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STATISTICAL SUMMARY OF THE 1987 FARM MANAGEMENT AND ENERGY SURVEY

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by

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Abstract

The 1987 Farm Management and Energy Survey was conducted to assemble a comprehensive data set of the structure, production, and use of electricity by farms in Upstate New York. A stratified random sample design was used to obtain a representative sample of farms with gross receipts of $10,000 or more. Data on farm size and structure are presented to illustrate the diversity of Upstate New York agriculture. Relationships between agricultural production and electricity use are also discussed.

* Research support specialist and associate professor, respectively, in the Department of Agricultural Economics at Cornell University. This research was supported with funds from the Niagara Mohawk Power Corporation. Paul Bascum, Warren Myers, Bernard Neenan and Bernard Stanton made helpful comments on an earlier draft of this report.

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Introduction

Researchers at Cornell University have studied the relationships between production agriculture and farm electrical use since the 1920s. Concerns with the economic viability of farming regions and the provision of electric power in rural communities generated much of the early research. In the 1980s, changing commodity prices, new government programs, adjustments in supply/demand relationships, and new prospects for the adoption of technology have again focused attention on farm viability and patterns of energy use in New York agriculture. To improve understanding of these issues, the Department of Agricultural Economics and the Department of Agricultural Engineering at Cornell University initiated the research project "Future Directions for the Upstate New York Agricultural Economy with Special Reference to the Potential for Electrical Energy Conservation". The project is supported by the Niagara Mohawk Power Corporation.

A major survey of agricultural producers was conducted to assemble data needed for the project. The purpose of this report is to describe the survey sample design employed and to present a detailed summary of the 1987 Farm Management and Energy Survey. The survey provides a comprehensive view of commercial farming in Upstate New York and the electric-powered appliances and equipment used in farm households and farm businesses. Development of a survey design was an iterative process involving the Cornell project study group, Niagara Mohawk personnel, and the New York Agricultural Statistics Service (formerly the New York Crop Reporting Service). The basic ideas for the survey and sample design were to:

(1) Draw probability samples from a list frame of agricultural producers in Upstate New York;

(2) Stratify the sample with strata based on type of farm enterprise and annual gross agricultural receipts; geographic location was also controlled for dairy producers, the largest single segment of the New York farm sector;

(3) Conduct on-farm personal interviews to collect the needed information.

The remainder of this report is divided into three major sections. The first provides a description of the survey and sample design. The second and third sections concentrate on the survey results. Farm production and financial information are covered in the second section. Farm and household electrical equipment and patterns of electrical use are detailed in the final section.

Definition of the Sample Universe

Very substantial amounts of data are assembled for the farm sector on a continuing basis by Federal and state agencies. To enhance the overall value of this survey effort, conventions used in companion data collection

efforts were used to the extent practicable. Departures from these general conventions are noted here; they were used for the purpose of this study to increase the integrity of the sample design and maintain respondent burden at a reasonable level.

In this study, a farm is defined as a place from which $10,000 or more of agricultural products were sold during the 1986 calendar year.[1] Places with agricultural sales which total less than $10,000 were eliminated because it was decided that their behavior was probably more typical of residential consumers of electric power. The agricultural enterprises on these small farms are a very minor part of New York State agricultural production (table 1). Data were further confined to farms located in Upstate New York. This approach excludes farms located on Long Island, New York City, and in Rockland, Putnam and Westchester Counties (figure 1). These definitions of the sample universe excluded a large number of farms (48 percent of New York State's total). However, the excluded farms account for only about 10 percent of the sector electrical expense and 7 percent of the sector gross receipts (table 1).

Table 1. Comparison of survey farm universe with all New York State farms, 1982

	New York State	Upstate New York	Survey farm universe[a]
Number of farms	42,207	41,009	21,770
Total farmland (acres)	9,189,559	9,123,783	7,259,597
Harvested cropland (acres)	4,430,198	4,378,234	3,872,517
Value of sales ($1,000)	2,426,936	2,318,474	2,262,569
Electrical expense ($1,000)	56,685	54,759	51,159

