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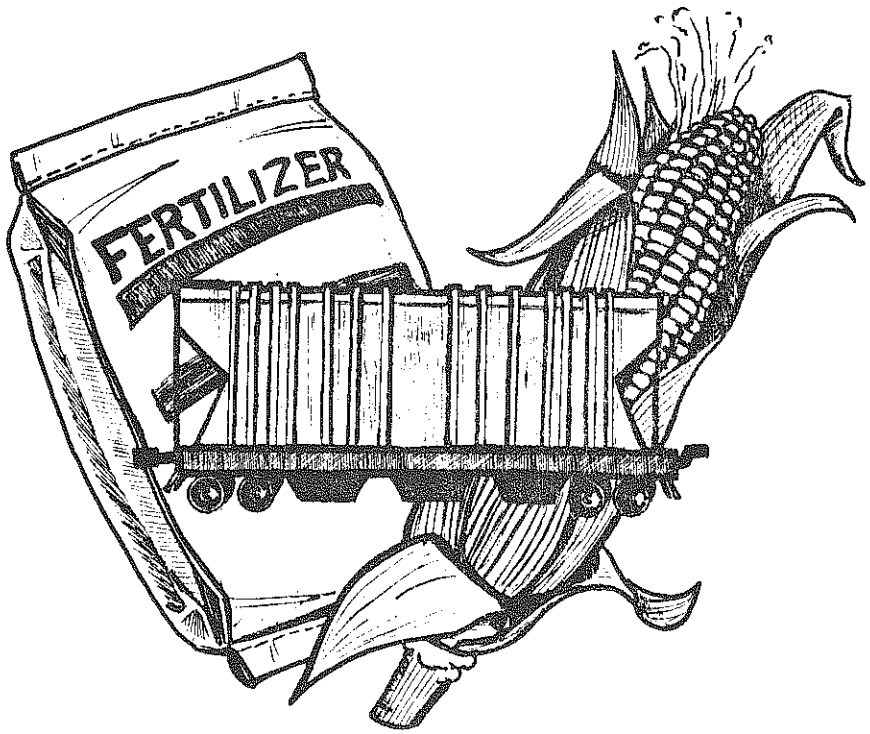
The New York Feed and Fertilizer Industries Structure, Characteristics and Input Movements



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The New York Feed and Fertilizer Industries:

Structure, Characteristics and Input Movements

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ACKNOWLEDGEMENTS

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This report is part of a larger project studying the economic feasibility of break-bulk rail receiving facilities in New York and Connecticut. This study was funded by and presented to the New York State Department of Agriculture and Markets and the New York State Department of Transportation as background for a break-bulk rail receiving study.

The author is also indebted to Claude Freeman, William Schiek, William Shope, Ali Wali and Laura Weiss for their assistance in data collection and analysis. Finally, a special thanks to Clara Travis for her patience in the typing and editing of this report.

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Section I

Introduction

Section I

INTRODUCTION

An economically viable and user-oriented rail transport system is essential to the agricultural economy of New York State. Two of the most important purchased inputs used on New York State farms are feed and fertilizer. Both are bulky, used in large quantities and moved into the state from distant production areas primarily by rail. These two commodities make New York agriculture extremely dependent on railroad transportation.

The Consolidated Rail Corporation (Conrail) is the backbone of the state's railroad system. It evolved from the bankruptcy of the Penn Central Railroad in 1970 and the subsequent demise of six other Northeast and Midwest railroads. Conrail was established by the Regional Rail Reorganization Act of 1973. The initial intent was to create a 17,000 mile semiprivate carrier that would become economically viable and financially self-sufficient by 1979. To date Conrail has received an estimated $6 billion in federal subsidies. Even conservative estimates suggest several hundred million more dollars are needed to achieve profitability. 1/

In April 1981 three proposals were presented to improve the economic performance of Conrail. One was presented by the U. S. Department of Transportation (DOT), another by the U. S. Railway Association (USRA) and the third by Conrail. The DOT report suggested a permanent transfer of Conrail, in whole or in part, to private investors. The likely buyers would be major railroads interested in establishing a nationwide rail network. The USRA proposal assumed continued federal ownership, but at reduced service and with up to $600 million in additional federal aid. 2/ The Conrail alternative also assumed continued governmental ownership, but requested only $342 million in additional subsidies. 3/

All three proposals had several points in common:

1. Transfer of Conrail's passenger commuter service to local transit authorities.

2. Relaxation of work rules and repeal of the labor protection benefits provided under the 1973 act.

3. Aggressive use of the rate-making flexibility provided for by the Stagger's Act, and

4. Greater service flexibility through the abandonment of additional rail lines.

1/ Sarason, J., "Reports at Odds on the Future of Conrail," Congressional Quarterly, April 4,, 1981, p. 594.
2/ Ibid.
3/ Sarasohn, op. cit.

It is the last point - increased rail abandonment - that will have a significant impact on New York feed and fertilizer firms as well as the state's agriculture. While it is difficult to accurately assess the eventual effect of any of these proposals, studies have been conducted to indicate the relative impact of the alternatives.

Conrail estimated their proposal would eliminate 2,400 miles (out of a total of 17,000 miles) of line. 4/

USRA suggests its proposal will cause a reduction of 4,000 miles of track. As a result it estimates the systemwide volume of agricultural traffic, primarily feed and fertilizer, will decrease by 3.5 percent compared with 1979 movements. 5/ Since the Northeast volume of agricultural commodities in 1979 was 107,000 cars, this implies a reduction of approximately 3,700 cars. The impact will vary by state and commodity and New York State would bear a significant portion of the total reduction. Of the 31,000 cars of agricultural commodities terminating or originating in New York, USRA estimates its proposal will decrease traffic by seven percent or approximately 2,200 cars. 6/

The DOT proposal contains no estimates of its impact on service. However, DOT has stated it intends to maintain service at 95 percent of the current level. An analysis of the DOT alternative conducted by USRA found that 70-75 percent of Conrail's traffic travels over only 5,000 miles of track. Although Conrail has stated it will not allow private investors to obtain only the attractive segments, buyers will be most interested in the lines with the high volume traffic. At 70-75 percent of current services, USRA found "that almost 45% of the agricultural traffic would cease to move by rail, which is a disproportionate loss of service." 7/ In addition, their findings indicated that fertilizer movements would decrease by 61 percent, while feed movements would face a reduction of 32 percent.

The future of Conrail will have a significant effect on the agricultural industries of New York. Those directly and indirectly affected can and should provide input into the decision making processes that will determine the future structure of the railroad system in New York State. But more important, effected parties should begin analyzing alternative ways to operate efficiently under whatever rail system evolves.

Objectives

The general purpose of this study is to outline the structure and characteristics of the current distribution system used by New York feed and fertilizer firms. It is part of a larger effort sponsored by the Federal Railroad Administration, NYS Department of Transportation, and the NYS Department of Agriculture and Markets. The objective of the project is to analyze the costs and benefit of alternative methods of receiving feed and fertilizer in New York and Connecticut. This report is meant to be used as background for an analysis of the alternatives.

4/ Sarasohn, op. cit.
5/ Remarks delivered by David A. Horsman, USRA, delivered at the Northeast Agriculture and Conrail's Future Conference, May 12, 1981, Albany, NY p. 4.
6/ Ibid.
7/ Horsman, Op. cit.

The specific objectives of this report are to:

1. To describe the structure and location of agricultural production within the state in order to determine the nature of feed and fertilizer utilization.

2. To determine the structure and characteristics of the feed and fertilizer industries of New York State.

3. To estimate the costs and economies of scale in bulk receiving facilities.

4. To develop projections of livestock numbers and crop production to 1985 and 1990 in order to determine potential feed and fertilizer consumption within the state, and

5. To outline potential issues that may have an impact on future feed and fertilizer utilization.

Section II

The Structure and Location of Agricultural Production in New York State

Section II

THE STRUCTURE AND LOCATION OF AGRICULTURAL PRODUCTION IN NEW YORK STATE

Introduction

The logical point to begin the analysis is with demand. Demand for feed and fertilizer depends on the characteristics of agricultural production.

The purpose of this section is to describe agricultural production in New York State as it relates to the demand for feed and fertilizer. To ease the task of discussing the locational characteristics of agricultural production and input distribution, the state was divided into nine regions. The rationale for the regional designations is presented in the first part of this section.

The second portion of this section focuses on the importance and trends in animal production. Crop production is the third topic. The final part of this section is concerned with feed and fertilizer utilization within the state.

Nine Regions

Determination of the Regions

For the purposes of this study the state was divided into nine regions (Figure 1). Two factors were taken into consideration when making this designation: 1) The type and nature of agricultural production and 2) The structure of the transportation system.

The location of various types of agriculture production depends not only on geographic factors such as the climate, fertility, slope, and drainage but also on the markets which they serve. History and economics have been important determinants of the latter.

The second major consideration was the transportaiton system. Since the focus of this study is on the needs of the rail transport system, current rail service was the primary consideration. Figure 2 illustrates the rail network currently serving New York State. The layout of the rail system has been affected by geography, demographics and economics. Rail lines typically run through the fertile areas of New York State linking major markets and population centers. Consequently, there was little difficulty in constructing regions. For the most part, agricultural production and the transportation system coincided very nicely. However, in some cases the inclusion of a county in one region rather than another region was more or less arbitrary. The rationale for this particular regionalization is presented below.

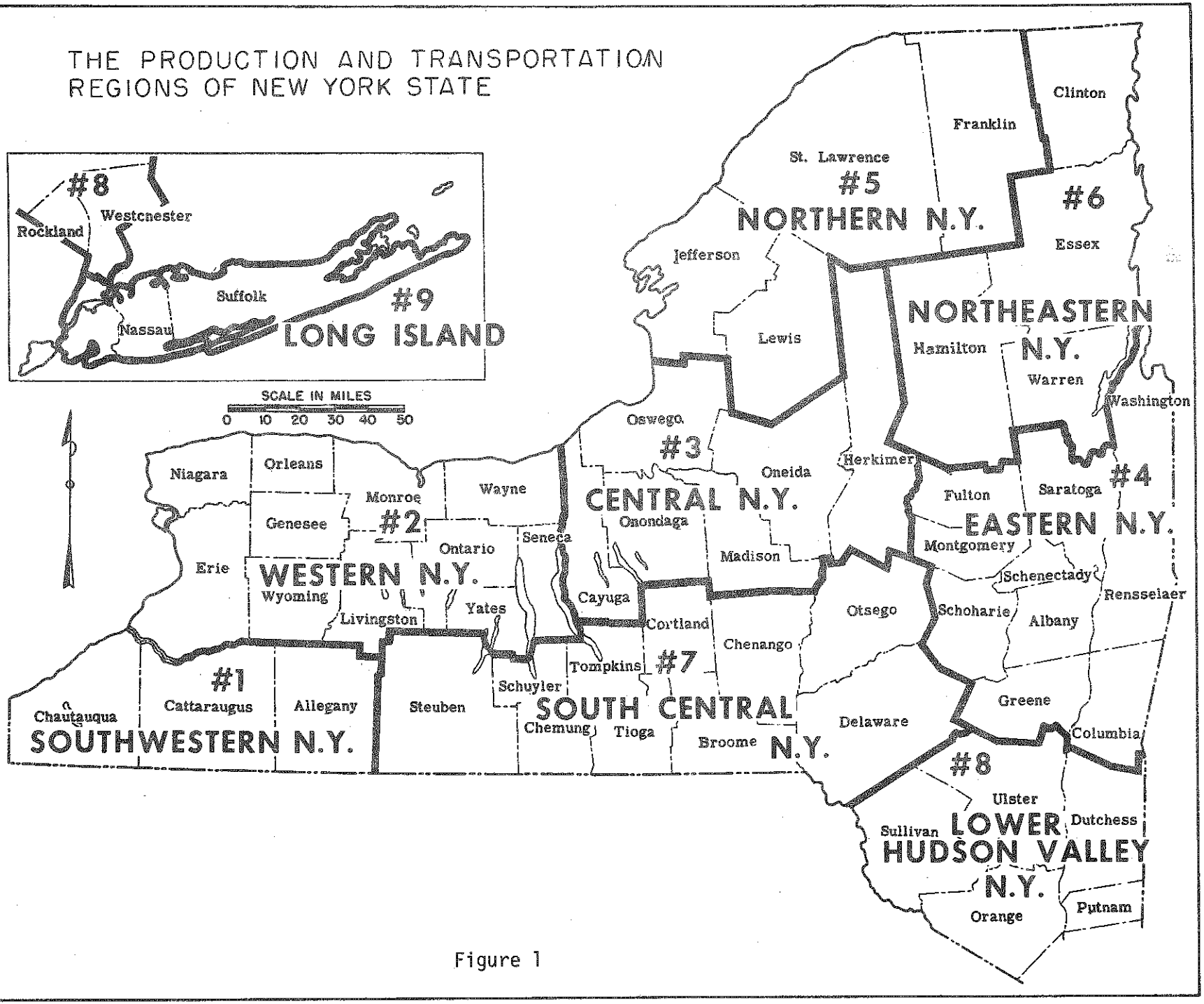

THE PRODUCTION AND TRANSPORTATION REGIONS OF NEW YORK STATE
#8
Westchester
Rockland
Suffolk
#9
LONG ISLAND
Nassau
SCALE IN MILES
0 10 20 30 40 50
Clinton
Franklin
St. Lawrence
#5
NORTHERN N.Y.
#6
Essex
Jefferson
Lewis
NORTHEASTERN
Hamilton
N.Y.
Warren
Washington
Oswego
#3
Oneida
Herkimer
Niagara
Orleans
Monroe
#2
Wayne
CENTRAL N.Y.
Fulton
Saratoga
#4
Genesee
Onondaga
EASTERN N.Y.
Seneca
Ontario
Montgomery
Erie
WESTERN N.Y.
Madison
Schenectady
Rensselaer
Wyoming
Cayuga
Yates
Otsego
Schoharie
Albany
Livingston
Cortland
Chenango
Tompkins
#7
Schuyler
Greene
#1
Cattaraugus
Allegany
Steuben
SOUTH CENTRAL
Delaware
Chautauqua
SOUTHWESTERN N.Y.
Chemung
Tioga
Broome
N.Y.
Columbia
#8
Ulster
Sullivan
LOWER
Dutchess
HUDSON VALLEY
N.Y.
Orange
Putnam

Figure 1

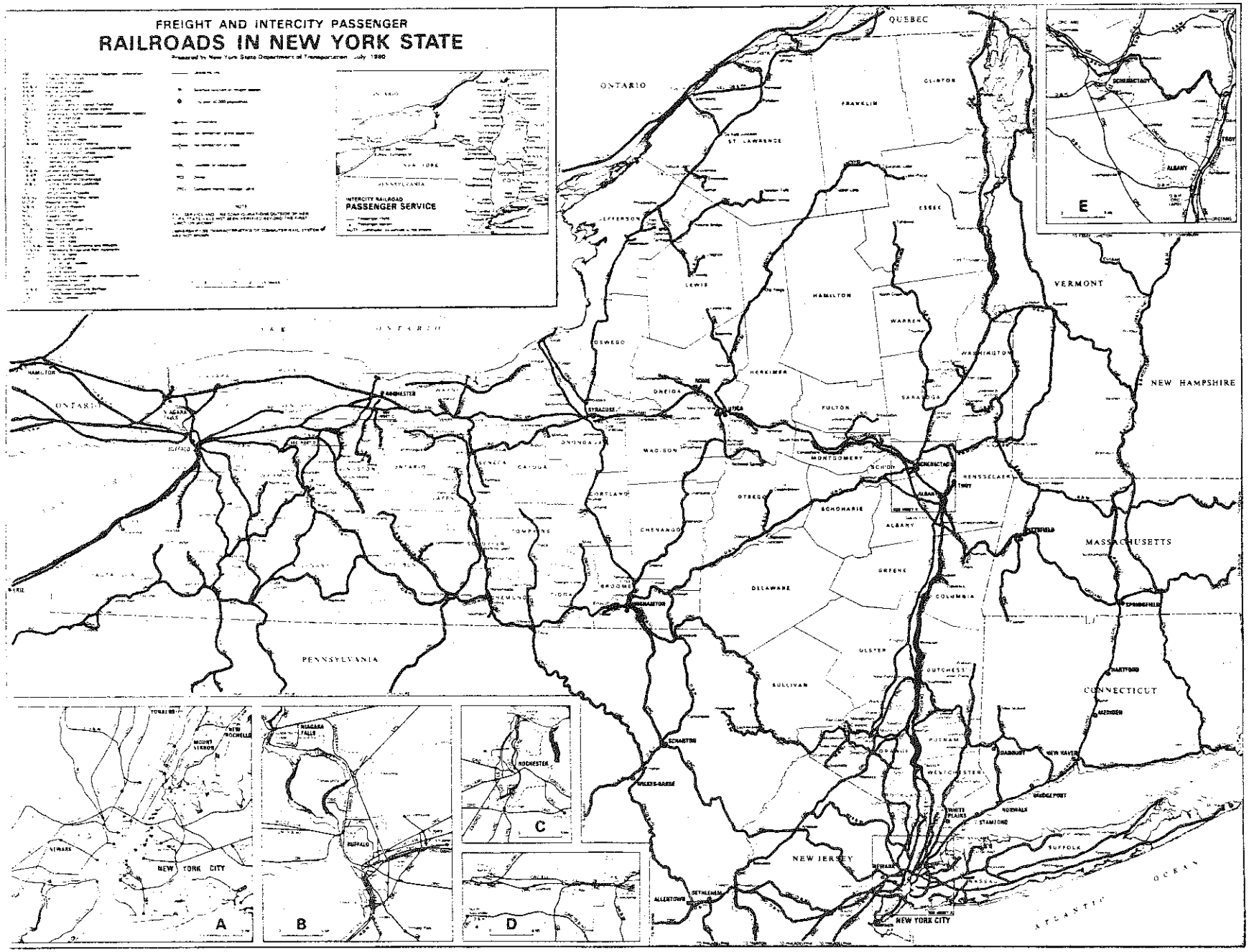

FREIGHT AND INTERCITY PASSENGER
RAILROADS IN NEW YORK STATE
INTERCITY RAILROAD
PASSENGER SERVICE
QUEBEC
ONTARIO
VERMONT
NEW HAMPSHIRE
MASSACHUSETTS
CONNECTICUT
NEW JERSEY
PENNSYLVANIA
NEW YORK CITY
ATLANTIC OCEAN
A
B
C
D
E

Figure 2

Description of the Regions

The regional distribution of the acres of land in various types of crops is presented in Table 1. The table also provides the dollar value of fertilizer purchases by region. Table 2 indicates the regional distribution of livestock. The cost of all purchased feed and commercially mixed formula feeds, by region, is presented in Table 3.

Region # 1 - Southwestern NY - consisted of three counties. This area consists primarily of dairy production although a substantial amount of fruit and vegetable production, particularly grape production, is located in Chautauqua County. Terrain and climate are probably the major determinants of the commodities produced. The region is serviced by the old Erie Lakawana segment of Conrail. Rail traffic to this region primarily enters the state through northwestern Pennsylvania.

Region # 2 - Western NY - is the breadbasket of the state. It has a very diverse agriculture and leads most regions in the number of units of animal and crop production. The region is relatively flat and enjoys the lee side of Lakes Erie and Ontario. It is the primary grain producing region of NYS with corn being the primary grain. Conrail's main trunk line services the region through the Buffalo gateway. While lake transport was once an important factor to this region only a few large firms currently use the Port of Buffalo. In addition to ready access to Conrail's trunk line the region also is traversed by several major highways.

Region # 3 - Central New York - has dairy production and grains as its major products. The region has a harsher climate and more diverse topography than Western New York. The area is also serviced by Conrail's trunk line, several major highways, and to a limited extent, Great Lakes traffic through the Port of Oswego. In addition, the Central Region functions as the gateway to Northern NY (Region # 5) for inbound traffic by rail and highway.

The agriculture of Region # 4 - Eastern NY - is also dominated by dairy production. Other products of minor importance include, corn for grain, oats, orchard crops, vegetables and poultry. Albany, the largest city in the region, serves as the primary rail gateway to New England. Conrail's trunk line feeds Albany from Buffalo and New York City. The Delaware & Hudson (D & H) railroad, headquartered in the region, provides service from Binghamton. The region is also linked to Canada (Montreal) through a line running through the Champlain Valley. The Port of Albany is also an important asset for the region. It serves as an export terminal for grain from the midwest.

Region # 5 - Northern NY - is a single product area - dairy production. This is due to its harsh climate, rocky soils, and rolling terrain. The crops produced are primarily in support of its dairy production, i.e. hay, corn for silage, and oats for bedding. The region's rail service originates in Syracuse or Montreal and runs along the western side of the region. An interstate highway connecting Syracuse and Montreal is the other major transportation artery.

Table 1. Land in Cropland, (1,000 acres), New York, 1978

Regions	Corn for Grain	Corn for Silage	Wheat	Oats	Orchards	Grapes
1. Southwestern NY	17.4	49.9	0.5	14.7	21.0	20.0
2. Western NY	295.2	127.8	44.5	116.7	68.4	16.0
3. Central NY	131.2	103.5	10.9	51.9	3.8	0.0
4. Eastern NY	49.8	98.4	1.2	13.7	9.8	0.5
5. Northern NY	13.2	95.1	0.4	18.3	0.1	0.0
6. Northeastern NY	2.6	21.5	1.0	1.4	3.8	0.0
7. South Central NY	66.4	127.8	5.1	54.3	6.6	5.7
8. Lower Hudson Valley	17.6	30.3	0.2	1.5	20.1	0.6
9. Long Island	0.3	-	0.8	0.2	0.7	0.0
TOTAL	593.7	654.3	64.6	272.7	134.3	42.8
OTHER 1/	7.5	4.8	0.9	2.5	3.6	0.1
NYS TOTAL	601.2	659.1	65.5	275.2	137.9	42.9

1/ The difference between the region total and the New York State total.

Table 1. Con't. Land in Cropland, (1,000 Acres), New York, 1978

Regions	Vegetables	Potatoes	Hay	Total	Total Cropland	Difference 2/	Fertilizer Purchases
1. Southwestern NY	4.3	0.1	214.7	342.6	313.8	+28.8	4,646
2. Western NY	89.0	14.0	397.7	1,169.3	1,205.1	-35.8	32,876
3. Central NY	22.9	2.3	357.1	683.6	670.5	+13.1	13,694
4. Eastern NY	7.2	0.8	370.7	552.1	534.5	+17.6	8,696
5. Northern NY	1.1	1.2	405.1	534.5	519.2	+15.3	6,220
6. Northeastern NY	0.4	0.2	71.5	102.4	101.1	+ 1.3	1,300
7. South Central NY	2.9	5.0	525.1	798.9	770.1	+28.8	12,134
8. Lower Hudson Valley	17.4	0.4	107.9	196.0	194.3	+ 1.7	4,574
9. Long Island	7.8	24.1	0.6	34.5	39.7	- 5.2	3,708
TOTAL	153.0	48.1	2,450.4	4,413.8	4,348.3	+65.6	87,848
OTHER 1/	2.0	2.2	128.4	152.0	135.3	+16.3	604
NYS TOTAL	155.0	50.3	2,578.8	4,566.0	4,483.6	+81.9	88,452

1/ The difference between the region total and New York State total.
2/ The difference between the total of all crops and total cropland reported.

SOURCE: Bureau of the Census, 1978 Census of Agriculture; New York (Preliminary Report), (Washington, D.C.: U.S. Department of Commerce, 1980.

