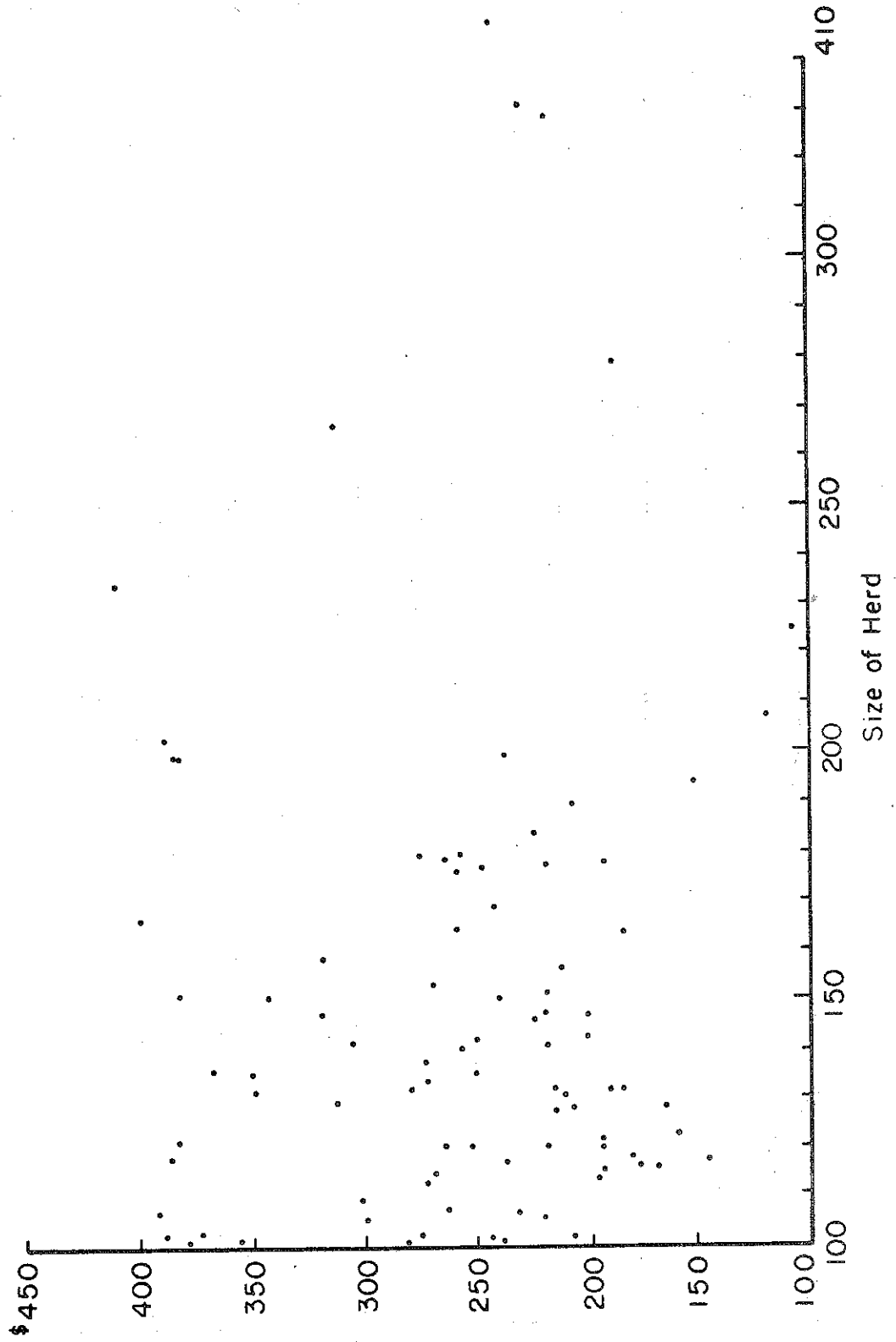