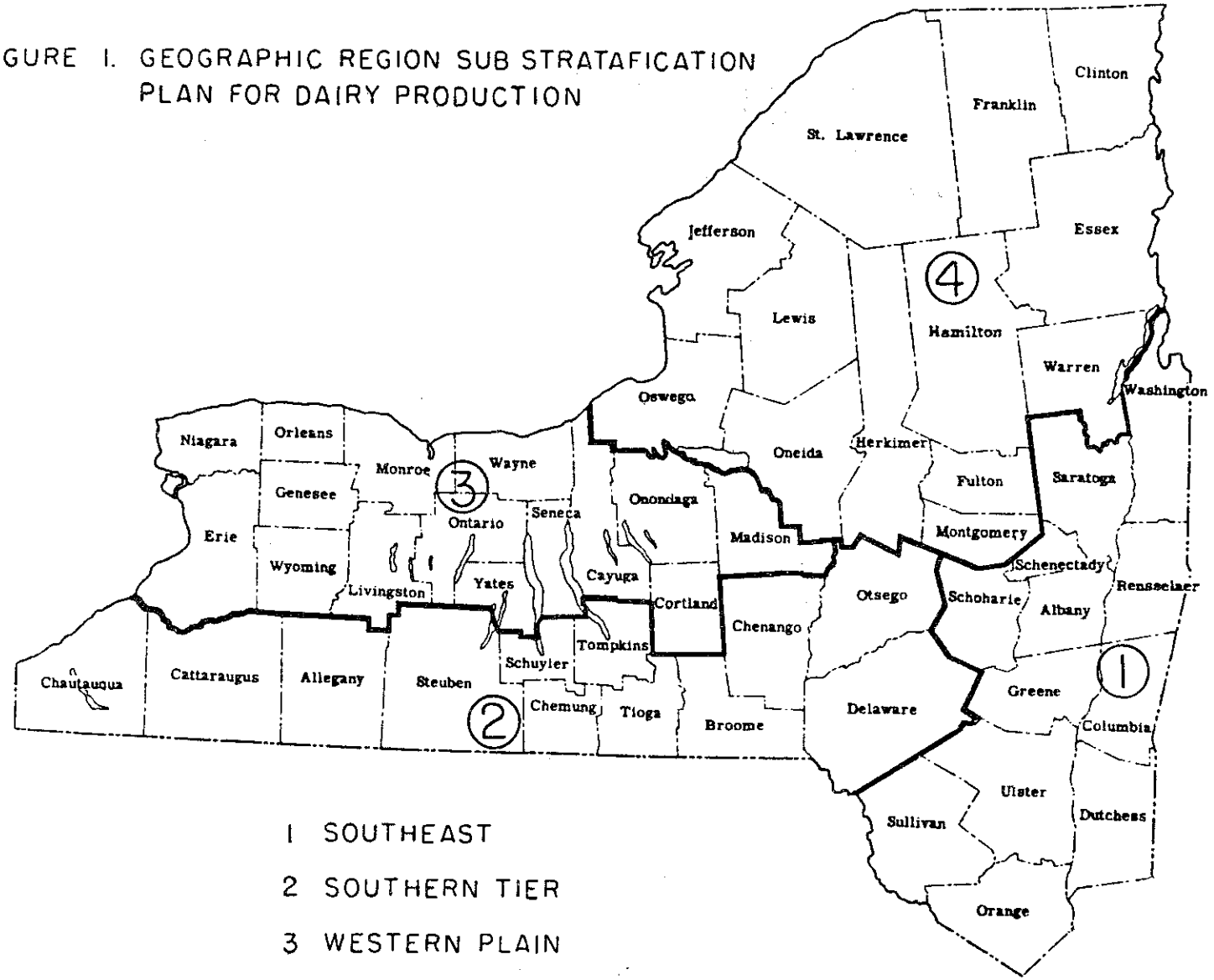
[a] The survey farm universe was estimated, based on Census data, for farms with $10,000 or more in gross agricultural receipts in 1982, and located in Upstate New York (Figure 1).

Source: 1982 Census of Agriculture.

Regardless of total product sales on the farm, production information was only enumerated for farm enterprises (such as dairy, vegetable, fruit, poultry, or other livestock) which generated at least $1,000 of cash sales for the 1986 calendar year. Accounting for these trivial enterprises would have complicated the on-site interview but would have added little precision to the planned research. A modification of this sample definition was made for field crop enterprises. Production information was enumerated for all farms having produced field crops valued at $1,000 or more for the 1986 calendar year. The value of field crops was used because of the large number of livestock farms with substantial field crop enterprises but little or no cash sales.