Table 2. Livestock Numbers, (1,000 Head), New York, 1978

Regions	Cattle & Calves	Milk Cows	Hogs & Pigs	Sheep & Lambs	Horses & Ponies	Chickens 3 Mo. & Older
1. Southwestern NY	141.4	72.4	11.1	3.9	4.2	229.6
2. Western NY	280.9	135.5	63.5	26.7	9.6	2,311.4
3. Central NY	260.3	129.3	16.3	2.7	4.7	587.4
4. Eastern NY	214.9	114.3	9.0	5.9	6.8	228.6
5. Northern NY	242.8	140.2	6.4	1.7	3.0	102.9
6. Northeastern NY	46.2	24.1	1.4	0.3	1.0	3.8
7. South Central NY	353.5	187.3	12.7	11.1	8.0	1,778.7
8. Lower Hudson Valley	79.8	36.3	7.3	2.7	5.9	2,871.0
9. Long Island	1.2	0.2	0.4	0.1	0.7	37.3
TOTAL	1,621.0	839.6	128.1	55.1	43.9	8,150.7
OTHER 1/	34.3	23.0	15.8	1.8	8.2	780.3
NYS TOTAL	1,655.3	862.6	143.9	56.9	52.1	8,931.0

1/ The difference between the regional total and the New York State total.

SOURCE: Bureau of the Census, 1978 Census of Agriculture; New York (Preliminary Report), (Washington, D.C.: U.S. Department of Commerce, 1980.)

Table 3. Purchases of Feed and Formula Feed, ($1,000), New York, 1978

Regions	Purchased Feed	Commercially Mixed Formula Feed
1. Southwestern NY	26.3	19.8
2. Western NY	56.0	41.4
3. Central NY	50.6	38.0
4. Eastern NY	47.4	37.7
5. Northern NY	55.2	44.0
6. Northeastern NY	11.1	8.8
7. South Central NY	84.8	67.5
8. Lower Hudson Valley	35.3	27.9
9. Long Island	8.1	7.8
TOTAL	374.8	292.9
OTHER 1/	7.9	4.8
NYS TOTAL	382.7	297.7

1/ The difference between the region total and New York State total.

Region # 6 - Northeastern NY - is a two product region. Dairy production is again the predominant agricultural industry. However, the Champlain Valley is a major area of apple production. Rail transportation is provided by the D & H Railroad and connects Albany and Montreal. One interstate highway runs through the region north and south.

Region # 7 - South Central NY - has the largest number of cattle and calves, including milk cows. Hay, corn for silage, corn for grain and oats occupy the vast majority of arable land. In addition, this region ranks third in the number of chickens. It has acid soil and a hilly topography. Binghamton, located in the center of the region, is the rail gateway of the region. One major interstate highway runs east-west across the southern tier of the region while another highway traverses the region north-south.

Region # 8 - The Lower Hudson Valley - has a very diverse agriculture. It is the primary poultry area of the state. This region also has a significant acreage of orchard crops (primarily apples), other fruits and vegetables. Agricultural production is influenced by the region's muck land and nearness to the New York metropolitan area. Rail transportation services both sides of the Hudson River and several major interstate highways cross the region.

Region # 9 - Long Island - plays a minor role in the agricultural production of New York State. Although it has a mild climate and is close to the major markets, agricultural production is decreasing in importance due to residential development. The remaining farms are located on the east end of the island. However, the region is a major producer of ducks and potatoes. Over 60 percent of its arable land is devoted to the latter product. All rail transportation services in the region must pass through the New York metropolitan area. Long Island has several highway arteries running east-west.

Animal Production 1/

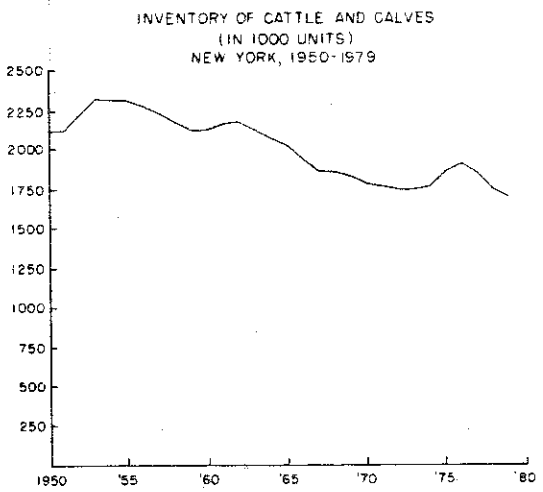
In 1979, livestock and livestock products accounted for $1,619 million or 72.3 percent of net farm income in New York State. Dairy products contributed 58.8 percent of the total. The sale of cattle and calves (7.4%), eggs (3.7%) and hogs (0.9%) were the other animal products of importance.

Cattle and Calves

The number of cattle and calves in the state has been gradually decreasing over the last thirty years (Figure 3), although some fluctuations have occurred due to significant changes in cattle prices. The last such upswing occurred in 1975-76. In 1980 there were an estimated 1.780 million head of cattle and calves in New York.

1/ Unless otherwise specified, figures used in the next two sections are taken from New York Crop Reporting Service, New York Agricultural Statistics, 1979, (Albany: USDA, 1980), and Bureau of the Census, 1978 Census of Agriculture: New York (Preliminary Report), (Washington D.C.: U. S. Department of Commerce, 1980).

Figure 3



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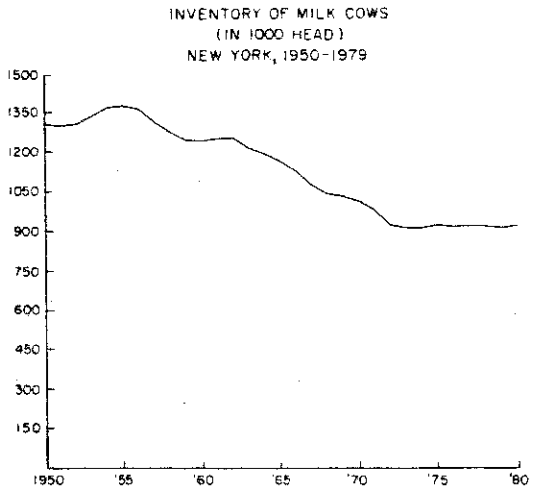

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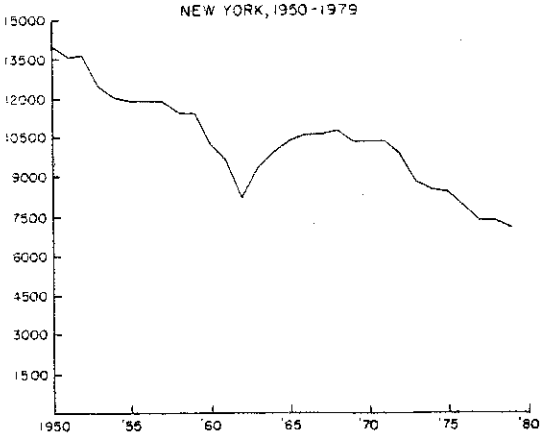

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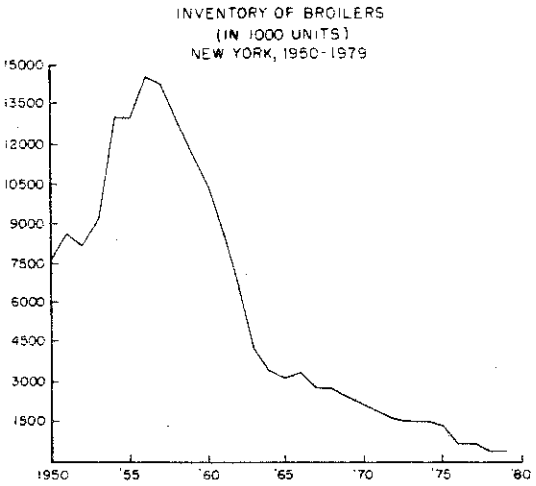

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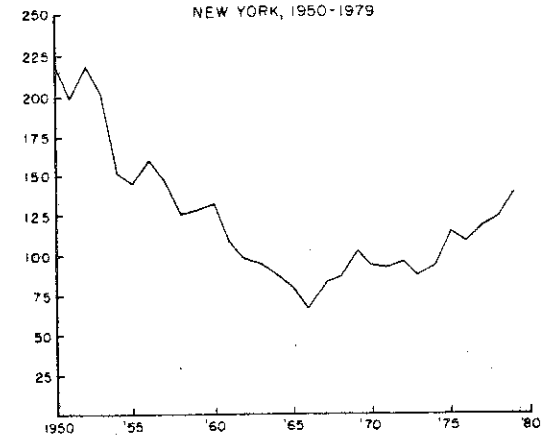
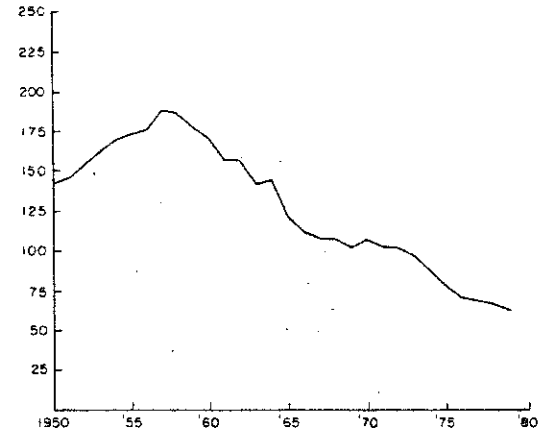


Figure 8



The inventory of cattle and calves is largely made up of dairy cattle. Dairy cattle are not only used for milk production, but are also the primary source of slaughter animals. The number of milk cows has decreased significantly since 1950, but leveled off in recent years (Figure 4). In 1980, there were approximately 912,000 milk cows in the state. Milk per cow has increased annually for several years. Consequently, total milk production has been increasing and in 1979 stood at 10.7 billion pounds.

Since milk production is the primary agricultural activity of New York significant changes in the dairy industry may have a substantial impact on the feed and fertilizer industries. Possible factors that could influence the dairy industry include changes in: government policy related to the dairy industry, prices of feed, animal nutrition, animal breeding, and innovations in the handling of milk.

Poultry

Poultry products includes eggs, broilers, turkeys and ducks. In 1979 net farm income from eggs amounted to 3.7 percent of total, while all other poultry products accounted for substantially less than 1.0 percent.

The recent trend in the number of layers has been downward (Figure 5). In 1979 there were 7.2 million layers in the state. Although eggs per layer has increased steadily over time it has not been sufficient to offset declining chicken numbers. As a result, total egg production has gradually decreased.

New York broiler production has experienced an even more dramatic demise (Figure 6). Between 1971 and 1979, broiler numbers fell by over 75 percent. In the latter years only 480,000 broilers were produced.

Turkey production also decreased until 1975. Since that time turkey numbers have hovered around 150,000 birds, although production increased to 227,000 in 1979.

Duck production is concentrated on Long Island. In 1979, 4.4 million ducks were produced in the state. This was a sharp increase over production in previous years - which averaged a stable 3.8 million between 1973 and 1978.

Except for eggs, the production of poultry products would have almost no impact on the feed industry of New York State. Although egg production, is very feed intensive only dramatic changes are likely to have any major influence on the feed industry. This is due to the small proportion of feed consumed by poultry in comparison to cattle and calves. Moreover, the state's poultry industry is gradually moving to Western New York. Current poultry feeds are composed of approximately 66 percent corn and 25 percent soybean meal. The move to Western New York is for the purpose of being near a major source of corn. By using a higher proportion of local corn, poultry farmers have become less dependent on imported feed ingredients.

Hogs

Hog numbers decreased sharply between 1950 and 1966 (Figure 7). However, since 1966 the inventory of hogs has been gradually increasing. On December 1, 1979 there were approximately 139,000 hogs on New York farms. Although hogs contribute 0.9% of net farm income and their numbers are increasing, hog production is not likely to have an impact on the feed and fertilizer industries of New York.

Sheep and Lambs

Net farm income from sheep and wool amounted to 0.1 percent of the state total. Sheep and lamb numbers have steadily declined and stood at 65,000 on January 1, 1980 (Figure 8). Sheep and lambs are of negligible importance to the state's agriculture and will have no impact on the feed and fertilizer industry.

Crop Production

Crop production accounted for the remaining 27.7 percent of net farm income in 1979 with field crops providing 7.3 percent, fruits and vegetables 14.5 percent and other crops 5.9 percent. The latter group includes greenhouse and nursery material, forest products, mushrooms and maple products.

The following discussion is not only concerned with commercial crops, but also with the crop production to support the state's livestock industry. Both types of crops require fertilizer. Moreover, an increase in the production of certain field crops may reduce the demand for commercial feed.

Corn

There are two types of corn: corn for grain and corn for silage. The acreages of both have increased dramatically in recent years (Figure 9).

Between 1970 and 1979 land in corn for grain increased from 315,000 acres to 650,000 acres. Production experienced a corresponding increase (Figure 10). Better varieties suited to short growing seasons is the primary factor responsible for this development. The increased use of high moisture corn is another. In addition, increased U.S. exports of grains have probably played a role in two ways: 1) They have increased the price of corn, making New York production more feasible and 2) the increased plantings of export crops in the mid-west have pushed a greater proportion of domestic production into surrounding areas, such as New York.

Figure 9

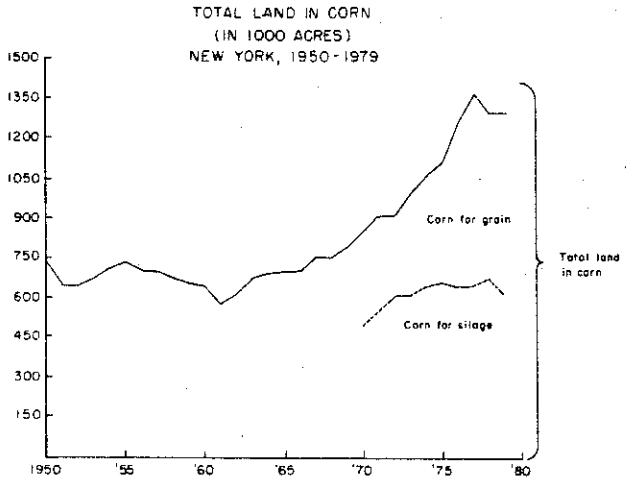


Figure 10

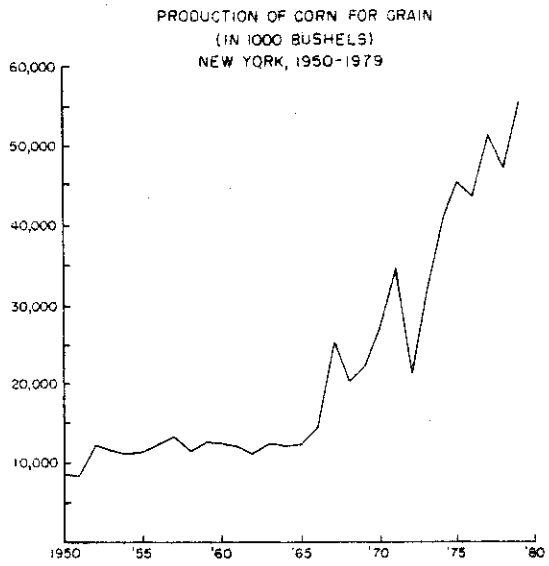


Figure 11

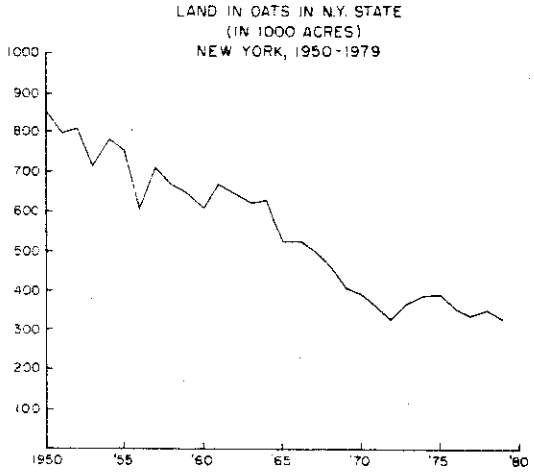


Figure 12

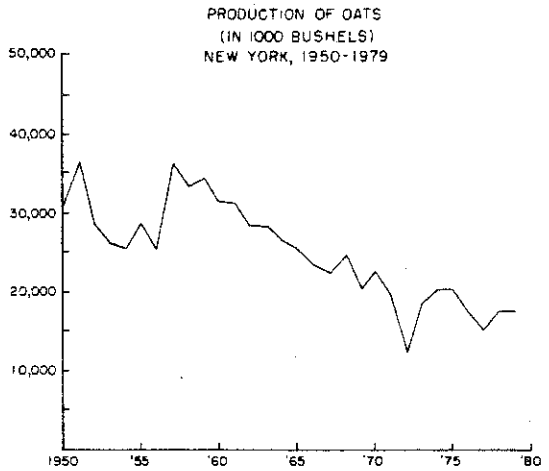


Figure 13

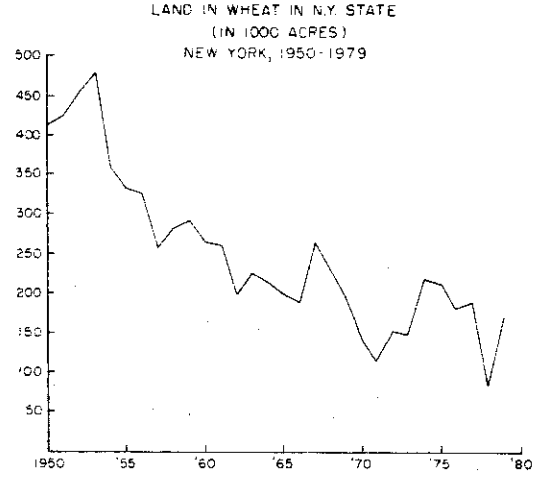
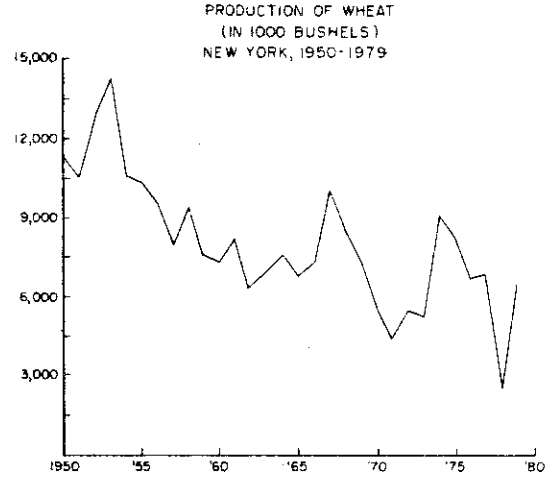


Figure 14



Land in corn for silage increased from 507,000 acres in 1970 to 625,000 acres in 1979. Production has averaged about 8.5 million tons the last several years.

Whether or not land is used in the production of corn for grain or corn for silage is dependent on the market price of the former. Since the end use of the product is somewhat flexible, it will depend on relative prices at the time of harvest as well as at the time of planting.

Oats

The number of acres devoted to the production of oats has declined steadily (Figure 11). In 1979 oats were planted to 330,000 acres and production amounted to 18.0 million bushels (Figure 12). However, oats are not only planted for the grain they produce, they are also an important source of bedding for livestock.

Wheat

New York wheat acreage decreased significantly between 1950 and 1970, but has exhibited a great deal of variability in the last ten years (Figure 13). This variability is primarily due to prices. In 1979, 170,000 acres were planted to wheat and production amounted to 6.6 million bushels (Figure 14).

Other Field Crops

Barley, rye and soybeans occupy only a small portion of the arable crop land in New York State. They are likely to have no impact on the demand for fertilizer or feed.

While hay is produced on nearly 2.5 million acres, very little fertilizer is used in its production.

Fruits and Vegetables

Several types of fruits and vegetables are produced in New York State. It is impossible to discuss the relative importance of each. Consequently the following discussion focuses on the most significant fruits and vegetables.

Apples accounted for 5.0 percent of net farm income in 1979. They were the third most important source of net farm income, only ranking behind dairy and cattle and calves. In 1979 apples occupied approximately 78,700 acres of land and production amounted to 940 million pounds.

The other important fruit is grapes. Some are sold fresh, but most grapes are used in the production of wine and juices. Approximately 43,000 acres were planted to grapes in 1979 and total production was 165,000 tons.

In 1979, 70,200 acres were planted to vegetables for fresh market and 88,600 acres were devoted to vegetables for processing. The former group includes sweet corn, onions, cabbage, and snapbeans, while the latter category includes snapbeans, sweet corn, and green peas. Total acres of both groups have remained rather stable over the past ten years.

Feed and Fertilizer Utilization

Several factors influence the demand for feed and fertilizer. The purpose of the above discussion was to describe the nature of agriculture production in New York State and indicate the importance of various types of livestock and crops.

Figure 15 illustrates the trend in feed and fertilizer utilization between 1970 and 1979. The graph for feed utilization was derived by dividing state feed expenditures by the reported cost per ton of 16% protein mixed dairy feed in each year. Dairy feed was selected since it is the primary type of feed used in the state. The graph is only meant to illustrate the general trend in feed consumption and should be used with care. For example, the 1974 Census of Agriculture found that total feed purchased in New York amounted to 1.901 million tons while the graph indicates feed utilization was approximately 2.6 million tons in 1974.

The bulk of the feed used in New York State is consumed by milk cows. In 1979 milk cows consumed approximately 2.115 tons of grains and concentrates per cow. 2/ This amounted to a total consumption of 1.914 million tons. Of course, not all of this represents purchased feeds. It also includes the consumption of grains produced on dairy farms.

Poultry for egg production require approximately 15 pounds of feed per bird for the 20 weeks between hatching and the time egg production starts. 3/ During the following 52 weeks of production, laying birds require approximately 85 pounds of feed. This implies each layer would require approximately 100 pounds of feed over its 72 week life. This translates into 72 pounds per bird per year. With a 1979 inventory of 10.2 million chickens, New York poultry consumed approximately 367,200 tons of feed.

Feed consumption for other types of livestock is not presented due to their negligible impact on feed consumption.

Fertilizer consumption was rather stable between 1970 and 1979 (Figure 15), despite significantly higher prices during the latter part of the decade. Although the total tonnage has remained relatively stable, the content of primary plant nutrients per ton of fertilizer increased from 36 percent in 1970 to 40 percent in 1979. The trend toward more nutrients per ton reduces the demand for fertilizer transportation.

2/ Crop Reporting Board, Milk Production, (Washington, D. C.: USDA, ESS, March 1981, p. 4).

3/ Information on feed requirements for Poultry was obtained from D. L. Cunningham and C. E. Ostrander, Department of Poultry Science, Cornell University.

FIGURE 15.