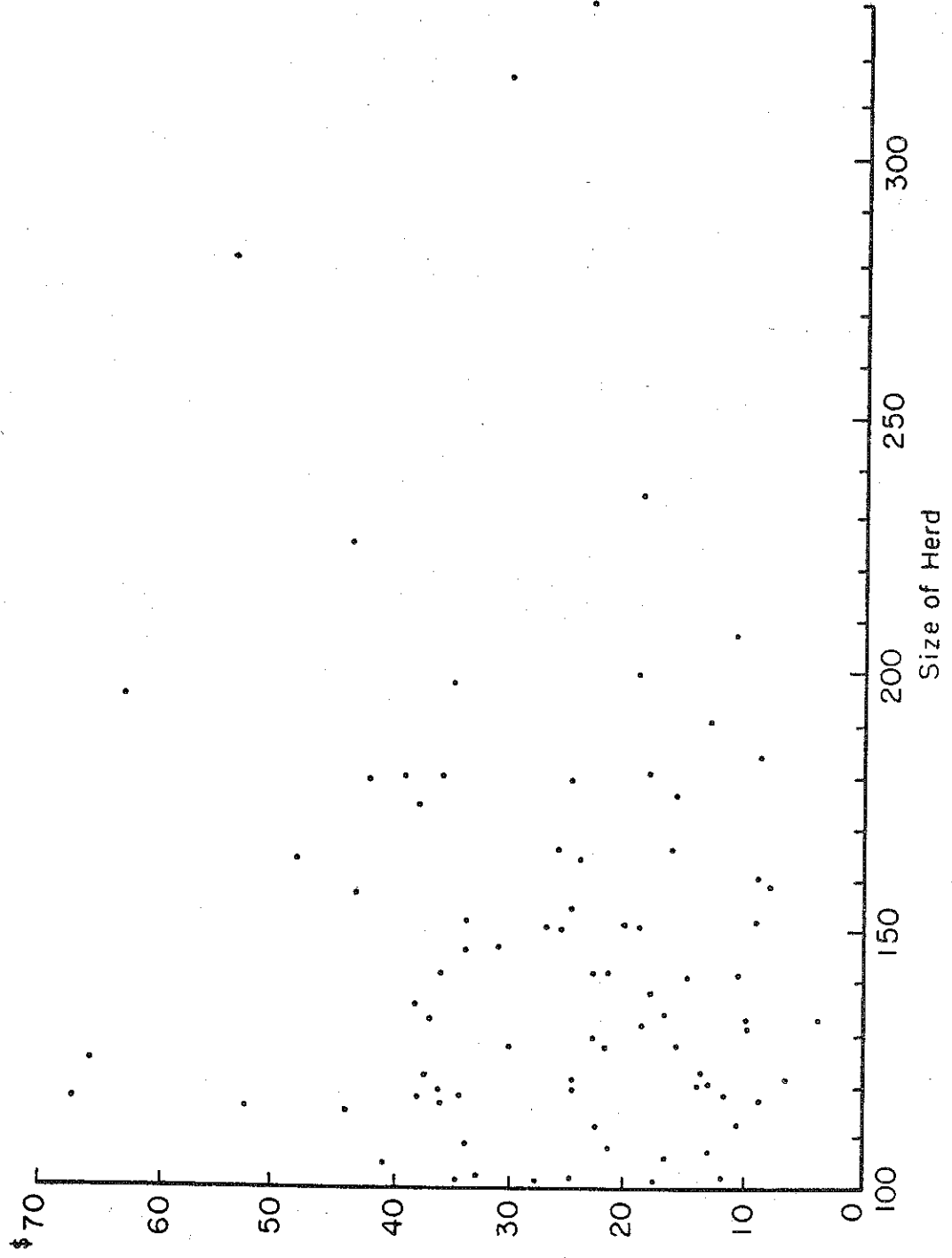