[1] The U.S. Bureau of the Census defines a farm as any place from which $1,000 or more of sales of agricultural products were made for the census year.

FIGURE 1. GEOGRAPHIC REGION SUB STRATAFICATION PLAN FOR DAIRY PRODUCTION



1 SOUTHEAST

2 SOUTHERN TIER

3 WESTERN PLAIN

4 NORTHERN

Objectives for the Survey Instrument

The project study group required diverse and relatively extensive data to complete their modeling objectives. These requirements could best be met with an on-site enumerative survey procedure. Average interview time was approximately 105 minutes per farm. Respondent burden was the greatest for highly diversified and/or large farms. A pretest was conducted in January 1987 to refine the survey instrument and provide an estimate of per unit interview costs. Enumerator training was completed in March and data were collected in April through May 1987.

The survey instrument was structured around the following study objectives:

(1) Assemble an inventory of energy-using appliances and equipment on Upstate farms and in the farm household, emphasizing the use and patterns of use of electrical energy.

(2) Collect information on farm structure, including standard measures of production and patterns of capital investment.

(3) Collect information on the socio-economic and demographic characteristics of Upstate farm households, including the utilization of family labor on farms, and off-farm sources of income for the farm family.

(4) Collect information to evaluate commercial farmer responses to the use of evolving production technologies, particularly those which will affect New York farm structure and electrical energy use, and the incentives which affect adoption decisions.

(5) Provide geographical referencing of a subsample of farms.

A copy of the survey instrument is included in Appendix A. A detailed description of the sample design employed in this study is included in Appendix B.

Summary of Production and Financial Data

A summary of production and financial information gathered from the survey is presented in this section. All calculations to create the tables incorporate the weight assigned to each survey record. Thus, the results are estimates for Upstate New York farms with $10,000 or more of gross receipts for the 1986 calendar year.

Farm Demographics

Extensive production and financial data were collected in the 1987 Farm Management and Energy Survey (tables 2-22). The data are disaggregated by form of ownership, farm size, farm type, and distance to a city of 20,000 or more people. Average acreage, yields, and percent of farms

producing various crop and livestock commodities are reported. Highlights from the tabular data are presented in the text.

Over 75 percent of Upstate farm operations are owned by individuals (table 2). Partnerships and corporations account for 17.2 and 6.7 percent, respectively, of all farms. As expected, farms organized as partnerships or corporations are larger, on average, than farms owned by individuals. Corporations operate an average of 669 acres of farmland. Partnerships and individually owned farms operate 518 and 336 acres of farmland, respectively. Other size measures, such as cropland operated, gross receipts, and value of total assets follow a similar trend. Individually operated farms utilize 60 percent of their farmland as cropland, as compared to 68 percent for partnerships and 74 percent for corporations. Nonfarm income and debt/asset ratios were similar, on average, across all forms of ownership. Corporations averaged nearly $50,000 in net cash farm income. Partnerships and individually owned farms earned $29,042 and $15,618 of net cash farm income, respectively.

Average age of the primary farm operator was 49 years. Almost 33 percent of the primary operators were 55 years or older (table 3). Less than 15 percent of the primary operators were under 35 years. Primary operators over 35 owned and operated more farmland on average than did

Table 2. Summary statistics by form of ownership, Upstate New York, 1986

Item	Unit	Individual	Partnership	Corporation or limited partnership
Percent of farms	Percent	75.6	17.2	6.7
			--- Per farm ---	
Total farmland	Acres	336	518	669
Owned	Acres	252	353	466
Rented from others	Acres	86	167	206
Total cropland	Acres	202	354	495
Total electric exp.	Dollars	3,296	4,965	6,933
Gross farm receipts	Dollars	103,087	180,369	316,544
Net cash farm income	Dollars	15,618	29,042	49,404
Nonfarm income	Dollars	7,158	7,991	7,718
Total assets	Dollars	370,088	556,301	1,085,200
Debt/asset ratio	Percent	.22	.22	.20
On-farm investment:				
1985	Dollars	7,133	16,332	24,774
1986	Dollars	8,212	18,098	29,875

those under 35 years. Net cash farm income, nonfarm income, and total assets follow the same pattern as farmland. However, gross farm receipts were similar across all age groups. Debt/asset ratios were higher (over 30 percent) on farms where the primary operator was under 45 years. In contrast, those 55 or older reported that only 11 percent of their total assets were debt-financed. A similar pattern can be seen in farm investment, where operators under 45 are more typically making larger capital purchases, probably to expand the farm operation.