FEED AND FERTILIZER UTILIZATION
NEW YORK, 1970-1979

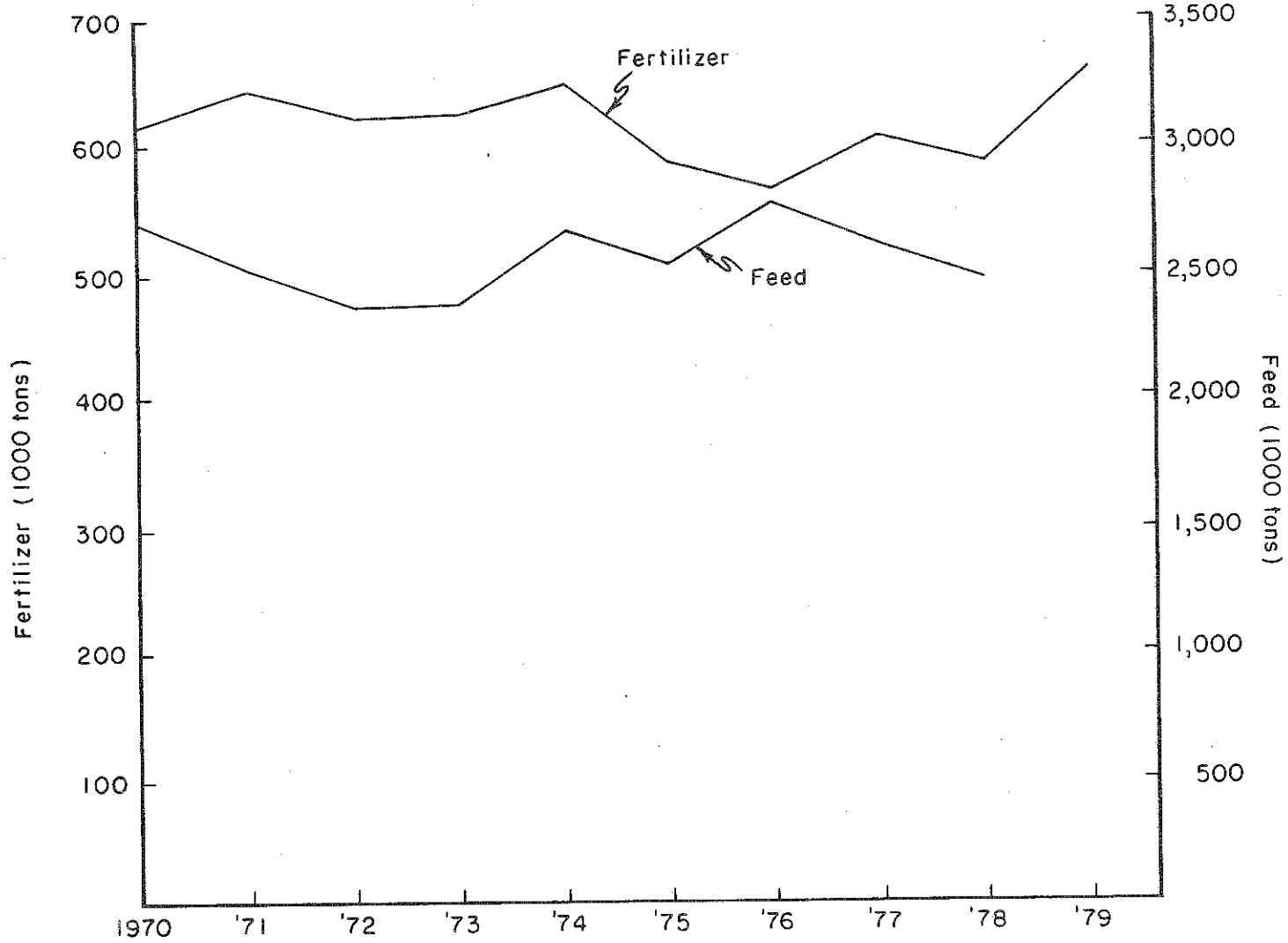


Table 4. Fertilizer Utilization by Crop, New York, 1974

Crop	Percent of Total Acreage of Each Crop Fertilized	Average Application Per Acre Fertilized (Tons Per Acre)	Total Fertilizer Used (Tons)	Percent of Total Fertilizer Used
Corn	90.5%	0.21	198,900	45.5%
Oats	76.8	0.13	30,200	6.9
Wheat	84.2	0.15	24,700	5.6
Hay	2.5	0.13	43,700	10.0
Potatoes	99.6	0.90	49,600	11.4
Orchards	76.0	0.16	17,500	4.0
Vegetables	97.9	0.34	48,900	11.2
Pasture	0	0.13	7,300	1.7
Other	0	0	16,300	3.7
TOTAL	-	-	437,100	100.0%

SOURCE: Bureau of the Census, 1974 Census of Agriculture, Vol. II, Part 4, (Washington, D.C.: U. S. Department of Commerce, 1977)

Table 4 presents fertilizer utilization by crop for New York in 1974. Over 90 percent of the acreage planted to potatoes, vegetables and corn was fertilized in 1974, while less than 3 percent of the land devoted to hay production received fertilizer. Most crops received an average of between 0.13 tons (260 pounds) and 0.16 (320 pounds) tons per acre. The highest application was on potatoes - .90 tons or 1800 pounds per acre. However, over 45 percent of all fertilizer used in New York was applied to corn. While there is no reason to believe the general pattern of fertilizer utilization has experienced a dramatic shift since 1974, the proportion of total fertilizer used on corn has probably increased with the increased acreage of corn.

Summary

The purpose of this section was to describe the way the agricultural production of New York State affects the locational demand for feed and fertilizer. Dairy production is the primary determinant of feed utilization. The dominant regions in terms of the number of cattle and calves, including milk cows, are South Central New York, Western New York, and Northern New York. Corn production uses approximately one half of all fertilizer used in the state. The region with the highest level of consumption is Western New York.

This discussion of the pattern of agricultural production and feed and fertilizer consumption suggests a major conclusion that should have a significant effect on the rail transportation alternatives to be considered. There is a very low density of feed consumption in the state since livestock production is not concentrated in one or a few regions. The low density of consumption makes it difficult to obtain significant economies of scale in transportation. On the other, fertilizer consumption has a high degree of concentration in Western New York. Unfortunately the total volume of fertilizer is approximately one-fourth the total volume of feed.

In the next section we will explore the structure and characteristics of the feed and fertilizer industries.

Section III

The Structure of the Feed and Fertilizer Industries in New York State

Section III

STRUCTURE OF THE FEED AND FERTILIZER INDUSTRIES IN NEW YORK STATE

Introduction

Feed and fertilizer are the two most important purchased inputs used in agricultural production. In 1978, feed purchases in New York amounted to $382.7 million, with $297.7 million of that going for commercially mixed formula feeds. 1/ Feed is the number one purchased input in the state. Commercial fertilizer ranks fifth. In 1978, $88.5 million was spent on fertilizer. It ranked behind only feed, hired labor ($185.1 million), energy costs ($122.5 million), and livestock and poultry purchases ($103.3 million).

It is reasonable to expect that the importance of purchased feeds and fertilizers will continue to increase. The high levels of production found in livestock and poultry are very dependent on proper nutrition and concentrated feeds. Likewise, recent improvements in crop yields have been brought about by varieties that are sensitive to proper fertilization.

Three factors make feed and fertilizer rail dependent commodities: 1) the large quantities required, 2) the distance of New York State from major areas of production, and 3) the bulkiness of these commodities.

The purpose of this section is to describe the current structure and characteristics of the feed and fertilizer industries in New York State. The data presented were collected in a survey of New York firms handling feeds, grains, fertilizers and lime. The first part is a discussion of the methodology used in obtaining the data.

The data were divided into two categories by type of firm: 1) feed and fertilizer firms and 2) other types of firms handling bulk agricultural commodities. The first category includes all firms dealing directly in New York State farm commodities such as feed manufacturing and distribution firms, fertilizer manufacturing and distribution firms, grain merchandisers and farm supply firms. These were the primary focus of the study. The second part of this section is devoted to a description of this category of firms. Several other types of firms also handle bulk agricultural commodities. They include: flour mills, breweries, fructose processing facilities and elevators dealing in grain for export. Although they typically do not handle New York bulk agricultural commodities, they do handle a significant quantity of grains and feed ingredients (usually as by-products of their primary manufacturing functions) and they are extremely dependent on the state's railroad system. The last part of this section outlines the general characteristics of other types of New York firms handling bulk agricultural commodities.

1/ Bureau of the Census, 1978 Census of Agriculture; New York (Preliminary Report), (Washington D.C.: U. S. Department of Commerce, June 1980, p. 2.

Methodology

A list of firms handling bulk agricultural commodities was compiled from available sources. All firms handling feeds, feed ingredients, grains, fertilizers and lime were contacted during August 1980. The firms were requested to complete a Bulk Commodities Survey (Appendix A). Large firms, those with more than one plant, were contacted personally. All others were mailed an explanatory letter, a survey and a self-addressed, stamped return envelope. Two follow-up letters were sent to the firms that did not return the form by the requested date. Finally, most nonrespondents were contacted by telephone.

Surveys were sent to primary feed and fertilizer facilities at 180 locations. 2/ Completed forms were received from 130 locations. Partial information was received on an additional five plants. The responses are referred to as locations because some firms operated more than one plant. In addition, information on feed and fertilizer tonnage was received for all the retail establishments of one large firm that operates at both the wholesale and retail level. The wholesale level is the primary source of product for the retail stores.

Information was received on a total of 405 outlets. All outlets were used to study the number, size, volume of sales and manufacturing volume of New York feed and fertilizer firms. However in so doing the sales volume and manufacturing volume of firms operating at both the wholesale and retail level were adjusted to minimize the double counting of volume. Although every effort was made to avoid double counting, it was impossible to eliminate it completely. However, it is thought the phenomenon is minimal and it is assumed to be uniformly distributed across all regions. The information presented for all characteristics other than number, size, sale volumes and manufacturing volumes only represents information on primary facilities.

All the major feed and fertilizer firms operating within the state cooperated in the study, except one. Firms that did not respond to our requests were primarily small firms. Moreover, since some of the information used to compile the mailing list was dated, a few of the firms sent a survey were no longer in operation. However, it is believed that the information collected represents a significant portion of the feed and fertilizer used in New York State and the missing data would not alter the general conclusion of this study.

The Structure and Characteristics of the Feed and Fertilizer Industries

Number, Size and Volume of Sales

The number of firms selling feeds, grains, fertilizer and lime is presented in Table 5. Each store of integrated feed and fertilizer firms was counted as a separate outlet in this table. There were 345

2/ Primary facilities are defined as the plants of first receipt of the ingredients used in the production of feed and fertilizer.

Table 5
Feed and Fertilizer Firms:
Number of Firms Selling Feeds, Grains, Fertilizer and Lime by Region
New York, 1979

Regions	Feeds	Grains	Fertilizer	Lime
1. Southwestern NY	30	26	33	24
2. Western NY	59	53	73	50
3. Central NY	48	34	50	38
4. Eastern NY	46	40	42	36
5. Northern NY	37	27	33	32
6. Northeastern NY	10	7	7	7
7. South Central	68	50	68	58
8. Lower Hudson Valley	37	29	34	29
9. Long Island	10	9	11	9
TOTAL	345	275	351	283

Table 6
Feed and Fertilizer Firms:
Tons of Feeds, Grains, Fertilizer and Lime Sold by Region 1/
New York, 1979

Regions	Feeds	Grains	Fertilizer	Lime
1. Southwestern NY	118,600	4,100	112,500	23,000
2. Western NY	278,200	190,300	215,600	60,000
3. Central NY	270,200	6,400	36,000	83,400
4. Eastern NY	310,700	8,600	62,400	49,400
5. Northern NY	257,100	2,100	8,400	29,400
6. Northeastern NY	99,900	300	0	4,600
7. South Central NY	503,600	34,400	60,000	136,200
8. Lower Hudson Valley	139,400	3,200	15,900	34,800
9. Long Island	10,500	2,200	17,500	4,600
TOTAL	1,988,200	251,600	528,300	425,400
Number of Firms	345	275	351	283

1/ Retail sales adjusted downward by a certain percentage to minimize double counting of sale volumes.

plants selling feed and 351 plants handling fertilizer. The South Central region had the largest number of firms selling feeds (68), while in Western NY 73 firms handled fertilizer. Table B-1 in Appendix B indicates the number of plants, volume of sales and number of rail cars used in each county.

The total quantity of feed, grain, fertilizer and lime sold in each region is presented in Table 6. The sales volumes of the retail stores of integrated firms were adjusted to minimize the double counting of commodities handled by both the wholesale and retail segments of the firms. Firm-wide percentages were used to adjust the quantities at each location. The percentages varied for feed, grain, fertilizer and lime. This assumes each firm outlet is affected uniformly. Although this is not the case in reality, the assumption was not believed to have a significant impact since the data is aggregated on a regional basis. Moreover, since the purpose of the study was to determine the inter-relationship between the rail transportation system and the feed and fertilizer industries, the volumes in Table 6 are thought to be an accurate indication of the regional location of initial sale. That is the place the feed and fertilizer was first received, processed or sold in the state.

New York State feed and fertilizer firms handled approximately 2.0 million tons of feed, 250,000 tons of grain, 528,000 tons of fertilizer and 425,000 tons of lime.

The South Central region had the largest volume of feed sales, accounting for over 25 percent of the total. Other major regions of feed sales, in order of importance, were Eastern NY, Western NY, Central NY and Northern NY. Sales in each of these regions was over 250,000 tons. Moreover, each of these regions, except Northern NY, is served by the Conrail trunk line.

Grain sales amounted to 250,000 tons. Some of the grain was resold to farmers in the same region, some was sold to farmers and firms in other areas of the state and some was shipped out-of-state. Western NY accounted for over 75 percent of grain sales, while South Central NY was second with 13 percent.

The author has some reservations about the accuracy of grain sales. In the year for which the data was collected, one major buyer of grain had financial difficulties. The firm temporarily ceased operations and it was difficult to determine the pattern of grain flows after that major change in market structure.

Fertilizer sales amounted to 528,000 tons in 1979. This is compared with official statistics indicating a 1979 consumption of 659,250 tons. 3/ Approximately 40 percent of fertilizer sales occurred in Western NY, due primarily to the large acreage of fertilizer responsive crops, i.e. corn, orchards, grapes, vegetables and potatoes. Southwestern NY ranked second and Eastern NY third in fertilizer sales. The ranking of the last two regions is more an indication of the location of major fertilizer facilities rather than the pattern of farm consumption.

3/ NY Crop Reporting Service, New York Agricultural Statistics, 1979, p. 68.

Lime sales totaled 425,000 tons, with one-third of the sales occurring in South Central NY. Soil acidity of each region as well as total arable land are the major factors determining lime sales.

To determine the validity of the regional pattern of the data collected, the distribution of feed and fertilizer sales across the different regions was compared with feed and fertilizer purchases reported in the 1978 Census of Agriculture. It should be noted that sales were identified with the plant of first sale, while purchases represent the location of farm consumption. The distributions for feed are almost identical (Table 7), while the distributions for fertilizer are similar. The location of major fertilizer production facilities in Southwestern, Western and Eastern NY increase the sales data in those regions. Consequently, it seems reasonable to assume that the sales data do accurately reflect the pattern of feed and fertilizer usage and flows in New York State.

Size of Firms

Firms were classified according to size of total sales. In classifying firms by total sales of the product, the retail sales of vertically coordinated firms were not adjusted downward to minimize double counting of volume. The results are presented in Table 8.

Table 8
Feed and Fertilizer Firms:
Size Distribution by Sales
New York, 1979

Distribution by Sales (Tons)	Number of Feed Firms	Distribution By Sale (Tons)	Number of Firms		
			Grain	Fertilizer	Lime
1 - 5000	223	1 - 1000	255	230	169
5001 - 10,000	70	1001 - 2000	4	58	43
10,001- 15,000	18	2001 - 3000	6	27	23
15,001 -20,000	4	3001 - 4000	1	11	17
20,001 -25,000	4	4001 - 5000	3	6	8
25,001 -30,000	2	5001 - 6000	2	5	9
30,001 -35,000	3	6001 - 7000	0	1	10
35,001 -40,000	2	7001 - 8000	0	1	2
40,001 -45,000	1	8001 - 9000	0	1	1
45,001 -50,000	3	9001 -10,000	1	0	0
Over 50,000	15	Over 10,000	3	11	1
TOTAL	345		275	351	283

Of the 345 firms handling feed, approximately two-thirds sold less than 5,000 tons. However, fifteen firms sold over 50,000 tons of feed each. Over 90 percent of the firms selling grain handled less than 1,000 tons, while three firms had sales of over 10,000 tons. Most firms dealing in fertilizer also were small, but eleven handled over 10,000 tons. Very few firms had a significant volume of lime.

Table 7
A Comparison of Feed Sold with Feed Purchases and
Fertilizer Sold with Fertilizer Purchases by Region
New York

Regions	Percent of Total Feed		Percent of Total Fertilizer	
	Sold-1979 1/	Purchased-1978 2/	Sold-1979 1/	Purchased-1978 2/
1. Southwestern NY	6.0%	7.0%	21.3%	5.3%
2. Western NY	14.0	14.9	40.8	37.4
3. Central NY	13.7	13.5	6.8	15.6
4. Eastern NY	15.6	12.7	11.8	9.9
5. Northern NY	12.9	14.7	1.6	7.1
6. Northeastern NY	5.0	3.0	0.0	1.5
7. South Central NY	25.3	22.7	11.4	13.8
8. Lower Hudson Valley	7.0	9.4	3.0	5.2
9. Long Island	0.5	2.1	3.3	4.2
TOTAL	100.0%	100.0%	100.0%	100.0%

1/ Based on tons sold at the plant as determined by the survey

2/ Based on dollar volume purchased by farmers from 1978 Census of Agriculture Preliminary Report

The data indicates that only a few firms handle a significant quantity of bulk agricultural inputs. This pattern of sales represents the policy decisions of several feed and fertilizer firms to concentrate production in a relatively few regional operations.

Manufacturing of Feed and Fertilizer

Information was obtaind to determine the level of feed and fertilizer manufactured in each region. As illustrated in Table 9, the manufacturing activity by region is highly correlated with sales volume by region. The difference between volume sold (Table 6) and quantity manufactured (Table 9) represents the sale of finished products manufactured at other facilities.

Table 9
Feed and Fertilizer Firms:
Tons of Feed and Fertilizer Manufactured by Region
New York, 1979

Regions	Feeds	Fertilizer
1. Southwestern NY	114,700	110,200
2. Western NY	243,700	157,300
3. Central NY	213,300	27,600
4. Eastern NY	307,700	62,100
5. Northern NY	222,300	4,900
6. Northeastern NY	97,500	0
7. South Central NY	497,200	52,000
8. Lower Hudson Valley	138,300	14,300
9. Long Island	10,500	17,500
TOTAL	1,845,200	445,900

This occurs under two different situations:

a) The finished product is manufactured in the wholesale segment of vertically coordinated firms and transferred to the retail segment for sale, or

b) The finished product is manufactured by an independent firm and purchased by the firm in question for re-sale.

Tons of feed and fertilizer manufactured are an accurate measure of the locational demand for primary feed and fertilizer ingredients. Moreover, it is a good starting point to determine the potential demand for rail transportation services.

Focus on Primary Facilities

The remainder of the study focuses on primary feed and fertilizer facilities. The retail establishments of vertically coordinated firms have been eliminated in the remainder of the data presented. These establishments handle only a small portion of the first receipts of bulk agricultural commodities. Typically, bulk agricultural commodities initially arrive at a primary manufacturing, processing, or blending facility and are then delivered to retail establishments or directly to the farm. Eliminating these establishments allowed us to concentrate on the location of first receipt of feed and fertilizer shipped into the state.

Manufacturing Capacity

Most manufacturing firms operated eight hours per day (Table 10). Feed firms on such a schedule processed about 100 tons per day while fertilizer firms handled approximately 150 tons per day. The seven feed facilities operating 24 hours per day manufactured an average of 250 tons per day.

Table 10
Feed and Fertilizer Firms:
Daily Processing/Blending Capacity by Type of Daily Operation
New York, 1979

Type of Daily Operation	Feed		Fertilizer	
	Quantity (Tons/Day)	Firms (No.)	Quantity (Tons/Day)	Firms (No.)
8 Hours/Day	98	58	147	40
24 Hours/Day	257	7	0	0
Other	55	1	0	0

The importance of the state's dairy industry is illustrated in Table 11. Approximately 85 percent of all feeds was processed into dairy feeds. It should be noted that dairy feeds are not used solely by milk cows. It is common practice to use the same feed for milk cows, yearlings, calves, bulls, and even other types of livestock on a dairy farm. The only other major feed of any significance was laying mash, accounting for about nine percent of the total. Other feeds make up only a small portion of the total feed manufactured in the state.

Table 11
Type of Feed Sold, By Percent
New York, 1979

Type of Feed	Percent
Dairy	84.9
Beef	0.5
Layer	8.8
Swine	1.8
Broiler	1.0
Other	3.0
TOTAL	100.0

Firms were asked to indicate the proportion of feed and fertilizer sold in bags. Fifty seven plants handled bagged feed and approximately 23 percent of their total volume was sold in bags. For fertilizer, 69 firms used bags and 81 percent of their fertilizer was handled in bags.

Shipping and Receiving Patterns

Modes of Transportation

Information on the modes of transportation used for receiving and shipping both feeds and fertilizers is shown in Table 12.

Table 12
Feed and Fertilizer Firms:
Percent of Volume Received and Shipped by Different
Modes of Transportation
New York, 1979

Mode Transportation	Feeds & Grains		Fertilizer & Lime	
	Received	Shipped	Received	Shipped
Truck	41.7%	95.9%	29.6%	99.5%
Boxcars	19.5	0.1	9.1	0.5
Hopper Cars	38.8	4.0	61.3	0.0
Water	0.0	0.0	0.0	0.0
TOTAL	100.0%	100.0%	100.0%	100.0%
Total Quantity	1,789,400	1,401,000	578,200	154,400

Over 40 percent of feeds and grains were received by truck. The high proportion of truck receipts is due to the large amount of state produced feeds and grains used by New York firms. The primary commodities received by truck are New York State corn, oats and distillers grains.

Approximately 60 percent of feed and grain receipts move by rail, with 20 percent coming by boxcars and 40 percent moving in covered hopper cars. No feeds or grains were received by water.

Shipments of feeds and grains moved almost entirely by truck. This represents transport directly to farms, retail establishments as well as truck movements to other firms. Only 4.1 percent of feed and grain shipments moved by rail and it all traveled in covered hopper cars.

For fertilizer and lime approximately 30 percent of inshipments moved by truck while 70 percent was received by rail. Boxcars accounted 9 percent and hopper cars 61 percent. The high proportion of truck transport primarily represents receipts of ready-mixed fertilizers and lime. The vast majority of primary fertilizer ingredients moved by rail.

Some fertilizer ingredients are known to move by water. After arriving at a New York State port the material is transported to manufacturing facilities by truck or rail. The survey found less than one-tenth of one percent of the fertilizer moving by water. The likely explanation for this discrepancy is that when fertilizer was transported by a combination of modes only the mode of the last segment of the movement was indicated when responding to the survey.

Nearly all shipments of fertilizer and lime were made by truck. Less than one percent was transported by rail and boxcars handled all such shipments.

In summary, feed and fertilizer firms are extremely dependent on rail transportation for their receipts of basic ingredients. On a percentage base, fertilizer appears more dependent on rail transportation than feed. However, the total volume of feeds and grains is three to four times larger than that of total fertilizer. Truck accounts for almost all plant shipments of both feed and fertilizer.

Plants were asked to indicate their daily receiving and shipping capacities. The results are presented in Table 13. For feeds and grains, plants could receive an average of about ten trucks per day, while the figure for fertilizer plants was seven loads per day. Shipping capacity by truck was greater than receiving capacity. Feed firms had the capacity to ship an average of 18 truck loads per day and fertilizer plants about 15 loads per day. Feed and grain plants could receive about three boxcars or hopper cars per day. Fertilizer firms had an average receiving and shipping capacity of approximately two rail cars per day.