FIGURE 12. VETERINARY EXPENSE PER COW (NEW YORK DAIRY FARMS OVER 100 COWS, 1977)



This analysis suggests that farmers with 250 or more cows project more growth in the near future than those with 150 to 200 cows; thus slowly widening the gap between large herds and very large herds in the state. While one operator has plans to double his herd size from 500 to 1,000 cows within the next five years, an increase of this magnitude was the exception rather than the rule. None said that they had any inclination of evolving into large dairies of 1,500 or 2,000 cows, such as those known to exist in parts of the south and west. In addition to the deterrents stated in the questionnaire, the dairymen saw several differences affecting size on forage producing, dairy farms in the Northeast and Lake States and the large scale, specialized dairies of the "sun belt". The most commonly cited of these restrictions are as follows:

Forage Production - Although the normal procedure in the west is to have someone else grow many or most of the feed requirements, the 38 dairymen in this study all agreed that to maintain an economically efficient operation in New York State, you must have at the very least, the land resources available to grow essentially all of your own roughage needs. Most indicated it would be difficult to obtain cropland for 1,500 cows or upwards in some desirable location relative to their milking facilities. In those cases where it could be acquired, most felt the expense involved in growing, harvesting, and transporting the feed would probably make it an inefficient enterprise.

As a result of this obvious difference in time and effort required for field operation between dairy farms in New York and dairy farms in parts of the south and west, dairymen here do not believe cow numbers by themselves accurately reflect the true size or complexity of their operations on a comparative basis.

Weather - Winter weather in New York State is a major problem for operations that cannot easily be overlooked. The various problems associated with snow and cold are unduplicated in areas where the sun shines 12 months of the year, minimizing the need for feed storage facilities and major investments for shelter for cattle. Winter also complicates the problems of handling animal wastes and their distribution or disposal.

Waste Disposal - According to the farmers interviewed in New York, waste disposal in the humid North where ice and snow can complicate regular procedures for handling manure is a substantial reason for the differences between New York and California or Arizona. On the large dairy farms in the "sun belt" the weather allows the cows to be in dry lots the year round. This alleviates many of the costs and "headaches" of handling wastes. Problems and dangers from environmental pollution are also substantially different in the two regions especially where daily spreading is a practice in proximity to streams and runoff may be a problem.

Labor Supply - There was generally a belief among New York dairymen that because of the type of large scale dairies in the "sun belt", unionization and specialization of labor makes the job of supervising operations easier and less time consuming. The concentration of production also insures a larger supply of trained manpower over time. There is enough demand for part time milking crews that this problem is reduced.

Deterrents to the Growth Process in the Future

On the basis of farmer observations and projections, the following statements summarize their expectations about future growth on large dairy farms in New York State.

1. Management and supervision requirements are among the strongest deterrents to the growth process.

Management time and labor supervision were clearly identified as the most important constraints to growth in this study. Many farmers felt that as herd size continued to increase, management might well be taxed beyond its coordinating capabilities. When additional management help is limited in most cases to family members, expansion may be limited.

2. Acquisition of capital is a relatively minor problem for farmers with herds of 100 to 300 cows.

Although this factor has often been cited as a major deterrent to the growth process, this analysis indicates that only a few dairymen had any problems obtaining capital. Of those that could not borrow additional capital, past performance in using added resources was readily recognized as the reason. Some farmers commented that it was "too easy" to borrow money.

3. Waste and sanitation problems are commanding increasing attention, both from the standpoint of environmental regulations, and cost.

Dairymen see this as an increasing source of trouble. In a few cases it was because of proximity to urban areas. For others, concern existed because of problems with storing and distributing the waste. The remainder fear the kinds of rules and regulations that may be enacted in their areas by people who have little interest in farming.

4. There is relatively little inherent fear of reductions in crop yields and milk production levels as herd size increases in the range between 150 and 300 cows.

Although for many years farmers have been cautioned to be prepared for reduced yields if they get larger herds, concern has dwindled over the size ranges considered with good management and exercise of control and timeliness in operations.

5. Costs associated with risks of disease and herd health can be managed successfully. Risks associated with disease, reproductive problems, and death loss are not viewed as a primary problem by the dairymen with 150 to 300 cows.

6. Observed increases in costs, when they occur during a period of expansion, are most often the result of management deficiencies and lack of necessary supervision and control rather than inherent diseconomies of scale.

7. Large New York dairy farmers are not very concerned about losing their market for milk or marketing problems compared to other issues in managing their businesses.

8. Natural resource limitations in the form of available cropland are a considerable deterrent to some, but should not be over emphasized in discussing growth on New York dairy farms.

9. Differences in the types of technology currently in use on large dairy farms in New York are small and this is not a likely reason for important differences in costs as herds increase in size up to 300 cows.