Table 3. Summary statistics by age of primary operator, Upstate New York, 1986

Item	Unit	Age of principal operator			
		Under 35	35-44	45-54	55 or over
Percent of farms	Percent	14.6	24.1	28.4	32.9
			--- Per farm ---		
Total farmland	Acres	347	407	401	381
Owned	Acres	219	293	294	294
Rented from others	Acres	129	115	108	91
Total cropland	Acres	230	263	250	242
Total electric exp.	Dollars	4,167	4,197	3,528	3,593
Gross farm receipts	Dollars	130,296	138,220	126,574	129,315
Net cash farm income	Dollars	13,974	20,115	21,847	20,731
Nonfarm income	Dollars	5,522	7,618	8,350	7,145
Total assets	Dollars	368,387	446,890	439,048	498,505
Debt/asset ratio	Percent	.33	.31	.20	.11
On-farm investment:					
1985	Dollars	9,188	13,925	8,601	8,078
1986	Dollars	13,393	12,916	11,778	9,676

Over 70 percent of the farm operations surveyed had between $40,000 and $250,000 in gross farm receipts in the 1986 calendar year (table 4). Farms with $250,000 or more of gross receipts account for only 10 percent of the farm population, and farms with less than $40,000 gross make up the remaining 18 percent. Much of the data in table 4 are measures of farm size and, thus, reflect the dominance of the largest gross receipts category. However, on the basis of net cash farm income per acre, the largest farms still dominate, averaging $103 per acre. This contrasts with the other size categories with $86 per acre, $78 per acre, and $11 per acre for successively smaller size categories, respectively. Income for farms with less than $40,000 in gross receipts is dominated by nonfarm income, averaging $11,425 per farm.

Table 4. Summary statistics by total gross receipts from farming, Upstate New York, 1986

Item	Unit	Gross farm receipts $10,000-$39,999	$40,000-$99,999	$100,000-$249,999	$250,000 or more
Percent of farms	Percent	18.5	34.6	36.7	10.2
			--- Per farm ---		
Total farmland	Acres	205	298	444	884
Owned	Acres	167	233	316	569
Rented from others	Acres	42	66	129	317
Total cropland	Acres	115	164	286	671
Total electric exp.	Dollars	1,256	2,861	4,564	9,787
Gross farm receipts	Dollars	23,932	70,309	150,661	487,202
Net cash farm income	Dollars	1,290	12,757	24,639	69,234
Nonfarm income	Dollars	11,425	6,598	5,654	6,301
Total assets	Dollars	204,495	336,803	522,539	1,178,350
Debt/asset ratio	Percent	.10	.23	.25	.27
On-farm investment:					
1985	Dollars	2,885	3,214	11,783	43,382
1986	Dollars	4,314	5,722	13,626	43,580

Size of farm operation was also examined utilizing the physical measure of total acres of farmland operated. In table 5, 8 percent of the farms have less than 100 acres. They report the lowest net cash farm income and the highest nonfarm income of the size categories. However, the small farms have the largest net cash farm income per acre, averaging $205 per acre of cropland operated. Net cash farm income per acre decreases for each of the successively larger size categories, with $114, $89, and $63 per acre, respectively. Total assets per acre follow a similar, although more striking, pattern. Farms with less than 100 acres reported $10,635 of total assets per acre. In contrast, farms with more than 500 acres reported $1,516 of total assets per acre.

Survey respondents indicated that 57 percent of farms are more than 25 miles from the nearest city of at least 20,000 people (table 6). Eleven percent of farms are less than ten miles from such cities. Farms within five miles of a city reported the highest average gross receipts ($192,701) and net cash farm income ($22,617). Interestingly, these farms owned and operated the smallest farmland acreage on average of all the distance categories. Farm investment levels for 1985 and 1986 were similar across categories, as were debt/asset ratios.