Table 13
Average Daily Receiving and Shipping Capacity, For Feed and Fertilizer Firms, New York, 1979

Mode of Transportation	Feeds & Grains				Fertilizer & Lime			
	Receiving		Shipping		Receiving		Shipping	
	Loads Per Day	Number of Firms	Loads Per Day	Number of Firms	Loads Per Day	Number of Firms	Loads Per Day	Number of Firms
Truck	9.6	64	18.1	21	7.0	64	14.7	10
Boxcar	3.0	48	1.3	4	2.0	15	0	0
Hopper Car	3.0	51	3.8	12	2.5	46	2.0	1

Type of Rail Cars Used

New York State feed and fertilizer firms received 11,001 boxcars and 14,727 covered hopper cars in 1979 (Table 14). The table also indicates the distribution of cars by type of firm. Feed firms received 10,935 boxcars and 9,066 hopper cars. Although feed firms used more boxcars than hopper cars, twice as much feed was transported by hopper cars (Table 12).

Table 14
Feed and Fertilizer Firms:
Number of Boxcars and Hopper Cars Received
New York, 1979

Type of Firm 1/	Boxcars	Hopper Cars
Feed	10,935	9,066
Fertilizer	66	5,661
TOTAL	11,001	14,727

1/ Firms that handled both feed and fertilizer were classified according to the product of primary importance.

Almost all fertilizer ingredients moved by hopper cars. Fertilizer firms used 66 boxcars and 5,661 covered hopper cars in 1979.

Table 15 presents the number of boxcars and hopper cars received by region. South Central NY and Northern NY received approximately 50 percent of the boxcars used in the state. Western NY and South Central NY accounted for over 40 percent of the covered hopper cars received.

Table 15
Feed and Fertilizer Firms:
Number of Boxcars and Hopper Cars Received by Region
New York, 1979

Regions	Boxcars	Hopper Cars
1. Southwestern NY	128	1,988
2. Western NY	780	3,133
3. Central NY	1,697	1,007
4. Eastern NY	1,515	2,448
5. Northern NY	2,245	1,184
6. Northeastern NY	754	793
7. South Central NY	3,168	2,946
8. Lower Hudson Valley	642	893
9. Long Island	72	335
TOTAL	11,001	14,727
Number of Firms	59	92

While the total number of cars received is closely correlated with the level of agricultural activity in each region, the type of cars used varied from region to region. Those regions using more boxcars than hopper cars, such as South Central NY and Northern NY, are primarily dairy regions and are not directly serviced by the main rail trunk line. There are three possible explanations for the higher proportion of boxcars in these areas:

1) Firms using boxcars do not have sufficient sales volume to warrant the purchase of hopper car loads,

2) Firms do not have adequate storage facilities for hopper loads, or

3) Branch lines and rail sidings are not capable of handling covered hopper cars.

It was impossible to verify the first two explanations. However survey respondents were asked the heaviest single car that could be moved on their side track. Of those responding, three firms indicated that 100 ton hopper cars could not use their side tracks. Although one firm was located in South Central NY and another was located in Northern NY, car weight did not appear to be a limiting factor.

The number of cars received per firm was also examined (Table 16). Over 60 percent of the firms receiving boxcars and hopper cars receive fewer than 100 of each annually. Only 21 firms received more than 100 boxcars per year, while 35 firms use more than 100 hopper cars. Consequently, a small number of firms receive the vast majority of rail cars.

Table 16
Distribution of Firms by Number of Boxcars and Hopper Cars Received
New York, 1979

Number of Cars Received	Number of Firms Receiving Boxcars	Number of Firms Receiving Hopper Cars
1 - 50	28	37
51 - 100	10	20
101 - 150	2	4
151 - 200	1	9
201 - 250	5	4
251 - 300	2	4
301 - 350	0	0
351 - 400	0	4
401 - 450	1	1
450 - 500	1	2
Over 500	9	7
TOTAL	59	92

Sixty-three plants had an average of 525 feet of sidetrack. Those with the longest sidings were located in Western NY where 17 plants had an average of 826 feet of sidetrack.

The number of cars that can be spotted for unloading is another measure of current receiving capacity. Thirty-three plants could spot an average of seven boxcars or six hopper cars on their sidings for unloading. These averages applied uniformly across all regions.

Rate Schedules

Single car rates apply to most shipments of feed and fertilizer moving into the state (Table 17). Eighty-eight percent of the feeds and grains and over 97 percent of the fertilizer moved under single car rates. Twelve percent of feeds and grains used 2-3 multiple car rates. Very little fertilizer was shipped under multiple car rates.

Table 17
Feed and Fertilizer Firms:
Percent Rail Volume by Type of Rate Schedule
New York, 1979

Rate Schedule	Feeds and Grains	Fertilizer
Single Car Rates	88.0%	97.2%
2-3 Multiple Car Rates	12.0	1.8
4 or More Multiple Car Rates	0.0	1.0
TOTAL	100.0%	100.0%
	18,231	7,369

There are four possible reasons for this phenomenon:

1) Firms do not have sufficient volume to justify multiple car receipts,

2) Firms do not have the receiving or storage capacity to handle multiple car inshipments,

3) The increased costs of handling multiple car receipts (ie inventory costs) outweigh the lower rail tariff, or

4) Railroads are unwilling to establish multiple car rates or establish rates that provide an incentive for multiple car shipments.

The real reason(s) will vary from firm to firm, but all four factors are probably responsible for the low usage of multiple car shipments into New York.

Truck Shipments

Approximately 75 percent of the livestock feed was shipped directly to farmers, while 64 percent of the fertilizer went direct to farmers (Table 18). The remainder was marketed through associated or outside firms.

Table 18
Feed and Fertilizer Firms:
Percent of Feed and Fertilizer Shipped Direct to the Farm
New York, 1979

Percent Shipped Direct	Feed (No. of Firms)	Fertilizer (No. of Firms)
0 - 20	2	4
21 - 40	1	2
41 - 60	1	22
61 - 80	17	2
81 - 100	37	34
Total Firms	58	64
Average, Based on Volume	75.4%	64.2%

The average market radius for feed and fertilizer shipped by truck is illustrated in Table 19. Eighty-three percent of the feed and 89 percent of the fertilizer was sold to farmers located within fifty miles of the facility. The bulky nature of these commodities is the primary determinant of this distribution pattern.

Table 19
Feed and Fertilizer Firms:
Percent of Truck Shipments Within Each Mileage Category
New York, 1979

Mileage Category (Miles)	Feed	Fertilizer
0 - 24	44.4%	47.1%
25 - 49	38.4	42.0
50 - 74	6.6	6.1
75 or more	10.6	4.8
TOTAL	100.0%	100.0%

Storage Capacity

Information was obtained on currently existing storage capacity (Table 20). New York firms have storage capacity to handle approximately 20 percent of the annual volume of feeds and grains and 50 percent of the annual volume of fertilizer. The substantially higher capacity for fertilizer is due to the seasonal nature of the commodity.

There is a great deal of regional variation in storage capacity. Over 80 percent of the storage capacity for feeds and grains was located in Western NY and South Central NY. Although these are the two primary livestock production regions in the state and Western NY is the major region of grain production, they have a disproportionately large amount of available storage.

Table 20
Total Storage Capacity of Feed and Fertilizer Firms by Region
New York, 1979

Regions	Bulk Feeds & Grains (Tons)	Bagged Feeds (Tons)	Molasses (1000 Gals.)	Bulk Fertilizer (Tons)	Bagged Fertilizer (Tons)	Liquid Fertilizer (1000 Gals.)
1. Southwestern NY	5,000	1,100	273	36,200	800	13
2. Western NY	243,500	2,000	141	86,200	9,200	1,483
3. Central NY	37,500	1,500	141	20,500	1,700	142
4. Eastern NY	14,400	1,100	78	13,100	700	75
5. Northern NY	10,200	700	130	4,000	400	42
6. Northeastern NY	2,500	100	0	0	100	0
7. South Central NY	104,200	2,100	378	33,200	2,900	736
8. Lower Hudson Valley	11,000	700	106	2,900	600	48
9. Long Island	0	0	0	5,400	200	21
TOTAL	428,300	9,300	1,247	201,500	16,600	2,560
Number of Firms	71	53	52	53	61	37
Average Capacity	6,032	176	24	3,802	272	69

The same pattern occurs in the case of fertilizer. Western NY, Southwestern NY and South Central NY account for over three-quarters of the available storage capacity.

Seasonality of Receipts

Feed and grain receipts are stable throughout the year, although there is a slight increase in receipts during harvest, the last three months of the year (Table 21). On the other hand, fertilizer shipments have a high degree of seasonality. Almost one-half of all fertilizer shipments are received during the planting season - April, May and June. The remainder is evenly distributed between the first quarter and the last quarter of the year. Almost no fertilizer is received in July, August and September.

Table 21
Feed and Fertilizer Firms:
Seasonal Receipts of Feeds, Grains, and Fertilizer
New York, 1979

Season	Feeds and Grains	Fertilizer
Jan. - Mar.	24.7%	24.2%
Apr. - June	23.3	48.9
Jul. Sep.	24.8	3.6
Oct. - Dec.	27.2	23.3
TOTAL	100.0%	100.0%

Qualitative Factors

The primary way to improve the efficiency of rail receiving of bulk commodities is through greater consolidation of shipments into state. For example, several firms would divide a unit train of a specific commodity. This would require that each firm agree on a source and common set of quality standards.

To determine the importance of qualitative factors in the purchase of bulk commodities, each plant was asked whether or not they considered official grades, the consignee, the area of production, the source firm, or some other qualitative factor in their procurement decisions.

Official grades were considered by the largest number of firms purchasing grains. However, area of production was the most important on a volume basis. Firms indicated a preference for New York corn due to ease in procurement.

For feed ingredients the source firm was the primary consideration. Other important factors included official grades and the consignee involved in the transaction.

Fertilizer quality was also primarily based on the source firm, although all the other factors were also considered in the decision.

So in the case of feed ingredients and fertilizer the firm producing the bulk commodity was the major quality consideration. This suggests it may be difficult to arrive at a common set of quality standards for these two groups of products. This, in turn, may make consolidation of inshipments difficult.

Thirty-two feed and grain firms and thirty-two fertilizer firms graded or tested their inshipment upon arrival. Testing in almost all cases was handled by their quality control personnel.

Inshipments of Feed and Fertilizer

Information was obtained on the origin and mode of transportation for bulk commodities received by feed and fertilizer firms. The bulk commodities included ready mixed final products, grains, feed ingredients, fertilizer materials, and lime.

New York State firms purchased the following commodities and quantities for the production of feed and fertilizer.

Feeds and Grains

	Tons
Ready Mixed Feeds	48,900
Corn	694,200
Oats	57,300
Other Grains	303,600
Soybean Meal	379,900
Distillers Grains	122,700
Other Feed Ingredients	389,400
TOTAL	1,996,000

Fertilizer and Lime

	Tons
Ready Mixed Fertilizer	55,700
Nitrogen Materials	138,000
Phosphate Materials	141,700
Potash Materials	145,300
Lime	83,600
TOTAL	564,300

Total inshipments corresponded very closely with total sales volume (Table 6). Total sales of feeds and grains amounted to 2,239,800 tons (1,988,200 tons of feed and 251,600 tons of grains) while receipts totaled 1,996,000 tons.

Fertilizer and lime sales amounted to 953,700 tons (528,300 tons of fertilizer and 425,400 tons of lime), while information was obtained on 564,300 tons of inshipments. The differences are due to four factors:

1) Inshipment information was not obtained from certain firms. Those firms sold 64,400 tons of feeds and grains and 333,400 tons of lime.

2) Information was not obtained on some inputs used in the manufacture of feed. No information was collected on the quantity of molasses, minerals and vitamins used.

3) The quantity of inputs purchased and feed sold by a firm did not always coincide perfectly, and

4) Some firms did not answer the question concerning inshipments. It was a long question, usually required them to consult their records and was the next to the last question on the survey.

The above figures represent the total quantity of each commodity used. Firms were asked to indicate the total quantity, the two primary origins of each commodity, the percentage of the total from each origin and the primary mode of transport from each origin. Since some firms obtained inputs from more than two origins, origin or mode information was not collected on a portion of some commodities.

The following is a brief discussion of the source and transportation method used for each major bulk commodity. The accompanying tables indicate the total volume for which origin and mode information was obtained as well as its proportion of the total quantity of inshipments of that commodity.

Ready Mixed Feeds

Purchases of ready mixed feeds represented only a small portion (48,900 tons) of total feed sales (Table 22). Eighty-seven percent of the total moved by truck and 13 percent was brought in by rail. As would be expected a very high proportion (83%) of ready mixed feed came from other firms in New York State and it all moved by truck.

Corn

Corn is the primary commodity used in the manufacture of feed (Table 23). Also, it is the major feed grain produced within the state. Corn purchases totaled 694,164 tons, while that of known origin and mode of transportation amounted to 624,600 tons. Approximately 84.0% of the total was delivered by truck. The dependence on truck transport is due to the fact that nearly 82 percent of the corn used was produced in the state and almost all of New York State corn moved by truck. Other sources, of minor importance, included Ohio (7.6%), the Midwest (6.3%), Pennsylvania (2.3%) and Michigan (1.2%).

Table 22
Ready Mixed Feed Inshipments to Feed and Fertilizer Firms
Origin and Transport Mode
New York, 1979

Origin	Quantity		Transport Mode	
	Tons	Percent	Truck	Rail
New York	40,526	82.9	100.0%	
Vermont	7,200	14.7	27.8	72.2%
Pennsylvania	635	1.3	5.5	94.5
Missouri	450	0.9		100.0
Minnesota	120	0.2		100.0
TOTAL	48,931 1/	100.0	87.0%	13.0%

1/ Represents 100% of the total receipts of ready mixed feed which amounted to 48,931 tons.

Table 23
Corn Inshipments to Feed and Fertilizer Firms
Origin and Transport Mode
New York, 1979

Origin	Quantity		Transport Mode	
	Tons	Percent	Truck	Rail
New York	511,434	81.7	98.8%	1.2%
Ohio	47,167	7.6		100.0
Midwest	39,460	6.3		100.0
Pennsylvania	14,356	2.3	100.0	
Michigan	7,200	1.2		100.0
Other	5,000	0.9	100.0	
TOTAL	624,617 1/	100.0	84.0%	16.0%

1/ Represents 90.0% of the total receipts of corn which amounted to 694,164 tons.

Although the proportion of corn moving by rail is relatively small (16%), the total volume is large, amounting to about 90,000 tons. Unless there is a major increase in production, New York will continue to remain dependent on railroads for corn, its most important bulk input.

Oats

Oats is not an important commodity for firms handling feeds and grains (Table 24). Only 57,295 tons were used in 1979. Over 63 percent of the oats was from New York State and almost all was transported by truck. Canada was the second most important source and accounted for 21.5 percent of the total. Most of the Canadian oats was delivered by rail. Other origins included Michigan (8.1%), Maine (3.6%) and Ohio (2.4%).

Other Grains

Other grains included wheat, barley, soybeans, etc. (Table 25). 303,600 tons of other grains were used by feed and grain firms. This category included other grains used in feed production, as well as the New York produced grains shipped out of the state. Origins and modes were obtained on only 55.6 percent of the total. However, there was no reason to suspect the grains with unknown origins and modes differed from those for which information was obtained. New York and Minnesota both accounted for 38 percent of total receipts. A large share of New York deliveries were transported by truck, while grains from all other sources (except Pennsylvania) moved by rail. Consequently, 50 percent of all other grains moved by truck and 50 percent moved by rail.

Soybean Meal

Soybean meal is the primary source of protein in manufactured feeds (Table 26). Approximately 380,000 tons were used by NYS feed firms. Illinois was the origin of over half the inshipments. Indiana and Ohio ranked second and third, with 33.3 percent and 9.0 percent, respectively.

Soybean meal inshipments are very dependent on rail transport, with almost 98 percent of the deliveries arriving by rail. The only truck movements of any importance originated in Ohio.

Distillers Grains

Another important ingredient in the production of feed is distillers grains (Table 27). Receipts amounted to 122,700 tons in 1979. New York was the primary source of distillers grains, accounting for 35 percent of the total. Other origins included Missouri (15.4%), Kentucky (15.0%), Indiana (13.0%) and Canada (8.5%).

Almost two-thirds of the distillers grains was transported by rail. Although the majority of purchases from New York and Canadian firms moved by truck, distillers grains from all other sources were delivered by rail.

Other Feed Ingredients

There were 389,400 tons of other feed ingredients used in New York State in 1979 (Table 28). Included in this category were such products as hominy, corn glutin meal, wheat mids, bran, etc.

Table 24
Oats Inshipments to Feed and Fertilizer Firms
Origin and Transport Mode
New York, 1979

Origin	Quantity		Transport Mode		
	Tons	Percent	Truck	Rail	Other
New York	35,830	63.1	99.6%	0.4%	
Canada	12,260	21.5	4.1	95.9	
Michigan	4,605	8.1		98.1	1.9%
Maine	2,047	3.6	1.6	98.4	
Ohio	1,392	2.4		100.0	
Iowa	500	0.9		100.0	
Pennsylvania	182	0.3	100.0		
Illinois	72	0.1		100.0	
TOTAL	56,888 1/	100.0	63.9%	35.9%	0.2%

1/ Represents 99.3 percent of the total receipts of oats which amounted to 57,295 tons.

Table 25
All Other Grain Inshipments to Feed and Fertilizer Firms
Origin and Transport Mode
New York, 1979

Origin	Quantity		Transport Mode	
	Tons	Percent	Truck	Rail
New York	66,976	38.4	93.3%	6.7%
Minnesota	66,633	38.1		100.0
Midwest	6,100	3.5		100.0
Illinois	800	0.5		100.0
Ohio	700	0.4		100.0
Canada	675	0.4		100.0
Pennsylvania	200	0.1	100.0	
Other	32,375	18.6	74.1	25.9
TOTAL	174,459 1/	100.0	49.7%	50.3%

1/ Represents 55.6 percent of the total receipts of all other grains, which amounted to 303,616 tons.

Table 26
Soybean Meal Inshipments to Feed and Fertilizer Firms
Origin and Transport Mode
New York, 1979

Origin	Quantity		Transport Mode	
	Tons	Percent	Truck	Rail
Illinois	153,158	53.8		100.0%
Indiana	94,539	33.3	0.1%	99.9
Ohio	25,427	9.0	25.4	74.6
Midwest	5,350	1.9		100.0
Michigan	3,000	1.1		100.0
Maryland	450	0.2		100.0
New York	102	0.0	100.0	
Other	1,920	0.7		100.0
TOTAL	283,946 1/	100.0	2.3%	97.7%

1/ Represents 74.7 percent of the total receipts of soybean meal, which amounted to 379,897 tons.

Table 27
Distillers Grain Inshipments to Feed and Fertilizer Firms
Origin and Transport Mode
New York, 1979

Origin	Quantity		Transport Mode	
	Tons	Percent	Truck	Rail
New York	35,060	35.3	87.3%	12.7%
Missouri	15,303	15.4		100.0
Kentucky	14,898	15.0		100.0
Indiana	12,886	13.0		100.0
Canada	8,427	8.5	65.6	34.4
Iowa	5,725	5.8		100.0
Illinois	3,935	4.0		100.0
Maryland	2,210	2.2		100.0
Ontario	200	0.2	100.0	
Other	585	0.6		100.0
TOTAL	99,229 1/	100.0	36.6%	63.4%

1/ Represents 80.9 percent of the total receipts of distillers grain, which amounted to 122,688 tons.

Table 28
Other Feed Ingredients Inshipments to Feed and Fertilizer Firms
Origin and Transport Mode
New York, 1979

Origin	Quantity		Transport Mode	
	Tons	Percent	Truck	Rail
Indiana	81,356	35.1		100.0%
New York	73,231	31.6	10.4%	89.6
Illinois	43,951	19.0	3.3	96.7
Midwest	14,420	6.2		100.0
Canada	5,694	2.5	89.6	10.4
Northeast	5,360	2.3	100.0	
Ohio	5,000	2.2	100.0	
New Jersey	1,260	0.5		100.0
Other	1,400	0.6	42.9	57.1
TOTAL	231,672 1/	100.0	10.8%	89.1%

1/ Represents 59.5 percent of the total receipts of all other feed ingredients which amounted to 389,385 tons.

Indiana was the origin of 35 percent of other feed ingredients with many of the corn products coming from this state. New York was the second most important source with 32 percent of the total. Illinois ranked third with 19.0 percent.

Almost 90% of other feed ingredients moved by rail. Although NYS feed firms are highly dependent on the rail system for the inshipments (of other feed ingredients), several products are included under the category. Consequently, it would be difficult to consolidate inshipments of this group of products.

Ready Mixed Fertilizer

Ready mixed fertilizer made up only a small portion of total fertilizer sales and amounted to 55,700 tons (Table 29). Three-fourths of the ready mixed fertilizer received by New York State firms came from other firms in the state, with 60 percent moving by truck and 40 percent by rail. The remainder had a number of origins. A surprisingly large proportion from other origins was delivered by truck. For the total volume of ready mixed fertilizer, 54 percent was transported by truck, while 46 percent moved by rail.

Nitrogen Materials

Inshipments of nitrogen materials amounted to 138,000 tons (Table 30). Approximately 93 percent was delivered by rail and only seven percent by truck.

New York was the origin of over half the shipments. Even a large share (90%) of New York nitrogen moved by rail. Ohio accounted for another 29 percent. Other significant sources of nitrogen materials included Florida (4.4%), Maryland (4.3%), and Pennsylvania (3.2%)

Phosphate Materials

Approximately 141,700 tons of phosphate materials were shipped into the state and 96 percent was transported by rail (Table 31). Florida accounted for 82 percent of the inshipments with the entire amount traveling by rail. The only other sources of any consequence were Maryland (9.1%), Ontario (3.9%) and Virginia (2.6%).

Movements of phosphate materials have the characteristics necessary for consolidated shipments: 1) a large volume from a single distant origin and 2) a high proportion of rail shipments. One factor that is not revealed by the data and that will inhibit consolidation is that New York firms used several types and grades of phosphate materials. Also, some firms have long term contractual arrangements with phosphate suppliers.

Potash Materials

Over 145,300 tons of potash materials were used in New York State in 1979 (Table 32). Ninety percent was transported by rail. Saskatchewan accounted for 63 percent of the inshipment and New Mexico was the origin of 15 percent. Canada was the third most important source with 12 percent. However, most of the Canadian volume was thought to originate in Saskatchewan. The New York portion (9.2%) was most likely transshipments from other sources.

Table 29
Ready Mixed Fertilizer Inshipments to Feed and Fertilizer Firms
Origin and Transport Mode
New York, 1979

Origin	Quantity		Transport Mode	
	Tons	Percent	Truck	Rail
New York	41,737	76.5	60.4%	39.6%
Alabama	3,050	5.5		100.0
Texas	1,200	2.2	100.0	
Pennsylvania	1,190	2.2	91.6	8.4
Canada	966	1.8	100.0	
Maryland	500	0.9	96.0	4.0
Ontario	300	0.6	100.0	
Wisconsin	300	0.6		100.0
New Jersey	120	0.2	100.0	
Northeast	97	0.2	100.0	
Georgia	52	0.1		100.0
Other	5,000	9.2		100.0
TOTAL	54,512 1/	100.0	54.1%	45.9%

1/ Represents 97.8 percent of the total receipts of ready mixed fertilizer, which amounted to 55,713 tons.