Table 5. Summary statistics by area of farmland operated, Upstate New York, 1986

Item	Unit	Acres 1-99	100-249	250-499	500 or more
Percent of farms	Percent	8.1	27.4	42.0	22.5
			--- Per farm ---		
Total farmland	Acres	53	180	354	826
Owned	Acres	50	148	267	560
Rented from others	Acres	7	35	87	268
Total cropland	Acres	33	114	207	562
Total electric exp.	Dollars	1,643	2,481	3,616	6,465
Gross farm receipts	Dollars	73,504	72,172	111,610	257,783
Net cash farm income	Dollars	6,772	12,962	18,485	35,251
Nonfarm income	Dollars	13,783	6,877	6,454	7,014
Total assets	Dollars	350,965	296,072	361,911	852,191
Debt/asset ratio	Percent	.16	.15	.25	.24
On-farm investment:					
1985	Dollars	6,130	4,198	7,030	23,690
1986	Dollars	10,567	6,303	7,976	25,720

Crop and Livestock Production

Production of feed for livestock dominates New York field crop production. Dry hay, corn silage, and hay crop silage were the most frequent crops, with 83, 66, and 49 percent of the farms reporting harvested acreage (table 7). In contrast, less than 5 percent of the farms reported growing soybeans, barley, rye, or dry beans. Shelled corn grain was grown by 25 percent of farms and averaged 118 acres per farm. Dry hay and hay crop silage also averaged large acreage per farm with 94 and 84 acres, respectively. Rye and oats were the smallest acreage with less than 30 acres per farm on average.

Vegetables and fruit are high-valued crops but are grown on only a few farms (tables 8 and 9). These commodities were grown by less than 5 percent of all farms. Recall, however, that definitions used in this study eliminate small farms. Many fruit and vegetable producers operate farms with less than $10,000 in gross receipts. Sweet corn in New York was reported by 5 percent of the farms and averaged 54 acres per farm (table 8). This contrasts with only 0.4 percent of the farms reporting snap beans, with an average of 513 acres per farm. Apples and grapes were the most commonly grown fruits in New York with 3 and 2.4 percent of the farms reporting (table 9). Average acreage grown for the two crops was also

Table 6. Summary statistics by distance to a city with a population of 20,000 or more, Upstate New York, 1986

Item	Unit	Miles			
		Under 5	5-9	10-24	25 or more
Percent of farms	Percent	3.5	7.7	31.5	57.2
			--- Per farm ---		
Total farmland	Acres	304	417	370	400
Owned	Acres	232	272	274	292
Rented from others	Acres	72	146	98	109
Total cropland	Acres	219	291	249	242
Total electric exp.	Dollars	4,373	4,435	3,741	3,719
Gross farm receipts	Dollars	192,701	142,279	127,607	127,236
Net cash farm income	Dollars	22,617	21,722	19,064	19,880
Nonfarm income	Dollars	5,649	7,230	7,538	7,351
Total assets	Dollars	391,602	649,226	476,299	413,846
Debt/asset ratio	Percent	.23	.20	.21	.22
On-farm investment:					
1985	Dollars	9,837	10,281	10,734	9,216
1986	Dollars	13,165	12,902	10,826	11,772

Table 7. Field crop acreage and yield, Upstate New York, 1986

Field crop	Percent reporting	Average acres	Average yield	
			Amount	Units
Corn grain				
Shelled	25	118	105	bushels
Ear	21	38	98	bushels
Corn silage	66	50	14	tons
Oats	28	26	68	bushels
Wheat	12	49	47	bushels
Dry hay	83	94	2.6	tons
Hay crop silage	49	84	5.1	tons
Dry beans	2	64	1,505	pounds
Barley	4	56	57	bushels
Soybeans	2	67	27	bushels
Rye	1	15	34	bushels
Other field crops	5	31	NA	bushels

NA = Not applicable.

Table 8. Vegetable crop acreage and yield, Upstate New York, 1986

Vegetable crop	Percent reporting	Average acres	Average yield (cwt.)
Potatoes	1.1	32	213
Onions	0.8	54	224
Sweet corn	5.0	54	101
Cabbage	1.2	27	334
Cauliflower	0.2	*	*
Lettuce	0.4	*	*
Snap beans	0.4	513	47
Tomatoes	1.8	5	*

* Confidential because of limited number of responses.