Table 30
Nitrogen Material Inshipments to Feed and Fertilizer Firms
Origin and Transport Mode
New York, 1979

Origin	Quantity		Transport Mode		
	Tons	Percent	Truck	Rail	Other
New York	60,538	53.3	9.5%	90.5%	
Ohio	32,713	28.8		100.0	
Florida	4,950	4.4		100.0	
Maryland	4,860	4.3		86.4	13.6%
Pennsylvania	3,650	3.2	12.3	87.7	
Ontario	2,000	1.8		100.0	
Virginia	2,111	1.9		100.0	
Canada	1,578	1.4	24.0	76.0	
Louisiana	350	0.3		100.0	
Tennessee	240	0.2	100.0		
Delaware	50	0.0	100.0		
North Carolina	50	0.0		100.0	
Other	560	0.5	100.0		
TOTAL 1/	113,650	100.0	6.5%	92.9%	0.6%

1/ Represents 96.8 percent of the total receipts of nitrogen materials, which amounted to 138,000 tons.

Table 31
Phosphate Material Inshipments to Feed and Fertilizer Firms
Origin and Transport Mode
New York, 1979

Origin	Quantity		Transport Mode		
	Tons	Percent	Truck	Rail	Other
Florida	116,116	82.3		100.0%	
Maryland	12,800	9.1		82.8	17.2%
Ontario	5,445	3.9		100.0	
Virginia	3,630	2.6	41.3%	58.7	
New York	830	0.6	100.0		
New Jersey	648	0.5		100.0	
North Carolina	640	0.5		100.0	
Louisiana	470	0.3	74.5	25.5	
Michigan	300	0.2	100.0		
Alabama	180	0.1		100.0	
TOTAL	141,059 1/	100.0	2.1%	96.3%	1.5%

1/ Represents 99.6 percent of the total receipts of phosphate materials, which amounted to 141,678 tons.

Table 32
Potash Material Inshipments to Feed and Fertilizer Firms
Origin and Transport Mode
New York, 1979

Origin	Quantity		Transport Mode		
	Tons	Percent	Truck	Rail	Other
Saskatchewan	91,991	63.4		100.0%	
New Mexico	21,987	15.2		100.0	
Canada	17,547	12.1		100.0	
New York	13,310	9.2	87.6%		12.4%
Connecticut	272	0.2		100.0	
TOTAL	145,107 1/	100.0	8.0%	90.8%	1.1%

1/ Represents 99.9 percent of the total receipts of Potash materials, which amounted to 145,319 tons.

Lime

Approximately 83,600 tons of lime were purchased by the primary feed and fertilizer facilities surveyed in 1979 (Table 33). Pennsylvania (49%) and New York (46%) accounted for the vast majority of inshipments. Approximately 85 percent of the lime was transported by truck, although 30 percent of the lime originating from Pennsylvania did move by rail.

Table 33
Lime Inshipments to Feed and Fertilizer Firms
Origin and Transport Mode
New York, 1979

Origin	Quantity		Transport Mode	
	Tons	Percent	Truck	Rail
Pennsylvania	25,988	48.5	69.2%	30.8%
New York	24,737	46.2	100.0	
Connecticut	1,850	3.5	100.0	
New Jersey	936	1.7	100.0	
Massachusetts	10	0.0	100.0	
Other	60	0.1	100.0	
TOTAL	53,581 1/	100.0	85.1%	14.9%

1/ Represents 64.1 percent of the total receipts of lime, which amounted to 83,597 tons.

The regional distribution of inshipments is presented in Table C-1 to C-12 of Appendix C. The data verifies the lack of regional concentration in bulk commodity receipts.

Inshipment Summary

Total inshipments and major origins of each commodity used by New York feed and fertilizer firms is illustrated in Figure 16. The figure was constructed by multiplying the total volume by the percentage for each known origin. In other words, it was assumed that the information on origins even applied to the portion with unknown origins.

Although corn is the dominant commodity, most is produced in New York. Other major commodities with one or more dominant sources includes soybean meal, other feed ingredients, other grains, phosphate materials, and potash materials.

Figure 17 indicates the extent to which each commodity is dependent on rail transportation. Again, the figure was constructed by multiplying the total volume of each ingredient by the percentage for each known mode of transportation. Soybean meal and other feed ingredients ranked first and second, respectively with about 350,000 tons of each moving by rail. Approximately 100,000 tons of other grains, phosphate materials, potash materials, nitrogen materials and corn were shipped by rail. Consequently these are the commodities that are most dependent on an efficient rail system and the one that should be the focus of attention in any efforts to improve the system.

FIGURE 16. TOTAL INSHIPMENTS AND MAJOR ORIGINS OF EACH COMMODITY, NEW YORK, 1979.

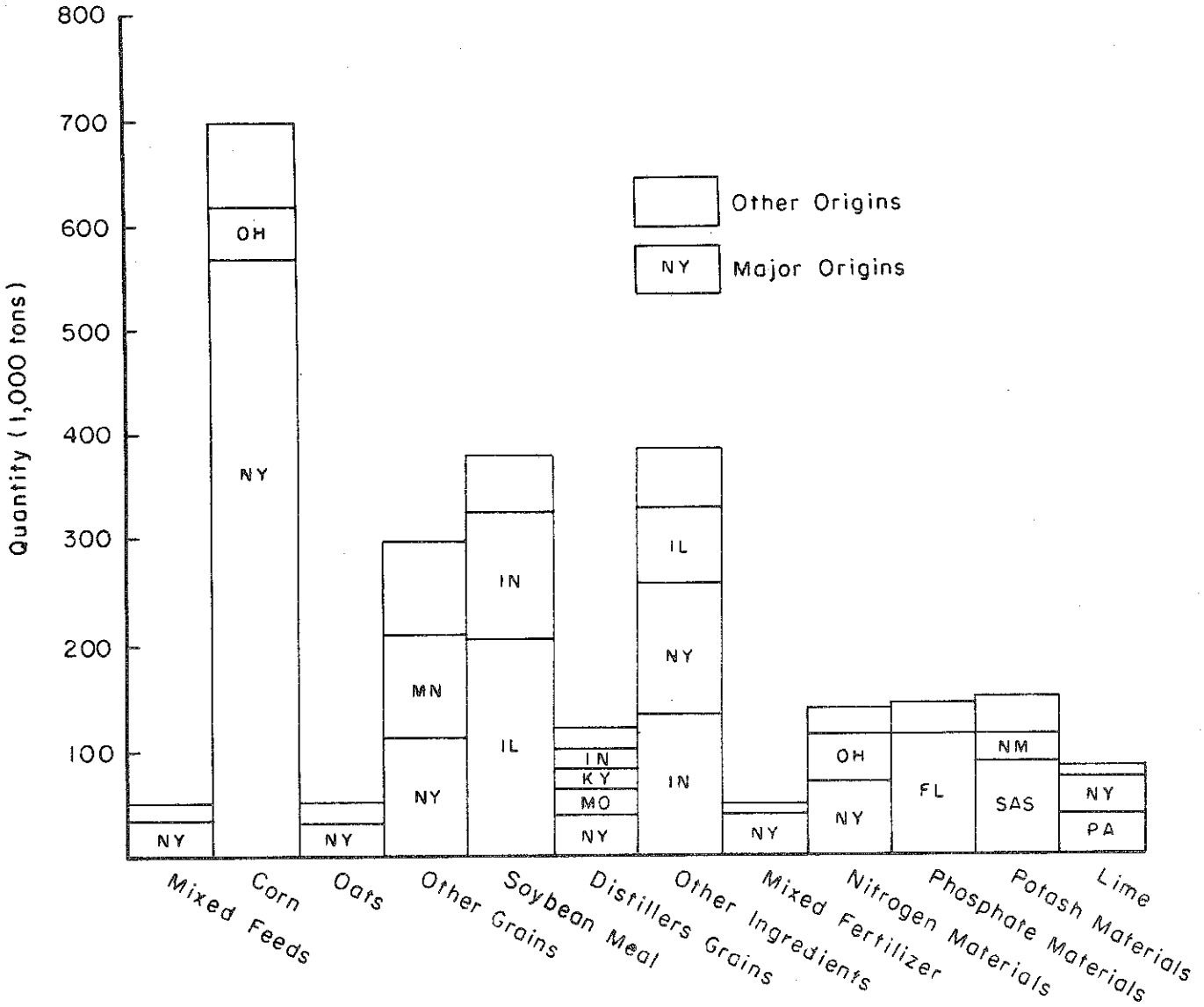
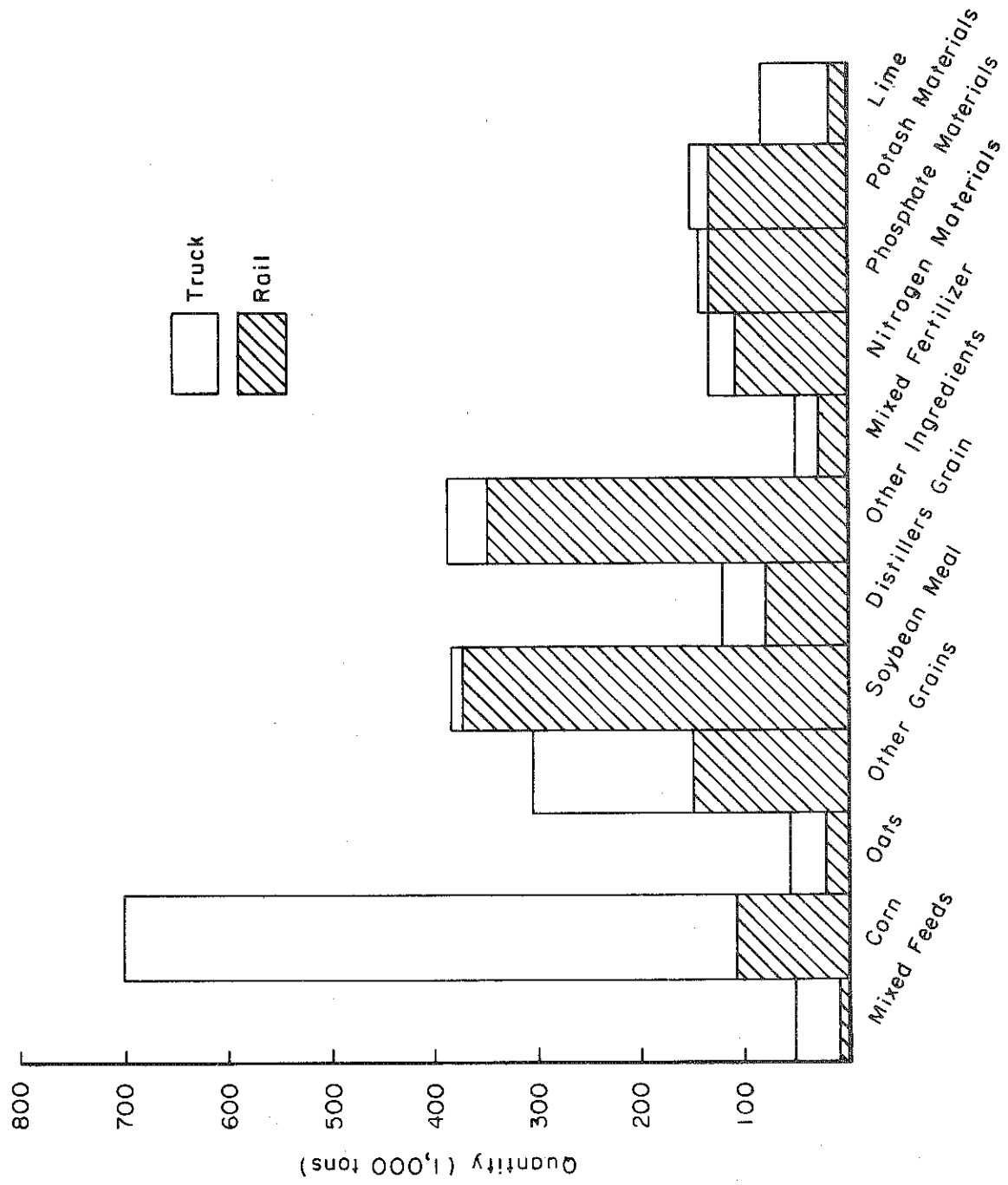


FIGURE 17. TOTAL INSHIPMENTS AND VOLUME TRANSPORTED BY RAIL, NEW YORK, 1979



Shipments to Other Firms

Feed and fertilizer firms were responsible for significant amount of shipments to other firms. Total shipments were as follows:

	Tons
Ready Mixed Feed	150,500
Corn	121,000
Oats	12,700
Wheat	49,200
Barley	3,700
Other Feeds and Grains	132,500
Ready Mixed Fertilizer	21,400
Nitrogen Material	44,000
Potash Materials	4,100

Although it appears NYS feed and fertilizer firms have a significant amount of shipments, the shipments are primarily to other firms in New York State.

Table 34 indicates the total quantity of shipments, the primary and secondary destinations, and the percent of the total moving by rail. The primary destination for five commodities was New York, and it was the secondary destination for three other commodities. All major shipments were to New York, adjacent states or Canada. Except for nitrogen materials, the vast majority of the shipments moved by truck.

Other Firms Handling Bulk Agricultural Commodities

The above discussion was limited to firms directly supplying production inputs to New York State agriculture. However, all firms in the state handling bulk agricultural commodities were surveyed. Eighteen firms could not be classified as feed and fertilizer firms. They included grain elevators, flour mills, breweries and a fructose manufacturing facility.

Most of these firms handled a significant quantity of bulk agricultural commodities. Due to their relative size, it is believed they have the ability to effectively arrange for their own transportation needs. However, the following is presented to give a brief indication of the magnitude of their combined use of bulk agricultural commodities and their dependence on the New York rail network.

Non-feed and fertilizer firms used 5,855 boxcars and 20,032 covered hopper cars in 1979.

Table 34
Out Shipments of Bulk Commodities
New York, 1979

Commodity	Total Shipments (Tons)	Shipments of Known Destination (Tons)	Primary Destination		Secondary Destination		Percent of Total By Rail
			Destination	Percent	Destination	Percent	
Mixed Feed	150,500	150,500	New York	84.4	Massachusetts	6.1	14.0
Corn	121,000	116,700	New York	78.0	Pennsylvania	15.0	7.0
Oats	12,700	12,300	Pennsylvania	49.5	New York	40.6	4.2
Wheat	49,200	45,000	Pennsylvania	63.9	New York	24.6	0.0
Barley	3,700	3,700	New York	75.0	New Jersey	25.0	0.0
Feed Ingredients	132,500	132,400	New York	49.0	Canada	44.3	5.4
Mixed Fertilizer	21,400	21,400	New York	67.5	New England	28.3	23.4
Nitrogen Material	44,000	44,000	New England	60.0	Pennsylvania	40.0	60.0
Potash Material	4,100	4,100	Pennsylvania	98.0	New York	2.0	0.0

Information on receipts is presented in Table 35. These firms used 913,500 tons of corn. Over 44 percent was obtained from Ohio and 29% came from Indiana. Approximately 88 percent was transported by rail.

Soybean meal, used in the production of nonagricultural feeds, amounted to 51,100 tons. Indiana and Illinois were the major sources of shipments and all soybean meal moved by rail.

Over 85,600 tons of other feed ingredients were used by non-feed firms. Over half originated in Ohio while 40 percent came from New York. Rail transportation accounted for 61 percent of deliveries.

Table 36 provides information on bulk commodity shipments of other types of firms. Outbound shipments of corn and wheat amounted to 354,500 tons and 556,000 tons, respectively. The majority was shipped to foreign destinations by water. Over half of the malt, feed ingredients and flour moved to other firms in New York State. Except for malt, a large proportion of these commodities moved by rail.

Summary

A total of approximately 400 facilities handle feeds, grains, fertilizer and lime in New York State. The vast majority are small plants, with the bulk of products manufactured by a relatively small number of large firms. While such a structure is relatively adaptable to consolidated central receiving, receiving methods would have a significant impact on institutional arrangements in the market as well as the competitive structure of the market.

The New York feed and fertilizer industries are dependent on the railroad systems in the Northeast. Those commodities most dependent on rail movements into the state are: soybean meal, other feed ingredients, other grains, potash materials, phosphate materials and nitrogen materials.

Currently almost all rail receipts move into New York under single car rates. With the increased possibility of negotiable multiple car rates, there is significant opportunity for central receiving of unit trains to significantly reduce transportation costs. But density of consumption remains a major problem. Although feed and fertilizer manufacturing is somewhat more concentrated than feed and fertilizer consumption, usage of bulk agricultural commodities is rather evenly distributed throughout the entire state.

Table 35
Inshipments of Other Firms Handling Bulk Agricultural Commodities
Origin and Mode of Transport
New York, 1979

Commodity	Total Receipts	Receipts of Known Origin	Primary Origin		Secondary Origin		Percent of Total By Rail
			Origin	Percent	Origin	Percent	
Corn	913,500	767,800	Ohio	44.6	Indiana	28.7	87.9
Other Grains	2,098,500	1,989,200	Minnesota	40.1	N. Dakota	31.3	93.9
Soybean Meal	51,100	28,100	Indiana	53.6	Illinois	32.7	100.0
Other Ingredients	85,600	72,200	Ohio	54.0	New York	39.2	60.8

Table 36
Outshipments of Other Firms Handling Bulk Agricultural Commodities
Destination and Mode of Transportation
New York, 1979

Commodities	Total Shipments	Shipments of Known Destinations	Primary Destinations		Secondary Destination		Percent of Total By Rail
			Destination	Percent	Destination	Percent	
Corn	354,500	354,500	Foreign	84.6	Maryland	12.3	12.3
Wheat	556,000	556,000	Foreign	98.9	Pennsylvania	0.9	0.0
Malt	120,800	120,800	New York	65.6	Pennsylvania	31.6	31.6
Feed Ingredients	610,500	601,200	New York	61.4	New England	16.8	65.6
Flour	534,600	413,500	New York	51.9	Pennsylvania	30.1	58.0

Section IV

Costs and Economies of Scale in Receiving, Storage and Shipping

Section IV

COSTS AND ECONOMIES OF SCALE IN RECEIVING, STORAGE AND SHIPPING

A major alternative to the existing transportation system for feed and fertilizer is consolidated rail movement of commodities into the state. The commodities would be unloaded at one of more central receiving facilities, stored and eventually shipped to the individual plants of cooperating firms by truck. Such an alternative has two primary advantages: 1) it allows movements to use multiple-car freight rates and 2) it allows cooperating firms to enjoy any economies of scale in receiving, storage and shipping. The major disadvantage of this system is the high cost of truck transportation between the central facility and the user's plant. However, given the current proposals concerning the railroad system in the Northeast, this may be the only feasible alternative for some New York feed and fertilizer firms.

The purpose of this section is to develop estimates of the costs and economies of scale of receiving, storage and shipping bulk agricultural commodities.

One question on the Bulk Commodities Survey asked participating plants to estimate the cost of receiving and shipping feed and fertilizer. Another question asked them to estimate the monthly cost of storage for these commodities. Very few respondents answered the questions and many of those that did indicated their answers were only guesses.

Consequently, the standard economic engineering approach was used to estimate costs and economies of scale. Information used to establish costs was obtained from past economic engineering studies, published data and industry experts. 1/

This section is divided into three parts. The first part discusses fixed costs. Variable costs are the topic of the second part and the last part is devoted to an analysis of the total costs of receiving, storage and shipping.

All costs have been expressed in 1981 dollars.

Fixed Costs

Facility Size

The size and number of central receiving facilities needed in New York will depend on the trade offs between the savings generated by central receiving facilities and the added costs of truck transportation. Another important factor is the number of bulk commodities handled by the facility. The results of the previous section indicate that soybean meal is the most likely candidate for central receiving, but other possible commodities include "other feed ingredients," "other grains," phosphate materials, and potash materials.

1/ Nichols, T.E. and N.J. Upshaw, "Economic Opportunities for a Grain Export Elevator in North Carolina" (Raleigh: North Carolina State Univ., April 1978) and Schienbein, A. G. and C. J. Vosloh, "Costs of Storing and Handling Grain and Controlling Dust in Commercial Elevators, 1971-72", (Washington, D. C.: USDA, ERS, March 1973).

Six facility sizes were studied. Size was measured by the total number of bushels of storage capacity. Results are also reported on a tonnage basis. Corn - at 56 pounds per bushel - was the standard for converting bushels to tons. Capacity can also be measured in the number of covered hopper cars each facility can handle. If each hopper car holds 100 tons, and corn is used as the general standard of measure, then each hopper car represents 3,571 bushels.

The following facility sizes were studied:

Facility Capacity		
Bushels	Tons	100 Ton Hopper Cars
50,000	1,400	14
100,000	2,800	28
250,000	7,000	70
500,000	14,000	140
750,000	21,000	210
1,000,000	28,000	280

While initial storage capacity is a major factor, turnover is even more important in determining the economies of scale of various facilities. As turnover increases fixed costs are spread over a greater number of units and this reduces the total costs of the operation. Various levels of turnover will be examined in the last part of this section.

Investment Costs

Investment costs consisted of two components: 1) building construction costs and 2) equipment costs. The investment costs below are a synthesis of estimates obtained by extrapolateing investment costs from past studies and consulting grain handling experts at the Farm Credit Banks of St. Paul.

Total investment costs of the various facilities were estimated to be as follows.

Capacity (Bushel)	Investment Cost Per Bushel			Total Investment Cost
	Building	Equipment	Total	
50,000	$ 1.60	$ 1.50	$ 3.10	$ 155,000
100,000	1.20	1.25	2.45	245,000
250,000	.87	1.13	2.00	500,000
500,000	.72	1.03	1.75	875,000
750,000	.61	.99	1.60	1,200,000
1,000,000	.54	.96	1.50	1,500,000

Interest and Depreciation

Annual interest and depreciation were determined by calculating the annual equivalent cash flow of the total investment for each facility (Table 37). The annual equivalent cash flow was found by dividing total investment by the annuity factor for 20 years at a discount rate of 15 percent. A 20 year planning horizon was used because this was thought to be the maximum planning horizon given the uncertainty associated with market conditions and the transportation system. The average cost of long term capital was assumed to be 15 percent.

$$\text{Annual Interest and Depreciation} = \text{Annual Equivalent Cash Flow for 20 years at 15\%} = \frac{\text{Investment}}{5.9288}$$

The annual equivalent cash flow assumes the average cost of both debt and equity over the entire life of the investment will be 15 percent. It also assumes full repayment of the initial investment over its useful life. Consequently, annual equivalent cash flow incorporates the interest of any loans, repayment of principal, and a return to equity.

Property Insurance

Property insurance was calculated on 90 percent of the initial investment. A rate of 1.5 percent was applied to base insurance value.

Insurance on Inventory

Insurance on inventory was estimated at 0.55 cents per bushel. The estimate was obtained by adjusting a previous published costs by inflation. The rate was applied to the capacity of the facility.

Property Taxes

Estimates of property taxes for various locations in upstate were obtained from the New York State Division of Equalization and Assessment. The average tax rate of $25 per $1000 of full value or 2.5 percent was used.

Interest on Inventory

In addition to a payment to debt and equity on the initial investment, there would be an interest on inventory. Interest on inventory was based on commodity values of $3.00 per bushel and an inventory at 55 percent of capacity. Although turnover may vary, interest on inventory will remain a fixed cost since it is based on the average inventory in the facility at any one point in time.

Repairs and Maintenance

Although repairs and maintenance have a variable component which depends on usage and a fixed component which depends on time, they were classified as fixed costs. Annual costs were computed as two percent of total investment costs.