Table 9. Fruit crop acreage and yield, Upstate New York, 1986

Fruit crop	Percent reporting	Average acres	Average yield	
			Amount	Unit
Apples	3.0	59	17,530	pounds
Grapes	2.4	52	5.1	tons
Pears	1.4	7	12,720	pounds
Peaches	1.0	4	4,420	pounds
Tart cherries	1.0	27	3,020	pounds
Sweet cherries	0.5	*	*	
Strawberries	0.6	4	NA	
Other berries or fruit	0.7	9	NA	

NA = Not applicable.
* Confidential because of limited number of responses.

similar with 59 acres of apples and 52 acres of grapes. Other fruit crops were grown by about 1 percent of the farms and averaged significantly smaller acres per farm.

Horticultural producers with gross receipts greater than $10,000 also represent a small proportion of the farm population. Outdoor nursery stock was produced by approximately 1 percent of farms, with an average of 107 acres per farm (table 10). Greenhouses were reported by 2.4 percent of farms. Polyethylene was the most common type of cover material used on the greenhouses.

Table 10. Horticultural production acreage and greenhouse area, Upstate New York, 1986

Item	Percent reporting	Area per farm
	Percent	Acres
Nursery stock	1.0	107.3
Container grown	0.6	2.7
Conventionally grown	0.8	80.2
Turf grass, sod production	0.1	*
	Percent	Square feet
Greenhouse	2.4	24,019
Glass	0.6	7,256
Polyethylene	2.4	23,244

* Confidential because of limited number of responses.

As expected, livestock dominates the target population. Seventy-six percent of all farms reported an inventory of milk cows, with a 70-cow per farm average (table 11). Nearly all of those farms also reported dairy heifers as part of their operation. Beef cattle held for breeding purposes or market were reported on 5 and 7 percent of the farms, respectively. Beef herds tended to be smaller than dairy herds, averaging less than 40 animals per farm. Significant numbers of hogs, sheep, and horses were also reported in the survey. Egg production in New York tends to be concentrated on a few (0.8 percent) relatively large farms with 42,825 hens on average.

Farm Type

Farms were classified by dominant enterprise. The dominant enterprise was defined as the enterprise providing 50 percent or more of the farm's total gross receipts. Farms without a dominant enterprise were classified as miscellaneous farms. A category of other dairy was also devised for dairy farms producing milk for less than 12 months in 1986. The other dairy category was typified by farms raising dairy replacements, entering into the Dairy Termination Program, and those farms bought or sold for other reasons during 1986.

Table 11. Livestock reported on farms, Upstate New York, 1986

Item	Percent reporting	Average per farm
	Percent	Number
Milk cows	76	70
Dairy heifers	74	51
Beef cows for breeding	5	30
Beef heifers for breeding	4	13
Steers and heifers for market	7	36
Sows for breeding	2	18
Feeder pigs	1.8	69
Market hogs	2.6	115
Sheep and lambs	1.5	208
Horses	1.7	31
Laying hens	0.8	42,825

Dairy farms dominate New York agriculture in terms of both number of farms (71.6 percent) and aggregate gross receipts (73.7 percent) (table 12). Cash crop farms and livestock farms are the next most common farms, accounting for 6.3 and 5.1 percent, respectively. Although poultry farms represent 0.6 percent of the farms, they produce 3.2 percent of the gross receipts. In contrast, 1.5 percent of the farms are dominated by grape sales, but they generate only 0.7 percent of total gross receipts. Miscellaneous and other dairy farms account for 8 percent of total farms and nearly 7 percent of the gross receipts.

Farms in Upstate New York average 388 acres of farmland operated. Approximately 64 percent of the farmland was operated as cropland in 1986. Cash crop, miscellaneous, and vegetable farms operate the largest farmland acreages with 563,484 and 461 acres, respectively (table 13). Cash crop and vegetable farms operate the largest cropland acreages and rent in the most cropland. Horticultural and grape farms operate the smallest farmland and cropland acreage. Vegetable farms crop 83 percent of their farmland. In contrast, grape and other dairy farms crop 55 and 49 percent, respectively, of their total farmland. Dairy farms rent in 43 percent of their cropland.