Table 37
Fixed, Variable and Total Costs of Receiving, Storage and Shipping

Item	Facility Size - In Bushels					
	50,000	100,000	250,000	500,000	750,000	1,000,000
Fixed Costs						
Interest and Depr.	24,800	39,100	79,900	139,800	191,700	239,600
Property Insurance	2,100	3,300	6,800	11,800	16,200	20,300
Insurance on Invent.	300	600	1,400	2,800	4,100	5,500
Property Taxes	3,900	6,100	12,500	21,900	30,000	37,500
Interest on Inventory	12,400	24,800	61,900	123,800	185,600	247,500
Repairs and Maint.	3,100	5,000	10,000	17,500	24,000	30,000
Indirect Labor	40,500	40,500	47,300	47,300	54,000	54,000
Misc. Costs	10,500	10,500	10,500	10,500	10,500	10,000
Total Fixed Costs	97,600	129,900	230,300	375,400	516,100	644,400
Variable Costs 1/						
Direct Labor	47,000	55,000	72,000	80,000	97,000	105,000
Employee Benefits	13,000	19,300	25,200	28,000	34,000	36,800
Energy Costs	5,000	10,000	25,000	50,000	75,000	100,000
Misc. Costs	2,500	5,000	12,500	25,000	37,500	50,000
Total Var. Costs	67,000	89,300	134,700	183,000	243,500	291,800
V. C. Per Bushel 1/	0.135	0.089	0.054	0.037	0.032	0.029
Total Costs 1/	155,100	219,200	365,000	558,400	759,600	936,200

1/ Based on ten inventory turnovers per year.

Management and Indirect Labor

Estimates for management and indirect labor were obtained from sources familiar with the industry. This category includes a plant manager, and an office person. It was assumed that as size increased, a more experienced person requiring a higher salary would be needed to manage the facility. Employee benefits were included at 35 percent of total salaries. The costs for each facility were computed as follows:

Indirect Labor Costs

Item	Facility Size - In Bushels					
	50,000	100,000	250,000	500,000	750,000	1,000,000
Manager	$ 20,000	20,000	25,000	25,000	30,000	30,000
Office Person	10,000	10,000	10,000	10,000	10,000	10,000
Sub Total	30,000	30,000	35,000	35,000	40,000	40,000
Employee Benefits	10,500	10,500	12,300	12,300	14,000	14,000
Total	40,500	40,500	47,300	47,300	54,000	54,000

Miscellaneous Costs

Miscellaneous costs include the annual cost of market information, office equipment and other fixed inputs. The amount was assumed to be $10,500 for all facility sizes.

Variable Costs

Variable costs are those costs that depend directly on turnover and are avoidable when the facility is idle. Items considered variable costs were direct labor, employee benefits, energy costs and other miscellaneous costs. Each component will be discussed separately below.

Direct Labor

Direct labor was considered to consist of three types of plant personnel: a foreman, semi-skilled labor and general labor. The foreman was assumed to have charge of the entire work crew and participate in plant activities. Since the foreman's required level of technical and managerial expertise would increase with the size of the facility this was reflected in wages.

Semi-skilled labor would be responsible for the receiving, storage and shipping of bulk commodities. The number of semi-skilled labor would vary from two to four depending on the size of the facility. It was assumed each semi-skilled worker would receive $12,000 per year.

General laborers would assist the semi-skilled workers and would be responsible for maintenance and miscellaneous tasks. This item also included extra office personnel. It was assumed the number of general laborers would vary between one and four, depending on facility size, and each would receive $8,000 per year.

Direct labor costs for each facility were computed in the following manner.

Direct Labor Costs

Direct Labor	Facility Size - In Bushels					
	50,000	100,000	250,000	500,000	750,000	1,000,000
Crew Foreman	$15,000	$15,000	$20,000	$20,000	$25,000	$ 25,000
Semi-Skilled Labor	24,000	24,000	36,000	36,000	48,000	48,000
General Labor	8,000	16,000	16,000	24,000	24,000	32,000
TOTAL	$47,000	$55,000	$72,000	$80,000	$97,000	$105,000

Employee Benefits

Employee benefits include Social Security and Workmen's Compensation as well as health and retirement benefits provided by the firms. They were assumed to be 35 percent of direct labor costs. The percentage used was based on 1976 data for comparable industries in the Northeast and adjusted to 1981. 2/

Energy Costs

Energy costs consist of electrical costs to operate the equipment and fuel for drying. Nichols and Upshaw used 1.0 cents per bushel for electricity costs in 1978. 3/ The rate was assumed to be sufficient to cover the costs of any drying.

Miscellaneous Costs

Remaining variable costs were lumped under the category of miscellaneous. Items falling under this heading would include fumigation costs, telephone, office supplies, etc. Miscellaneous costs were assumed to be 0.5 cents per bushel.

Total Variable Costs

Total variable costs are presented in Table 37. They varied between 11.5 cents per bushel and 2.9 cents per bushel. An average of ten turnovers per year was assumed in calculating total variable costs. The costs of direct labor and employee benefits are sensitive to the number of turnovers. If the number of turnovers is less than ten per year then labor must be willing to accept only part-time employment or must have alternative employment adjacent to the facility in order for the indicated variable costs per bushel to be realized.

2/ U. S. Chamber of Commerce, Employee Benefits, 1976.
3/ Nichols, T. E. Jr. and N. J. Upshaw. p. 37.

Table 38
Volume and Unit Costs at 1, 5, 10 and 20 Turnovers Per Year

Size and Number of Turnovers	In Bushels		In Tons[1/]	
	Volume (1,000 Bu.)	Cost ($/Bu.)	Volume (1000 Tons)	Cost ($/Ton)
50,000 Bu. Facility				
1	50	2.07	1.4	73.80
5	250	0.51	7.0	18.00
10	500	0.31	14.0	11.10
20	1,000	0.21	28.0	7.60
100,000 Bu. Facility				
1	100	1.39	2.8	49.60
5	500	0.35	14.0	12.10
10	1,000	0.22	28.0	7.80
20	2,000	0.15	56.0	5.50
250,000 Bu. Facility				
1	250	0.98	7.0	34.80
5	1,250	0.24	35.0	8.50
10	2,500	0.15	70.0	5.20
20	5,000	0.10	140.0	3.60
500,000 Bu. Facility				
1	500	0.79	14.0	28.10
5	2,500	0.19	70.0	6.70
10	5,000	0.11	140.0	4.00
20	10,000	0.08	280.0	2.70
750,000 Bu. Facility				
1	750	0.72	21.0	25.70
5	3,750	0.17	105.0	6.10
10	7,500	0.10	210.0	3.60
20	15,000	0.07	420.0	2.40
1,000,000 Bu. Facility				
1	1,000	0.67	28.0	24.10
5	5,000	0.16	140.0	5.60
10	10,000	0.09	280.0	3.30
20	20,000	0.06	560.0	2.20

1/ With a conversion rate of 35.714 bushels per ton.

Total Costs

Annual costs ranged between $145,000 for the 50,000 bushel facility and $927,000 for the one million bushel facility if each plant had ten turnovers per year (Table 38).

Table 38 illustrates the impact of the number of turnovers on the unit cost of receiving, storage and shipping. The results are expressed in dollars per ton as well as on a per bushel basis. 4/ As turnover increases fixed costs are spread over a larger number of units and the per unit cost decreases. Five turnovers per year are required of most facilities to result in costs less than $10.00 per ton. Costs less than $5.00 per ton can only be realized with plants larger than 250,000 bushels (7,000 tons) and then there must be at least 10 turnovers per year.

Summary

The economic feasibility of centralized receiving facilities is dependent on the economies of scale in such operations as well as the turnover of these facilities. However, the costs of truck transportation must also be considered. As size increase, the radius of the market area served by such a facility will increase and the cost of truck transportation will increase. What the tradeoffs are and what the optimal number, size and location of facilities should be was not one of the objectives of this study.

4/ A conversion rate of 35.714 bushels per ton was used.

Section V

Commodity Projections

Section V

COMMODITY PROJECTIONS

Introduction

The purpose of this section is to: 1) report the results of projections of livestock numbers and crop acreage for 1985 and 1990, and 2) estimate the quantity of major bulk agricultural commodities needed in 1985 and 1990.

Projection of Livestock Numbers and Crop Acreage

Methodology

Initially, an extensive effort was made to project livestock numbers, and crop acreage using econometric methods. While the resulting projections seemed reasonable, the estimated relationships were either not theoretically justifiable or statistically adequate. Consequently, this approach was abandoned and simple trend projections were estimated.

The general equation used was:

$$Y_t = a + b_1 Y_{t-1} + b_2 T \text{ 1/}$$

Where:

Y_t = projected number of livestock or crop acres in year t

Y_{t-1} = the number of livestock or crop acres in year t-1

T = trend variable

Coefficients for a, b_1 and b_2 were estimated for each commodity using simple linear regression techniques and data published by the New York State Crop Reporting Service. 2/ The data were for the years 1970 to 1980 or 1981 for all livestock and crops. A detailed description of the estimated equations is found in Table D1 of Appendix D.

It must be emphasized that the estimates that follows are merely trend projections. Implicit in the projections are several assumptions. The primary assumption is that the economic and political factors causing the trends in production and consumption since 1970 will continue to exert the same general influence to 1985 and 1990. This is a bold if not erroneous assumption. Therefore, the reader should exercise extreme care in evaluating the projections because they are simple trend line estimates. The presentation of the results also includes a discussion of major factors that could have an impact on the projected number of livestock and crop acres.

1/ For milk cows the equation was: $Y_t = a + b_1 Y_{t-1} + b_2 T + b_3 Y_{t-2}$ Where Y_{t-2} is the number of milk cows in year t-2.

2/ New York Crop Reporting Service, New York Agricultural Statistics, (Albany: New York State Department of Agriculture and Markets, various years).

The Results

Actual livestock numbers and crop acreages for 1979 as well as the projections for 1985 and 1990 are presented in Table 39. Projections for 1979 to 1990 inclusive are presented in D2 of Appendix D.

Inventories of milk cows were projected to decrease from 905,000 in 1979 to 814,000 in 1990. The projected numbers seem probable. The number of milk cows are likely to decrease as production per cow continues to increase and milk consumption remains the same or decreases.

Since milk cows are currently the primary consumers of feed concentrates and feedstuffs produced by commercial fertilizers, the trend in milk cows will have a significant impact on the quantity of feed and fertilizer imported into New York State. However, there are several exogenous factors that could have a significant impact on the number of milk cows. The government price support program for dairy products is one factor. Given the current level of surpluses, changes in the program are likely to result in lower support prices. In the longrun this could result in even fewer milk cows.

Future government policy toward casein imports is another important factor. If the current import policy is not altered, more imported casein will be substituted for milk in the production of manufactured dairy products. This could also reduce the number of milk cows.

The last factor that could have a significant impact on cow numbers is related to productivity of dairy cattle. While genetic improvements in milk production are likely to increase at a constant rate there are possible changes in feeding practices that could increase the productivity per cow. Specifically, in the near future, it may be possible to increase milk production per cow 15-20 percent using the same quantity of feedstuffs by supplementing their diet with isoacid and amino acid compounds or through the use of growth hormones. Adoption of such management practices on a large scale would eventually reduce the number of milk cows.

The number of other cattle - calves, yearlings, bulls and beef cattle was projected to increase to 897,000 head by 1990. This estimate seems too high. It is more likely the number of other cattle will decrease slowly at about the same rate as dairy cows. The only reasons to expect otherwise would be if there was a significant increase in the proportion of replacement cattle kept on farms or if there was an increase in beef cattle production. Currently neither alternative is considered likely, at least to the extent indicated by the projection.

A moderate increase in the number of chickens for egg production was projected. There were 10.2 million birds in the state in 1979 and 13.5 million were predicted for 1990. Even a significant decrease in the transportation costs of feed ingredients is not expected to have a major impact on the number of layers in the state. Laying mash consists of 67 percent corn products. A decrease in transportation cost will only have a small impact on the cost of feed in specific and the cost of egg production in general since less than one third of the ingredients are imported from outside the state and transportation is a relatively small component in the total cost of imported feeds. While lower transportation costs are likely to have some consequence, the impact is not likely to be dramatic.

Table 39
Projected Livestock Numbers and Crop Acres, 1979 (Actual), 1985, 1990
New York State

Item	1979 (Actual)	1985 (Projected)	1990 (Projected)
		1,000 Head or Birds	
Livestock:			
Milk Cows	905	846	814
Other Cattle	807	889	897
Chickens-Eggs	10,200	11,416	13,535
Chickens-Broilers	480	1/	1/
Hogs and Pigs	139	169	199
Sheep and Lambs	63	34	9
		1,000 Acres Planted	
Crops:			
All Corn 2/	1,275	1,623	1,871
Corn for Grain	650	919	1,119
Corn for Silage	625	704	752
Wheat	170	177	184
Oats	330	308	284
All Hay	2,450	2,561	2,675
Fresh Vegetables	69	73	76
Processed Vegetables	89	91	93

1/ Production projected to be less than zero

2/ Sum of subcomponents

Broiler production in New York, on the other hand, was predicted to disappear. Most current production is on Long Island. Factors other than transportation costs are causing the current demise of the state's broiler production.

The numbers of hogs and pigs were projected to increase while the numbers of sheep and lambs were predicted to decrease. Neither category of livestock is expected to have a major impact on the demand for feed.

Total corn acreage was projected to increase by as much as 35 percent to over 1.8 million acres by 1990. The increase will be due to increased plantings of both corn for grain and corn for silage, but corn for grain was predicted to account for most of the increase in the near future. The primary reason for the increase in corn production is the success of short season varieties. However, there is a limit to the number of acres that can be converted to corn production. Although the projection may be considered probable, corn acreage will likely peak at a level higher than current production but significantly less than the 1990 projection.

Oat acreage was projected to experience a moderate decline. The number of acres to wheat and hay were predicted to increase somewhat. It is difficult to explain an increase in hay acreages, especially given the increased production of corn. All these projections are considered reasonable and currently there are no foreseeable developments likely to alter the projections.

One other possible development deserves mention. A New York group is currently investigating the feasibility of a soybean processing facility in the state. There are large economies of scale in soybean processing and very little soybean production within the state. Consequently the plant would be very dependent on rail shipments of soybeans from the Mid-west.

Projections of livestock numbers and crop acreage for 1985 and 1990 by region are presented in Table 40. Changes in regional production and consumption were computed by calculating the change in each region between 1969 and 1978 and multiplying that change by 7/9 for 1985 and 12/9 for 1990. Data for farms with agricultural sales of $2,500 or more taken from the New York Census of Agriculture were used to compute the regional change in production over the nine years. The percent of livestock and crop acres on farms with agricultural sales of $2,500 or more, as well as the percentage change in production between 1969 and 1978 is presented in Table D3 of Appendix D for each region.

Projection of Bulk Commodity Needs

The future utilization of feed and fertilizer was estimated. Feed needs were based on predicted livestock numbers. Estimates of fertilizer usage were projected in the same manner as livestock numbers and crop acreage.

Table 40
Projected Livestock Numbers (1,000 Animals), Crop Acreage (1,000 Acres)
and Fertilizer Utilization (1,000 Tons) By Region, New York, 1985 and 1990

	Milk Cows		Other Cattle		Chickens-Eggs		Chickens-Broilers		Hogs & Pigs		Sheep and Lambs	
	1985	1990	1985	1990	1985	1990	1985	1990	1985	1990	1985	1990
Southwestern NY	73	71	76	77	319	366	0	0	17	22	2	0
Western NY	140	138	156	159	3950	5136	0	0	81	92	17	5
Central NY	139	134	146	150	704	722	0	0	23	27	2	0
Eastern NY	114	109	120	122	0	0	0	0	12	14	4	1
Northern NY	144	142	137	139	30	0	0	0	9	12	1	0
Northeastern NY	23	22	24	24	0	0	0	0	1	1	0	0
South Central NY	189	184	198	204	2953	3784	0	0	17	20	6	2
Lower Hudson Valley	24	15	31	22	3424	3497	0	0	9	11	2	1
Long Island	0	0	0	0	36	30	0	0	0	0	0	0
Total	846	814	889	897	11416	13535	0	0	169	199	34	9

	Corn for Grain		Corn for Silage		Wheat		Oats		Hay		Fertilizer	
	1985	1990	1985	1990	1985	1990	1985	1990	1985	1990	1985	1990
Southwestern NY	27	34	59	67	1	0	12	7	231	246	34	34
Western NY	484	610	140	152	115	115	155	158	421	445	274	289
Central NY	201	243	109	115	36	43	57	51	384	409	116	124
Eastern NY	61	59	94	91	2	0	11	7	401	428	69	71
Northern NY	20	23	120	141	1	1	8	0	409	416	54	60
Northeastern NY	0	0	26	29	4	6	1	1	67	65	11	12
South Central NY	101	122	137	146	14	15	63	59	554	581	27	22
Lower Hudson Valley	25	28	19	11	1	0	1	1	94	85	91	90
Long Island	0	0	0	0	3	4	0	0	0	0	0	0
Total	919	1119	704	752	177	184	308	284	2561	2675	676	702

Livestock Feeds

Projected livestock numbers were first multiplied by estimated feed consumption to determine the total quantity of feed needed by each type of livestock. Annual per unit feed consumption was assumed to remain constant. The following annual consumption rates were used:

Livestock	Feed Consumption Per Animal Per Year
Milk Cows	4,230.0 Pounds
Other Cattle	2,097.7 "
Chickens-Eggs	72.0 "
Chickens-Broilers*	9.4 "
Hogs and Pigs	771.1 "
Sheep and Lambs	92.2 "

* A broiler's production cycle is only 9 to 10 weeks

Estimates of annual feed consumption for each major category of livestock in 1979, 1985 and 1990 are presented in Table 41. Total feed utilization was projected to 3.2 million tons. These figures include the consumption of farm-produced and commercially purchased feeds. A decrease in commercial rations is likely to occur if more roughage, high moisture corn or farm grown feeds are substituted for commercial feeds.

The demand for individual feed ingredients was estimated by multiplying total consumption by typical rations for each group of livestock. The composition of typical New York livestock feeds was provided by E. J. McCormick of Feed Services, Agway, Inc. (Table 42). The projected utilization of major feed ingredients for 1979, 1985 and 1990 appears in Table 43.

Although total feed consumption (Table 43) was estimated to remain about constant, some minor changes in the usage of feed ingredients may occur. The consumption of corn products and other ingredients (primarily minerals and vitamins) were projected to increase, while usage of soybean meal, distillers grains and other feed ingredients were estimated to decrease.

Utilization of corn products was projected to increase from 930,000 tons in 1979 to 995,000 tons in 1990. These estimates far exceed the commercial purchases of corn (691,000 tons) found in the survey of feed firms. Two factors explain the discrepency. First, these estimates include the utilization of both farm-produced and commercial procurements, while the survey included only the latter. And second, all manufactured corn products in the survey were classified as other feed ingredients.

However, the important issue is the direction and magnitude of the change. The estimates suggest a 7 percent increase in corn products. Actual consumption could be less if the cost of commercial rations increases relative to the cost of feeding more roughage, high moisture corn or home grown feeds.

Table 41
Estimated Annual Feed Consumption for Livestock
1979, 1985 and 1990, New York 1/

Livestock	Feed Consumption - 1,000 Tons 1979	1985	1990
Milk Cows	1914	1789	1722
Other Cattle	846	932	941
Chickens-Eggs	367	411	487
Chickens-Broilers 2/	2	0	0
Hogs and Pigs	54	65	77
Sheep and Lambs	3	2	1
Total	3186	3200	3228

1/ Consumption of farm-produced and commercially mixed feeds
2/ Based on 6 production cycles per year

Table 42
Percentage of Major Ingredients in Typical New York Livestock Feeds 1/

	Milk Cows	Other Cattle	Chicken Eggs	Chicken Broilers	Hogs & Pigs	Sheep & Lambs
Corn Products	25.0%	20.0%	67.0%	55.0%	63.5%	10.5%
Soybean Meal	13.0	3.5	12.8	33.1	12.6	34.5
Distillers Grain	10.0	0.0	0.0	0.0	0.0	0.0
Other Ingredients	45.0	41.0	6.0	0.0	20.0	38.0
Molasses	3.0	5.0	0.0	0.0	0.0	3.0
Vitamins & Minerals	4.0	30.5	14.2	11.9	3.9	14.0
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

1/ E. J. McCormick, Feed Services, Agway Inc., Syracuse, NY personal communication

Table 43
Estimates of the Demand for Major Feed Ingredients
1979, 1985 and 1990, New York

Feed Ingredients	Annual Consumption - 1,000 Tons 1979	1985	1990
Corn Products	929	951	995
Soybean Meal	334	327	329
Distillers Grains	191	179	172
Other Feed Ingredients	1242	1226	1205
Molasses	100	100	99
Other	390	417	428
Total	3186	3200	3228

Soybean meal utilization was predicted to decrease from 334,000 tons to 329,000 tons or a total of only 1 percent between 1979 and 1990. For distillers grains the decline was estimated at 11 percent from 191,000 tons to 172,000 tons. Consumption of other feed ingredients was projected to drop from 1,242,000 tons in 1979 to 1,205,000 tons in 1990 or 3 percent. Again it should be pointed out that the volumes may be over estimated due to utilization of farm grown feeds.

Estimates of the demand for feed components by region are presented in Table D4 of Appendix D.

Fertilizer

Equations identical to those discussed above were used to project fertilizer usage in 1985 and 1990. A description of the estimated equations is provided in Table D1 of Appendix D. The projections are presented in Table 44.

Table 44
Projected Fertilizer Usage
1979 (Actual), 1985 and 1990, New York

Fertilizer	Annual Consumption - 1,000 Tons 1979 (Actual)	1985 (Projected)	1990 (Projected)
All Fertilizer	686	676	702
Fertilizer Nutrients: 1/	293	283	304
Nitrogen	108	115	130
Phosphates	90	80	80
Potash	95	88	94

1/ Sum of subcomponents

Total fertilizer tonnage was projected to increase from 686,000 tons in 1979 to 702,000 tons in 1990. The quantity of fertilizer nutrients was predicted to increase from 293,000 to 304,000 tons over the same period. In other words, the analysis of fertilizer was assumed to continue a slight upward trend. If this does not happen, fertilizer tonnage may be higher than indicated. The increased fertilizer tonnage will primarily be devoted to increased corn production.

Summary

The total consumption of feed was projected to increase from 3,186,000 tons in 1979 to 3,228,000 in 1990. Demand for component feed ingredients is expected to remain about constant with marginal changes in individual components. Fertilizer tonnage was predicted to increase from 686,000 tons in 1979 to 702,000 tons in 1990.

It should be emphasized that the estimates presented in this section are based on simple trend projections. Consequently, extreme care should be exercised when interpreting and using these projections. They are presented to provide the reader a point of departure in constructing his or her own estimates.

Section VI

Summary

Section VI

SUMMARY

The purpose of this study was to examine the structure and characteristics of the New York feed and fertilizer industries as background for an analysis of alternative rail transportation systems for bulk agricultural commodities.

Agricultural production and consumption of feed and fertilizer are distributed throughout the entire state. Although Western New York has the highest level of agricultural activity, no region dominates with respect to feed and fertilizer utilization. The dispersed consumption of bulk agricultural commodities makes consolidated rail receiving more difficult.

Dairy production is the dominant type of agriculture in New York State. Dairy cattle (ie milk cows and other cattle) consume approximately 85 percent of the livestock feeds and a substantial portion of the commodities using fertilizer as an input. The number of milk cows will continue to decline, but other cattle were projected to increase. Consequently, feed utilization is expected to remain about constant. Poultry is the other major consumer of livestock feeds and chicken numbers and consumption of poultry feeds are also likely to decrease.

Corn is the single most important bulk agricultural commodity. In 1979 approximately 82 percent of the corn used in the manufacture of feeds was produced in New York. Moreover, corn production is expected to continue its increase with state self-sufficiency likely between 1979 and 1990. If enough farm and off-farm storage is available imports of corn and corn products from other states will be minimal.

State production of other feed grains will continue to decrease. Consequently, New York will continue to be dependent on other states for its supplies of soybean meal, other feed ingredients and other grains. Rail will be the most important mode of transportation for these commodities. However, the volumes required will decrease as livestock numbers and total feed consumption declines. Also, "other grains" and "other feed ingredients" consist of several diverse commodities, which may make unit shipments difficult.

Fertilizer usage is likely to increase slightly as corn production increases and acreage of other crops decreases. Rail volume will increase in proportion to fertilizer consumption. While the total tonnage of fertilizer is small in comparison to feed, bulk receiving of fertilizer ingredients may be feasible.

There will be significant pressure to reduce the size of the New York railroad network. Feed and fertilizer firms must take this into consideration when making their plans for the next 10 years. The industries are very dependent on rail transportion for specific commodities. In analyzing alternative ways to deal with a reduced rail system, it is essential that feed and fertilizer firms consider the current structure of the industries and the future demands of agricultural production, as well as their own specific needs.

Appendix A

Questionnaires

NEW YORK FEED AND FERTILIZER TRANSPORTATION STUDY

Department of Agricultural Economics
Cornell University
Ithaca, N.Y. 14853

CONFIDENTIAL

Manager or Contact Name _____

Firm Name _____

Plant Address _____ City _____

County _____ Telephone( ) _____

NOTE: Use information from 1979 or your latest fiscal year, whichever is most convenient. If not 1979, fiscal year used: _____.

1. Did your firm handle feed, grain, fertilizer or lime in 1979?

   ☐ Yes - If "Yes" please complete the survey.

   ☐ No - If "No" please return the questionnaire in the enclosed envelope.

2. To classify your firm, check (X) the functions you perform.

   ☐ Feed manufacturing ☐ Fertilizer manufacturing or blending

   ☐ Feed distribution ☐ Fertilizer distribution

   ☐ Grain merchandising ☐ Farm supply retailing

   ☐ Other (Please specify) _____

3. How many tons of the following were sold through your facility in 1979 or in your last fiscal year?

	Tons		Tons
Livestock feed	_____	Fertilizer	_____
Grains, not used in feed	_____	Lime	_____

4. Of the feed and fertilizer that moved through your facility, what proportion was manufactured or mixed in this facility?

   Livestock feed _____% Fertilizer _____%

5. How many tons of feed and/or fertilizer can be processed or blended at this facility in a normal day.

   Feed manufacturing _____ Tons per 8-hour day, 24-hour day, Other (Circle One)

   Fertilizer blending _____ Tons per 8-hour day, 24-hour day, Other (Circle One)

6. Of the total quantity handled, what proportion was bagged?

   Livestock feed _____% Fertilizer _____%

7. What was the percentage breakdown by type of feeds handled in 1979?

Dairy	_____%	Layers	_____%	Broilers	_____%
Beef	_____%	Swine	_____%	Other	_____%

8. What proportion of your 1979 volume was received and shipped by:

	Feeds and Grains		Fertilizer and Lime	
	Received	Shipped	Received	Shipped
Truck	_____%	_____%	_____%	_____%
Boxcars	_____%	_____%	_____%	_____%
Covered hopper cars	_____%	_____%	_____%	_____%
Water	_____%	_____%	_____%	_____%
Total	100%	100%	100%	100%

9. How many loads or cars can be received and shipped in a normal day?

	Grains and Feeds		Fertilizer and Lime	
	Receiving	Shipping	Receiving	Shipping
Truck	_____loads/day	_____loads/day	_____loads/day	_____loads/day
Boxcars	_____cars/day	_____cars/day	_____cars/day	_____cars/day
Hopper cars	_____cars/day	_____cars/day	_____cars/day	_____cars/day

10. Approximately how many rail cars did you receive in 1979?

Boxcars_____ Covered hopper cars_____

11. Of your 1979 volume received by rail, what percent moved by:

	Feeds and Grains	Fertilizer
Single car rates	_____%	_____%
2-3 Multiple car rates	_____%	_____%
More than 4 multiple car rates	_____%	_____%

12. If your facilities are capable of receiving by rail, how many feet of side track do you have?_____Feet.

13. How many rail cars can be spotted for unloading on your tracks at one time?

40-Foot Boxcars_____ Covered hopper cars_____

14. What is the heaviest single car that can be moved on your side track?_____Tons

15. If your side track cannot handle a 100 ton hopper car what is the limiting factor. (Check "X" as appropriate)

☐ Track limits ☐ Siding weight limits

☐ Bridge limits ☐ Other (Please specify)_____

16. What quality factors do you consider in the procurement of bulk commodities (Check as appropriate):

	Grains	Feed Ingredients	Fertilizer
Official grades	☐	☐	☐
Consignee	☐	☐	☐
Area of production	☐	☐	☐
Source firm	☐	☐	☐
Other_____	☐	☐	☐

17. Are shipments graded or tested upon arrival? (Please check "X")

	Yes	No	If yes, by whom?
Grains and Feed Ingredients	☐	☐	_____
Fertilizer	☐	☐	_____

18. What percent of the livestock feed and fertilizer you handle goes directly to farmers:

Livestock feed_____% Fertilizer_____%

19. Of that shipped by truck, estimate the volume within each mileage category.

Mileage Category	Livestock Feed	Fertilizer and Lime
0-24	_____%	_____%
25-49	_____%	_____%
50-74	_____%	_____%
Over 75	_____%	_____%

20. Indicate the seasonal variation of receipts by estimating the percent received in each quarter of 1979.

	Grains and Feeds	Fertilizer and Lime
Jan.-Feb.-Mar.	_____%	_____%
Apr.-May-June	_____%	_____%
Jul.-Aug.-Sept.	_____%	_____%
Oct.-Nov.-Dec.	_____%	_____%
Total	100%	100%

Storage Capacity

21. What was the total storage capacity at the facility on January 1, 1980?

Bulk feeds	_____Tons	Bulk Fertilizer and Lime	_____Tons
Bagged feeds	_____Tons	Bagged Fertilizer	_____Tons
Molasses	_____Tons or Gallons (Check one)	Liquid Fertilizer	_____Tons or Gallons (Check one)

22. Do you store feed grains under USDA Commodity Credit Corporation programs?

(Check one) ☐ Yes ☐ No

If yes, indicate approximate quantity in CCC storage on January 1, 1980.

_____Tons

Handling Costs

23. Estimate the current cost to receive and ship:

Feeds and Grain: $_____per ton

Fertilizer: $_____per ton

24. If you store feeds, grains or fertilizer, what is the approximate cost per month to store one ton:

Feeds and Grain: $_____per ton per month

Fertilizer $_____per ton per month

25. If you received feed and grain in 1979 indicate the total quantity of each product, the two primary origins, the proportion of the product from each origin, and the primary mode of transportation.

	Total Quantity Received	Two Primary Origins (States)	Percent from This Origin	Primary Mode Check Truck	Rail
Ready mixed feeds	_____Tons	(1)_____	_____%	☐	☐
		(2)_____	_____%	☐	☐
Corn	_____Tons	(1)_____	_____%	☐	☐
	_____Tons	(2)_____	_____%	☐	☐
Oats	_____Tons	(1)_____	_____%	☐	☐
		(2)_____	_____%	☐	☐
All other grains	_____Tons	(1)_____	_____%	☐	☐
		(2)_____	_____%	☐	☐
Soybean meal	_____Tons	(1)_____	_____%	☐	☐
		(2)_____	_____%	☐	☐
Distillers grains	_____Tons	(1)_____	_____%	☐	☐
		(2)_____	_____%	☐	☐
All other feed ingredients	_____Tons	(1)_____	_____%	☐	☐
		(2)_____	_____%	☐	☐

26. If you handle fertilizer and lime indicate the total quantity of each product received in 1979, the two primary origins, the proportion of the product from each origin and the primary mode of transportation.

	Total Quantity Received	Two Primary Origins (States)	Percent from This Origin	Primary Mode Check Truck	Primary Mode Check Rail
Ready mixed fertilizer	____ Tons	(1)_____	_____%	☐	☐
		(2)_____	_____%	☐	☐
Nitrogen materials	____ Tons	(1)_____	_____%	☐	☐
		(2)_____	_____%	☐	☐
Phosphate materials	____ Tons	(1)_____	_____%	☐	☐
		(2)_____	_____%	☐	☐
Potash materials	____ Tons	(1)_____	_____%	☐	☐
		(2)_____	_____%	☐	☐
Lime	____ Tons	(1)_____	_____%	☐	☐
		(2)_____	_____%	☐	☐

27. If you shipped grain or fertilizer outside the local area (more than 50 miles) in 1979, indicate the product, the total quantity, the two primary destinations, mode of transportation and months shipped.

Product (Identify)	Total Quantity (Tons)	Two Primary Destinations (State)	Primary Modes (Check) Truck	Rail	Water	Months Shipped
a._____	_____	(1)_____	☐	☐	☐	_____
		(2)_____	☐	☐	☐	_____
b._____	_____	(1)_____	☐	☐	☐	_____
		(2)_____	☐	☐	☐	_____
c._____	_____	(1)_____	☐	☐	☐	_____
		(2)_____	☐	☐	☐	_____
d._____	_____	(1)_____	☐	☐	☐	_____
		(2)_____	☐	☐	☐	_____

28. Any comments about the transportation system for feed and fertilizer in New York State.

NEW YORK BULK COMMODITIES TRANSPORTATION STUDY

Department of Agricultural Economics
Cornell University
Ithaca, N.Y. 14853

CONFIDENTIAL

Manager or Contact Name_____

Firm Name_____

Plant Address_____ City_____

County_____ Telephone( )_____

NOTE: Use information from 1979 or your last fiscal year, whichever is most convenient. If not 1979, fiscal year used?_____

1. What is the major function of this facility?

- ☐ Grain elevator
- ☐ Flour mill
- ☐ Brewery
- ☐ Other_____

2. What bulk products and by-products were produced in this facility in 1979?

	Bulk Products	Quantity		Bulk By-Products	Quantity
A.	_____	_____Tons	D.	_____	_____Tons
B.	_____	_____Tons	E.	_____	_____Tons
C.	_____	_____Tons	F.	_____	_____Tons

3. What bulk commodities were used in the manufacture of these products in 1979?

G.	_____	_____Tons
H.	_____	_____Tons
I.	_____	_____Tons
J.	_____	_____Tons

4. What is the normal operating capacity of this facility?

_____Tons per 8 hour day, 24-hour day, other (Circle one)

Shipping and Receiving

5. What proportion of your 1979 volume of bulk commodities was received and shipped by:

	Received	Shipped
Trucks	_____%	_____%
Boxcars	_____%	_____%
Hopper cars	_____%	_____%
Water	_____%	_____%
Total	100%	100%

6. How many loads or cars can be received and shipped in a normal day?

	Received	Shipped
Truck	_____loads/day	_____loads/day
Boxcars	_____cars/day	_____cars/day
Hopper cars	_____cars/day	_____cars/day

7. Approximately how many rail cars did you receive in 1979?

Boxcars_____ Covered hopper cars_____

8. Of your 1979 volume moving by rail, what percent was received and shipped by:

	Received	Shipped
Single car rates	_____	_____
2-3 Multiple car rates	_____	_____
More than 4 multiple car rates	_____	_____
Total	100%	100%

9. If your facilities are capable of receiving by rail, how many feet of side track do you have? _____Feet.

10. How many rail cars can be spotted for unloading on your tracks at one time?

40-Foot Boxcars_____ Covered hopper cars_____

11. What is the heaviest single car that can be moved on your side track?_____Tons

12. If your side track cannot handle a 100 ton hopper car what is the limiting factor. (Check "X" as appropriate)

☐ Track limits ☐ Siding weight limits

☐ Bridge limits ☐ Other (Please specify)_____

13. What quality factors do you consider in the procurement of bulk commodities (Check as appropriate):

	Commodity G	Commodity H	Commodity I	Commodity J
	_____	_____	_____	_____
Official grade	☐	☐	☐	☐
Consignee	☐	☐	☐	☐
Area of production	☐	☐	☐	☐
Source firm	☐	☐	☐	☐
Other_____	☐	☐	☐	☐

14. Are shipments graded or inspected upon arrival? (Please check "X")

☐ Yes ☐ No If yes, by whom?_____

15. Indicate the seasonal variations in receipts and shipments by estimating the percent received in each quarter of 1979.

	Receipts	Shipments
Jan.-Feb.-Mar.	_____%	_____%
Apr.-May-June	_____%	_____%
Jul.-Aug.-Sept.	_____%	_____%
Oct.-Nov.-Dec.	_____%	_____%
Total	100%	100%

16. Indicate the market area for the bulk by-products by estimating the proportion of your 1979 volume sold within each mileage category.

Mileage Category (miles)	Bulk By Products (Identify)		
	_____	_____	_____
0 - 99	_____%	_____%	_____%
100 -199	_____%	_____%	_____%
200 -299	_____%	_____%	_____%
300 -399	_____%	_____%	_____%
400 -499	_____%	_____%	_____%
500 and over	_____%	_____%	_____%
Total	100%	100%	100%

Storage Capacity

17. What was the total storage capacity at this facility on January 1, 1980?

_____Tons or bushel (Circle One)

18. Do you store feed grains under USDA Commodity Credit Corporation programs?

(Check one) ☐ Yes ☐ No

If yes, indicate approximate quantity in CCC storage on January 1, 1980.

_____Tons.

Handling Costs

19. Estimate the current costs to receive and ship one ton of bulk commodities and by-products. $_____ per ton.

20. Estimate the cost to store one ton of bulk commodities one month.

$_____per ton per month

Commodity Origins and Destinations

21. For the bulk commodities used by your plant, please indicate the two primary origins, the proportion of that product from each origin and primary mode of transportation.

Commodity (Identify)	Two Primary Origins (State)	Percent from this Origin	Primary Mode (Check) Truck	Rail
________	(1) ________	________%	☐	☐
	(2) ________	________%	☐	☐
________	(1) ________	________%	☐	☐
	(2) ________	________%	☐	☐
________	(1) ________	________%	☐	☐
	(2) ________	________%	☐	☐
________	(1) ________	________%	☐	☐
	(2) ________	________%	☐	☐

22. For the bulk products and by-products you shipped in 1979, indicate the two primary destinations, the proportion of that product to each destination and primary mode of transportation.

Product or By-Product (Identify)	Two Primary Destinations (State)	Percent to this Destination	Primary Mode (Check) Truck	Rail
________	(1) ________	________%	☐	☐
	(2) ________	________%	☐	☐
________	(1) ________	________%	☐	☐
	(2) ________	________%	☐	☐
________	(1) ________	________%	☐	☐
	(2) ________	________%	☐	☐
________	(1) ________	________%	☐	☐
	(2) ________	________%	☐	☐
________	(1) ________	________%	☐	☐
	(2) ________	________%	☐	☐
________	(1) ________	________%	☐	☐
	(2) ________	________%	☐	☐

23. Comments concerning the transportation situation for bulk commodities in New York State.

Thank you for your cooperation.

Appendix B

County Information

Table B 1

Number of Firms, Volume of Sales and Number of Rail Cars Received by County
New York, 1979

County	Number of Firms	Feed (Tons)	Grain (Tons)	Fertilizer (Tons)	Lime (Tons)	Box Cars	Hopper Cars
Reg. 1: Southwestern NY							
Chautauqua	15	99,800	3,300	1,500	11,500	28	688
Cattaraugus	13	18,000	600	111,000	3,000	100	1,300
Allegany	9	800	200	0	8,500	0	0
Subtotal	37	118,600	4,100	112,500	23,000	128	1,988
Reg. 2: Western NY							
Erie	17	77,200	5,900	5,700	10,500	50	520
Niagara	2	300	100	0	7,900	0	0
Wyoming	9	35,200	1,100	6,100	9,400	100	414
Genesee	9	132,900	6,300	29,500	6,500	594	554
Orleans	2	0	9,600	2,800	0	0	118
Livingston	9	7,600	4,400	36,400	3,700	3	194
Monroe	9	300	28,900	11,000	200	9	0
Ontario	6	3,800	2,800	4,200	6,100	4	81
Wayne	11	600	200	77,900	10,300	15	784
Yates	4	100	1,200	42,000	2,600	5	468
Seneca	4	20,100	129,800	0	2,800	0	0
Subtotal	82	278,100	190,300	215,600	60,000	780	3,133
Reg. 3: Central NY							
Cayuga	7	68,400	3,200	5,100	6,700	215	268
Onondaga	6	42,800	100	0	6,600	0	0
Oswego	6	500	200	3,800	8,900	0	34
Madison	11	16,800	300	13,800	14,600	35	196
Oneida	18	112,400	1,900	11,600	33,300	1,368	257
Herkimer	7	29,300	700	1,700	13,300	79	252
Subtotal	55	270,200	6,400	36,000	83,400	1,697	1,007

County	Number of Firms	Feed (Tons)	Grain (Tons)	Fertilizer (Tons)	Lime (Tons)	Box Cars	Hopper Cars
Reg. 4: Eastern NY							
Fulton	2	400	100	0	1,700	0	0
Montgomery	3	1,000	100	4,300	7,600	0	28
Schoharie	3	9,800	400	0	1,600	27	28
Greene	3	200	500	0	500	0	0
Albany	8	163,300	5,500	48,000	600	388	1,669
Schenectady	1	100	100	0	200	0	0
Saratoga	7	800	400	0	7,000	0	0
Washington	8	72,300	500	4,600	12,600	430	443
Rensselaer	7	1,200	600	0	8,800	0	0
Columbia	8	61,600	400	5,500	8,800	670	280
Subtotal	50	310,700	8,600	62,400	49,400	1,515	2,448
Reg. 5: Northern NY							
Jefferson	13	155,000	100	3,200	4,700	1,588	712
Lewis	8	38,600	500	2,700	9,100	157	131
St. Lawrence	13	62,400	1,200	2,500	10,200	500	341
Franklin	6	1,100	300	0	5,400	0	0
Subtotal	40	257,100	2,100	8,400	29,400	2,245	1,184
Reg. 6: Northeastern NY							
Clinton	7	59,800	100	0	3,600	4	693
Essex	1	100	100	0	1,000	0	0
Warren	2	40,000	100	0	0	750	100
Hamilton	0	0	0	0	0	0	0
Subtotal	10	99,900	300	0	4,600	754	793

County	Number of Firms	Feed (Tons)	Grain (Tons)	Fertilizer (Tons)	Lime (Tons)	Box Cars	Hopper Cars
Reg. 7: South Central NY							
Delaware	12	51,100	1,800	3,300	12,700	30	200
Otsego	13	102,900	3,300	11,200	12,000	918	678
Broome	9	103,300	4,500	500	4,500	716	573
Chenango	13	151,600	1,100	3,900	46,800	1,059	403
Cortland	6	1,400	200	0	21,700	0	0
Tioga	4	12,100	1,300	1,500	15,300	0	0
Tompkins	5	400	300	0	6,700	0	0
Chemung	3	23,100	0	34,000	1,700	134	672
Schuyler	2	100	0	1,600	6,300	36	3
Steuben	11	57,600	21,900	4,000	8,500	275	417
Subtotal	78	503,600	34,400	60,000	136,200	3,168	2,946
Reg. 8: Lower Hudson Valley							
Sullivan	8	86,400	600	1,600	2,800	400	335
Ulster	5	300	300	0	2,600	0	0
Orange	11	36,600	1,000	4,800	14,500	0	467
Putnam	0	0	0	0	0	0	0
Dutchess	15	15,900	800	9,500	14,900	242	91
Rockland	0	0	0	0	0	0	0
Westchester	1	100	400	0	0	0	0
Bronx	1	0	100	0	0	0	0
Subtotal	41	139,300	3,200	15,900	34,800	642	893
Reg. 9: Long Island							
Nassau	0	0	0	0	0	0	0
Suffolk	12	10,500	2,200	17,500	4,600	72	335
Subtotal	12	10,500	2,200	17,500	4,600	72	335
GRAND TOTAL	405	1,988,000	251,600	528,300	425,400	11,001	14,726

Appendix C

Feed and Fertilizer Firms: Inshipments By Region

Table C 1
READY MIXED FEED RECEIPTS BY REGION
New York, 1979

ORIGIN	1 S. W. N. Y.	2 West N. Y.	3 Cent. N. Y.	4 East N. Y.	5 North N. Y.	6 N. E. N. Y.	7 S. Cent. N. Y.	8 Hudson Valley NY	9 L. I. N. Y.	TOTAL
NEW YORK	145	17,380	10,015	0	10,186	0	2,800	0	0	40,526
VERMONT	0	0	0	1,200	900	2,000	3,100	0	0	7,200
PENNSYLVANIA	0	0	35	0	0	0	600	0	0	635
MISSOURI	0	0	200	250	0	0	0	0	0	450
MINNESOTA	0	0	0	0	0	0	120	0	0	120
TOTAL 1/	145	17,380	10,250	1,450	11,086	2,000	6,620	0	0	48,931
Other 2/	0	0	0	0	0	0	0	0	0	0
Grand Total	145	17,380	10,250	1,450	11,086	2,000	6,620	0	0	48,931

1/ With a known origin and mode of transportation.

2/ Unknown origin or mode of transportation.

Table C 2
CORN RECEIPTS BY REGION
New York, 1979

ORIGIN	1 S. W. N. Y.	2 West N. Y.	3 Cent. N. Y.	4 East N. Y.	5 North N. Y.	6 N. E. N. Y.	7 S. Cent. N. Y.	8 Hudson Valley NY	9 L. I. N. Y.	TOTAL
NEW YORK	29,188	137,657	95,405	62,627	49,498	0	98,741	38,318	0	511,434
OHIO	3,128	4,205	3,040	10,502	3,332	8,000	13,770	1,190	0	47,167
MIDWEST	0	0	11,160	8,040	0	0	8,050	12,210	0	39,460
PENNSYLVANIA	1,000	0	0	0	0	0	0	13,356	0	14,356
MICHIGAN	0	0	0	7,200	0	0	0	0	0	7,200
OTHER	0	0	5,000	0	0	0	0	0	0	5,000
TOTAL 1/	33,316	141,862	114,605	88,369	52,830	8,000	120,561	65,074	0	624,617
Other 2/	1,564	2,104	1,210	24,651	16,666	0	22,756	596	0	69,547
Grand Total	34,880	143,966	115,815	113,020	69,496	8,000	143,317	65,670	0	694,164

1/ With a known origin and mode of transportation.

2/ Unknown origin or mode of transportation.

Table C 3
OATS RECEIPTS BY REGION
New York, 1979

ORIGIN	1 S. W. N. Y.	2 West N. Y.	3 Cent. N. Y.	4 East N. Y.	5 North N. Y.	6 N. E. N. Y.	7 S. Cent. N. Y.	8 Hudson Valley NY	9 L. I. N. Y.	TOTAL
NEW YORK	1,600	8,989	7,189	0	5,697	0	9,488	2,867	0	35,830
CANADA	0	0	0	0	500	0	11,760	0	0	12,260
MICHIGAN	0	1,816	350	1,800	0	0	639	0	0	4,605
MAINE	0	0	8	0	0	0	2,039	0	0	2,047
OHIO	0	192	0	1,200	0	0	0	0	0	1,392
IOWA	500	0	0	0	0	0	0	0	0	500
PENNSYLVANIA	0	0	0	0	0	0	0	182	0	182
ILLINOIS	0	0	0	0	72	0	0	0	0	72
TOTAL 1/	2,100	10,997	7,547	3,000	6,269	0	23,926	3,049	0	56,888
Other 2/	0	0	0	0	0	0	404	0	0	404
Grand Total	2,100	10,997	7,547	3,000	6,269	0	24,330	3,049	0	57,292

1/ With a known origin and mode of transportation.

2/ Unknown origin or mode of transportation.

Table C 4
OTHER GRAIN RECEIPTS BY REGION
New York, 1979

ORIGIN	1 S. W. N. Y.	2 West N. Y.	3 Cent. N. Y.	4 East N. Y.	5 North N. Y.	6 N. E. N. Y.	7 S. Cent. N. Y.	8 Hudson Valley NY	9 L. I. N. Y.	TOTAL
NEW YORK	700	57,976	2,600	4,500	0	0	1,200	0	0	66,976
MINNESOTA	0	66,633	0	0	0	0	0	0	0	66,633
U.S. - OTHER	0	0	24,000	0	0	0	8,375	0	0	32,375
MIDWEST	0	0	0	6,000	0	0	100	0	0	6,100
ILLINOIS	0	800	0	0	0	0	0	0	0	800
OHIO	0	0	700	0	0	0	0	0	0	700
CANADA	0	0	0	0	300	0	375	0	0	675
PENNSYLVANIA	0	0	0	0	0	0	0	200	0	200
TOTAL 1/	700	125,409	27,300	10,500	300	0	10,050	200	0	174,459
Other 2/	13,800	20,070	10,500	30,450	14,700	0	34,387	5,250	0	129,157
Grand Total	14,500	145,479	37,800	40,950	15,000	0	44,437	5,450	0	303,616

1/ With a known origin and mode of transportation.

2/ Unknown origin or mode of transportation.

Table C 5
SOYBEAN MEAL RECEIPTS BY REGION
New York, 1979

ORIGIN	1 S. W. N. Y.	2 West N. Y.	3 Cent. N. Y.	4 East N. Y.	5 North N. Y.	6 N. E. N. Y.	7 S. Cent. N. Y.	8 Hudson Valley NY	9 L. I. N. Y.	TOTAL
ILLINOIS	9,461	11,287	10,861	17,945	18,243	52,612	28,605	4,144	0	153,158
INDIANA	7,887	10,843	6,566	21,917	8,408	5,845	27,588	5,485	0	94,539
OHIO	1,000	7,048	2,621	0	1,070	4,000	5,650	4,038	0	25,427
MIDWEST	0	0	0	0	950	0	0	4,400	0	5,350
MICHIGAN	0	0	0	3,000	0	0	0	0	0	3,000
OTHER	0	0	1,920	0	0	0	0	0	0	1,920
MARYLAND	0	0	0	0	0	0	0	450	0	450
NEW YORK	0	102	0	0	0	0	0	0	0	102
TOTAL 1/	18,348	29,280	21,968	42,862	28,671	62,457	61,843	18,517	0	283,946
Other 2/	7,887	10,614	6,006	22,418	14,409	0	28,813	5,803	0	95,950
Grand Total	26,235	39,894	27,974	65,280	43,080	62,457	90,656	24,320	0	379,896

1/ With a known origin and mode of transportation.

2/ Unknown origin or mode of transportation.

Table C 6
DISTILLER'S GRAIN RECEIPTS BY REGION
New York, 1979

ORIGIN	1 S. W. N. Y.	2 West N. Y.	3 Cent. N. Y.	4 East N. Y.	5 North N. Y.	6 N. E. N. Y.	7 S. Cent. N. Y.	8 Hudson Valley NY	9 L. I. N. Y.	TOTAL
NEW YORK	3,312	4,454	2,520	7,308	3,528	0	12,678	1,260	0	35,060
MISSOURI	1,656	2,226	1,260	3,654	1,764	0	4,113	630	0	15,303
KENTUCKY	0	1,700	4,545	2,250	950	0	4,655	798	0	14,898
INDIANA	1,020	187	1,908	0	1,240	0	6,229	2,302	0	12,886
CANADA	87	1,100	140	0	1,900	0	5,200	0	0	8,427
IOWA	0	0	725	0	0	5,000	0	0	0	5,725
ILLINOIS	1,262	33	1,190	0	450	0	0	1,000	0	3,935
MARYLAND	0	500	0	750	0	0	0	960	0	2,210
ALL	0	0	0	0	0	0	585	0	0	585
ONTARIO	0	200	0	0	0	0	0	0	0	200
TOTAL 1/	7,337	10,400	12,288	13,962	9,832	5,000	33,460	6,950	0	99,229
Other 2/	553	743	482	4,718	7,588	0	9,165	210	0	23,459
Grand Total	7,890	11,143	12,770	18,680	17,420	5,000	42,625	7,160	0	122,688

1/ With a known origin and mode of transportation.

2/ Unknown origin or mode of transportation.

Table C 7
OTHER FEED INGREDIENT RECEIPTS BY REGION
New York, 1979

ORIGIN	1 S. W. N. Y.	2 West N. Y.	3 Cent. N. Y.	4 East N. Y.	5 North N. Y.	6 N. E. N. Y.	7 S. Cent. N. Y.	8 Hudson Valley NY	9 L. I. N. Y.	TOTAL
INDIANA	8,740	11,781	7,200	19,285	9,310	0	21,715	3,325	0	81,356
NEW YORK	1,080	281	7,898	0	3,080	21,000	31,452	8,440	0	73,231
ILLINOIS	6,856	5,220	3,500	7,714	5,121	0	13,610	1,930	0	43,951
MIDWEST	360	0	7,160	0	0	0	6,900	0	0	14,420
CANADA	0	5,000	694	0	0	0	0	0	0	5,694
NORTHEAST	0	0	0	0	0	0	360	5,000	0	5,360
OHIO	0	5,000	0	0	0	0	0	0	0	5,000
OTHER	0	0	0	0	600	0	800	0	0	1,400
NEW JERSEY	0	0	0	0	0	0	0	1,260	0	1,260
TOTAL 1/	17,036	27,282	26,452	26,999	18,111	21,000	74,837	19,955	0	231,672
Other 2/	5,244	7,072	5,358	33,571	36,064	0	59,409	10,995	0	157,713
Grand Total	22,280	34,354	31,810	60,570	54,175	21,000	134,246	30,950	0	389,385

1/ With a known origin and mode of transportation.

2/ Unknown origin or mode of transportation.

Table C 8
READY MIXED FERTILIZER RECEIPTS BY REGION
New York, 1979

ORIGIN	1 S. W. N. Y.	2 West N. Y.	3 Cent. N. Y.	4 East N. Y.	5 North N. Y.	6 N. E. N. Y.	7 S. Cent. N. Y.	8 Hudson Valley NY	9 L. I. N. Y.	TOTAL
NEW YORK	6,009	16,697	5,407	2,846	1,675	0	7,832	441	830	41,737
ALL OVER	0	5,000	0	0	0	0	0	0	0	5,000
ALABAMA	0	1,200	1,800	0	0	0	0	50	0	3,050
TEXAS	0	0	0	0	0	0	1,200	0	0	1,200
PENNSYLVANIA	0	0	0	0	0	0	240	950	0	1,190
CANADA	550	320	0	0	96	0	0	0	0	966
MARYLAND	0	20	0	0	0	0	0	480	0	500
WISCONSIN	0	300	0	0	0	0	0	0	0	300
ONTARIO	0	300	0	0	0	0	0	0	0	300
NEW JERSEY	0	0	0	0	0	0	0	120	0	120
NORTHEAST	0	97	0	0	0	0	0	0	0	97
GEORGIA	0	52	0	0	0	0	0	0	0	52
TOTAL 1/	6,559	23,986	7,207	2,846	1,771	0	9,272	2,041	830	54,512
Other 2/	0	1,001	200	0	0	0	0	0	0	1,201
Grand Total	6,559	24,987	7,407	2,846	1,771	0	9,272	2,041	830	55,713

1/ With a known origin and mode of transportation.

2/ Unknown origin or mode of transportation.

Table C 9
NITROGEN MATERIAL RECEIPTS BY REGION
New York, 1979

ORIGIN	1 S. W. N. Y.	2 West N. Y.	3 Cent. N. Y.	4 East N. Y.	5 North N. Y.	6 N. E. N. Y.	7 S. Cent. N. Y.	8 Hudson Valley NY	9 L. I. N. Y.	TOTAL
NEW YORK	18,180	16,363	3,974	9,389	862	0	7,333	1,696	2,741	60,538
OHIO	10,908	7,636	1,763	5,633	487	0	3,769	873	1,644	32,713
FLORIDA	0	4,950	0	0	0	0	0	0	0	4,950
MARYLAND	0	600	1,600	660	0	0	2,000	0	0	4,860
PENNSYLVANIA	0	2,240	0	0	0	0	0	1,410	0	3,650
VIRGINIA	0	707	1,404	0	0	0	0	0	0	2,111
ONTARIO	0	2,000	0	0	0	0	0	0	0	2,000
CANADA	0	1,481	97	0	0	0	0	0	0	1,578
ALL OVER	0	560	0	0	0	0	0	0	0	560
LOUISIANA	0	250	100	0	0	0	0	0	0	350
TENNESSEE	0	0	0	0	0	0	0	0	240	240
NORTH CAROLINA	0	50	0	0	0	0	0	0	0	50
DELEWARE	0	0	0	0	0	0	0	50	0	50
TOTAL 1/	29,088	36,837	8,938	15,682	1,349	0	13,102	4,029	4,625	113,650
Other 2/	7,273	7,618	1,178	3,757	326	0	2,516	584	1,098	24,350
Grand Total	36,361	44,455	10,116	19,439	1,675	0	15,618	4,613	5,723	138,000

1/ With a known origin and mode of transportation.

2/ Unknown origin or mode of transportation.

Table C 10
PHOSPHATE MATERIAL RECEIPTS BY REGION
New York, 1979

ORIGIN	1 S. W. N. Y.	2 West N. Y.	3 Cent. N. Y.	4 East N. Y.	5 North N. Y.	6 N. E. N. Y.	7 S. Cent. N. Y.	8 Hudson Valley NY	9 L. I. N. Y.	TOTAL
FLORIDA	34,542	36,047	6,233	17,839	1,543	0	11,938	2,766	5,208	116,116
MARYLAND	0	6,900	1,200	2,200	0	0	2,500	0	0	12,800
ONTARIO	1,818	1,270	293	937	81	0	627	145	274	5,445
VIRGINIA	0	770	0	0	0	0	1,360	1,500	0	3,630
NEW YORK	0	430	60	0	0	0	340	0	0	830
NEW JERSEY	0	0	648	0	0	0	0	0	0	648
NORTH CAROLINA	0	640	0	0	0	0	0	0	0	640
LOUISIANA	0	120	0	0	0	0	350	0	0	470
MICHIGAN	0	0	0	0	0	0	0	0	300	300
ALABAMA	0	180	0	0	0	0	0	0	180	180
TOTAL 1/	36,360	46,357	8,434	20,976	1,624	0	17,115	4,411	5,782	141,059
Other 2/	0	606	0	3	0	0	3	0	0	612
Grand Total	36,360	46,963	8,434	20,979	1,624	0	17,118	4,411	5,782	141,671

1/ With a known origin and mode of transportation.

2/ Unknown origin or mode of transportation.

Table C 11
POTASH MATERIAL RECEIPTS BY REGION
New York, 1979

ORIGIN	1 S. W. N. Y.	2 West N. Y.	3 Cent. N. Y.	4 East N. Y.	5 North N. Y.	6 N. E. N. Y.	7 S. Cent. N. Y.	8 Hudson Valley NY	9 L. I. N. Y.	TOTAL
SASKATCHEWAN	29,088	23,769	5,791	15,023	1,300	0	10,054	2,330	4,636	91,991
NEW MEXICO	7,272	5,270	1,175	3,755	325	0	2,512	582	1,096	21,987
CANADA	0	16,247	0	0	0	0	1,300	0	0	17,547
NEW YORK	0	5,100	1,060	1,650	0	0	3,000	2,500	0	13,310
CONNECTICUT	0	0	272	0	0	0	0	0	0	272
TOTAL 1/	36,360	50,386	8,298	20,428	1,625	0	16,866	5,412	5,732	145,107
Other 2/	0	204	0	0	0	0	0	0	0	204
Grand Total	36,360	50,590	8,298	20,428	1,625	0	16,866	5,412	5,732	145,311

1/ With a known origin and mode of transportation.

2/ Unknown origin or mode of transportation.

Table C 12
LIME RECEIPTS BY REGION
New York, 1979

ORIGIN	1 S. W. N. Y.	2 West N. Y.	3 Cent. N. Y.	4 East N. Y.	5 North N. Y.	6 N. E. N. Y.	7 S. Cent. N. Y.	8 Hudson Valley NY	9 L. I. N. Y.	TOTAL
PENNSYLVANIA	0	7,247	38	3	1,820	0	12,713	4,167	0	25,988
NEW YORK	0	2,497	2,525	2	1,213	0	14,722	3,778	0	24,737
CONNECTICUT	0	0	0	0	0	0	350	1,500	0	1,850
NEW JERSEY	0	0	0	0	0	0	136	800	0	936
UNKNOWN	0	60	0	0	0	0	0	0	0	60
MASSACHUSETTS	0	0	0	0	0	0	10	0	0	10
TOTAL 1/	0	9,804	2,563	5	3,033	0	27,931	10,245	0	53,581
Other 2/	0	3,750	65	8	3,034	0	16,212	6,947	0	30,016
Grand Total	0	13,554	2,628	13	6,067	0	44,143	17,192	0	83,597

1/ With a known origin and mode of transportation.

2/ Unknown origin or mode of transportation.

Appendix D

Projection Information

Table D1. Equation Estimates for Livestock (1,000 Animals), Crops (1,000 Acres) and Fertilizer (1,000 Tons), New York State

Item	a	b_1 [1/]	b_2 [1/]	b_3	R^2	F-Statistic
Livestock (1,000)						
Milk Cows	6543	1.023 (3.120)	-3.115 (-0.729)	-0.447 (-1.250)	.84	10.5
Other Cattle	-516	0.673 (2.462)	0.407 (0.069)		.49	3.8
Chickens-Eggs	-111,962	0.970 (2.796)	56.718 (0.357)		.80	37.4
Chickens-Broilers	338,289	0.085 (0.196)	-170.722 (-1.855)		.92	46.9
Hogs & Pigs	-7118	0.395 (1.679)	3.639 (3.152)		.89	31.8
Sheep and Lambs	5058	0.489 (1.619)	-2.541 (-1.647)		.95	79.0
Crops (1,000 Acres)						
Corn for Grain	-86,197	-0.100 (-0.291)	43.931 (3.000)		.92	44.6
Corn for Silage	-44,191	0.539 (1.496)	22.653 (1.029)		.93	49.4
Wheat	-2,361	0.128 (0.378)	1.267 (0.303)		.03	0.1
Oats	6,189	0.377 (1.173)	-3.022 (-1.100)		.45	3.3
Hay	-21,338	0.498 (3.202)	11.403 (2.524)		.65	7.4
Fresh Vegetables	-648	0.312 (1.281)	0.352 (1.900)		.47	3.6
Processed Vegetables	-504	0.239 (0.592)	0.289 (0.500)		.14	0.7
Fertilizer (1,000 Tons)						
All Fertilizer	-4980	0.503 (1.279)	2.679 (0.785)		.20	0.9
Nutrients						
Nitrogen	-3468	0.392 (1.030)	1.783 (1.750)		.67	8.2
Phosphate	121	0.426 (1.387)	-0.040 (-0.053)		.25	1.3
Potash	-2565	-0.194 (-0.532)	1.345 (2.063)		.38	2.5

1/ Numbers in parentheses are T-statistics.

Table D2. Projected Number of Livestock (1,000 Animals) Crop Acreage (1,000 Acres) and Fertilizer Utilization (1,000 Tons), New York, 1979-90

Year	Milk Cows	Other Cattle	Chickens Eggs	Chickens Broilers	Hogs & Pigs	Sheep & Lambs
1979	905*	807*	10,200*	480*	139*	63*
1980	911*	868*	10,500*	570*	175*	65*
1981	901	875	10,578	137	145	69*
1982	882	880	10,710	0	151	51
1983	886	884	10,895	0	157	44
1984	854	887	11,131	0	163	39
1985	846	889	11,416	0	169	34
1986	840	891	11,750	0	175	29
1987	834	893	12,130	0	181	24
1988	827	895	12,555	0	187	19
1989	821	896	13,024	0	193	14
1990	814	897	13,535	0	199	9

Year	Corn for Grain	Corn for Silage	Wheat	Oats	Hay	Vegetables (Fresh)
1979	650*	625*	170*	330*	2450*	69*
1980	730*	600*	160*	320*	2430*	69*
1981	759	643	170	323	2462	71
1982	800	663	172	321	2489	71
1983	839	680	174	317	2514	72
1984	879	692	175	313	2537	72
1985	919	704	177	308	2561	73
1986	959	714	178	303	2584	74
1987	999	723	180	298	2606	74
1988	1039	733	181	294	2629	75
1989	1079	742	182	289	2652	75
1990	1119	752	184	284	2675	76

Year	Vegetable Processing	All Fertilizer	Nitrogen	Phosphate	Potash
1979	89*	686*	108*	90*	95*
1980	83*	682*	107*	82*	90*
1981	88	671	106	81	82
1982	90	668	108	81	85
1983	90	669	110	80	86
1984	91	672	113	80	87
1985	91	676	115	80	88
1986	92	681	118	80	89
1987	92	686	121	80	91
1988	92	692	124	80	92
1989	93	697	127	80	93
1990	93	702	130	80	94

*Actual data

Table D3. Livestock Numbers, Crop Acreages and Fertilizer Utilization By Region, Percentage Distribution in 1978 and Change in Distribution Between 1969 and 1978, New York.

Region	Milk Cows		Other Cattle		Chickens--Eggs		Chickens-Broilers	
	Percent	Percent Change 69-78	Percent	Percent Change 69-78	Percent	Percent Change 69-78	Percent	Percent Change 69-78
Southwestern, NY	8.50	0.13	8.60	-0.03	2.82	0.07	0.99	-2.78
Western, NY	15.95	0.77	17.40	0.26	28.36	9.33	1.34	-4.86
Central, NY	16.40	0.05	16.11	0.44	7.21	-1.11	0.71	-0.17
Eastern, NY	13.52	-0.09	13.34	0.21	2.80	-6.55	0.08	-5.94
Northern, NY	16.50	0.68	15.17	0.24	1.26	-1.27	0.17	0.15
Northeastern, NY	2.88	-0.17	2.84	-0.14	0.05	- .90	0.00	0.00
South Central, NY	21.97	0.47	21.68	0.81	21.82	6.18	0.54	-27.04
Lower Hudson Valley	4.24	-1.76	4.81	-1.73	35.22	-5.58	0.29	-16.47
Long Island	0.04	-0.08	0.05	-0.06	0.46	-0.17	95.88	57.11
TOTAL	100.00	0.00	100.00	0.00	100.00	0.00	100.00	00.00

Region	Hogs & Pigs		Sheep & Lambs		Corn for Grain		Corn for Silage	
	Percent	Percent Change 69-78	Percent	Percent Change 69-78	Percent	Percent Change 69-78	Percent	Percent Change 69-78
Southwestern, NY	8.66	2.14	7.14	-1.83	2.88	0.14	7.62	1.00
Western, NY	49.58	-1.75	48.42	2.01	49.98	3.50	19.53	0.51
Central, NY	12.74	1.01	4.89	-0.41	22.23	-0.41	15.83	-0.37
Eastern, NY	7.00	0.12	10.66	1.81	8.42	-2.33	15.04	-2.20
Northern, NY	5.02	0.60	3.11	1.13	2.24	-0.11	14.53	3.18
Northeastern, NY	1.08	-0.47	0.54	-0.25	0.18	-0.17	3.29	0.43
South Central, NY	9.92	0.50	20.22	-2.90	11.12	-0.15	19.53	-0.02
Lower Hudson Valley	5.72	-0.10	4.91	0.57	2.91	-0.29	4.63	-2.40
Long Island	0.28	-2.05	0.11	-0.13	0.04	-0.18	0.00	-0.13
TOTAL	100.00	0.00	100.00	0.00	100.00	0.00	100.00	0.00

Region	Wheat		Oats		Hay		Fertilizer	
	Percent	Percent Change 69-78	Percent	Percent Change 69-78	Percent	Percent Change 69-78	Percent	Percent Change 69-78
Southwestern, NY	0.80	-0.46	5.38	-2.13	8.76	0.33	5.20	-0.12
Western, NY	68.81	-4.70	42.80	9.58	16.23	0.29	37.55	4.16
Central, NY	16.84	4.80	19.06	-0.67	14.57	0.54	15.64	2.11
Eastern, NY	1.87	-1.31	5.01	-1.95	15.13	0.67	9.90	0.54
Northern, NY	0.63	-0.17	6.72	-5.17	16.53	-0.73	7.11	1.33
Northeastern, NY	1.62	1.13	0.50	-0.10	2.92	-0.37	1.48	0.21
South Central, NY	7.86	0.14	19.91	0.56	21.44	0.23	5.07	-1.36
Lower Hudson Valley	0.36	-0.12	0.56	-0.16	4.40	-0.93	13.78	-0.31
Long Island	1.21	0.69	0.06	0.04	0.02	-0.03	4.27	-6.56
TOTAL	100.00	0.00	100.00	0.00	100.00	0.00	100.00	0.00

Table D4. Projected Utilization of Feed Ingredients (1,000 Ton), New York, 1979-1990.

Year	Corn Products	Soybean Meal	Distillers Grains	Other Feed Ingredients	Molasses	Vitamins & Minerals	Total
1979	929	334	191	1242	100	390	3186
1980	962	341	193	1277	103	412	3288
1981	951	337	190	1269	103	413	3264
1982	947	332	187	1254	102	413	3234
1983	945	329	183	1241	101	414	3214
1984	946	327	181	1232	101	416	3202
1985	951	327	179	1226	100	417	3200
1986	958	327	177	1222	100	419	3204
1987	966	327	176	1219	100	421	3209
1988	974	328	175	1214	99	423	3214
1989	984	328	174	1210	99	426	3221
1990	995	329	172	1205	99	428	3228

Table D5. Projected Utilization of Feed Ingredients (1,000 Tons) by Region for 1985 and 1990, New York

1985

Region	Corn Products	Soybean Meal	Distillers Grain	Other Feed Ingredients	Molasses	Vitamins & Minerals	Total
Southwestern NY	67	25	15	104	9	32	252
Western NY	221	67	30	216	17	83	634
Central NY	127	48	29	199	16	63	482
Eastern NY	88	36	24	161	14	48	371
Northern NY	108	45	31	197	16	56	453
Northeastern NY	18	7	5	32	3	10	75
South Central NY	217	74	40	273	22	95	721
Lower Hudson Valley	104	25	5	44	3	30	211
Long Island	1	0	0	0	0	0	1
Total	951	327	178	1228	100	417	3200

1990

Region	Corn Products	Soybean Meal	Distillers Grain	Other Feed Ingredients	Molasses	Vitamins & Minerals	Total
Southwestern NY	68	25	15	103	9	33	253
Western NY	253	72	29	218	17	90	679
Central NY	127	47	28	196	16	63	477
Eastern NY	87	35	23	157	13	48	363
Northern NY	107	45	30	195	16	57	450
Northeastern NY	16	7	5	30	3	9	70
South Central NY	236	77	39	273	23	101	749
Lower Hudson Valley	100	21	3	33	2	27	186
Long Island	1	0	0	0	0	0	1
Total	995	329	172	1205	99	428	3228

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