Assets and debts provide a useful measure of farm size and structure. Tree fruit, horticultural, cash crop, and poultry farms reported the largest amounts of assets, all with over $600,000 of total assets per farm (table 14). Cash crop farms were the largest debtors, on average, with $116,091 of total debt per farm. Poultry, vegetable, dairy and miscellaneous farms all reported over $90,000 of total debt per farm. In contrast, general livestock farms are the smallest on average, with $254,174 in assets and $25,193 in total debt. Horticultural farms reported the best debt/asset ratio with less than 7.5 percent of total assets debt-financed.

Capital turnover ratio is a measure of how efficiently capital is used by the farm (Lee, et al.). It reflects the dollars of gross farm receipts generated from the total assets of the farm. Poultry farms were

Table 12. Distribution of farms and gross receipts by type of farm enterprise, Upstate New York, 1986

Type of farm	Farms	Gross receipts
	- - - Percent - - -	
Cash crop	6.3	5.4
Dairy	71.6	73.7
General livestock	5.1	1.3
Grape	1.5	0.7
Horticulture	2.2	2.4
Poultry	0.6	3.2
Tree fruit	2.5	2.3
Vegetable	2.1	4.3
Miscellaneous	3.6	3.9
Other dairy[a]	4.4	2.8
Total[b]	100.0	100.0

[a] Other dairy includes farms selling milk for only part of 1986 (because of the Dairy Termination Program, farm sale, or other reasons), and dairy heifer operations with no reported milk sales in 1986.

[b] Totals may not add due to rounding.

Table 13. Average farm and cropland acreage by type of farm, Upstate New York, 1986

Type of farm	All land operated	Cropland operated	Cropland rented from others
		- - - Acres - - -	
Cash crop	563	442	243
Dairy	403	247	107
General livestock	260	154	31
Grape	165	91	30
Horticulture	116	81	37
Poultry	294	184	106
Tree fruit	197	156	52
Vegetable	461	403	219
Miscellaneous	484	322	111
Other dairy[a]	297	145	41

[a] Other dairy includes farms selling milk for only part of 1986 (because of the Dairy Termination Program, farm sale, or other reason), and heifer raising operations with no reported milk sales in 1986.

Table 14. Average assets, debt, and capital turnover ratio by type of farm, Upstate New York, 1986

Type of farm	Total assets	Total debt	Capital turnover ratio[b]
	Dollars	Dollars	
Cash crop	642,455	116,091	.21
Dairy	433,418	92,412	.33
General livestock	254,174	25,193	.13
Grape	345,825	82,016	.17
Horticulture	645,288	48,167	.36
Poultry	614,027	96,562	.59
Tree fruit	757,282	86,934	.20
Vegetable	541,138	92,912	.35
Miscellaneous	550,839	90,664	.21
Other dairy[a]	296,311	39,188	.37

[a] Other dairy includes farms selling milk for only part of 1986 (because of the Dairy Termination Program, farm sale, or other reason), and heifer raising operations with no reported milk sales in 1986.

[b] The capital turnover ratio is a common measure of capital efficiency. It is defined as: Gross farm receipts/total assets.

by far the most capital efficient, earning $0.59 in 1986 for each dollar of total assets (table 14). In contrast, general livestock and grape farms earned less than $0.20 for each dollar of total assets. Tree fruit farms, with over $750,000 in total assets, had a capital turnover ratio of 0.20.

New capital investments were made by 56 percent of the farms in 1986. Capital investment was greater in 1986, on average, than 1985 for all types of farms except grape and general livestock (table 15). Vegetable, miscellaneous, and horticultural farms reported the largest average capital investments. Grape farms made significantly lower investments for 1985 and 1986 than did other types of farms.

Poultry, miscellaneous, and other dairy farms reported the largest net cash farm income in 1986 (table 16). Poultry farms were significantly larger in terms of gross receipts than other farm types, with $751,543 in gross receipts. General livestock farms reported the lowest gross receipts, net cash farm income, and nonfarm income. Cash crop and grape farms reported the largest nonfarm income -- $17,577 and $17,083, respectively.

Farm labor is a major input and cost in the production of farm commodities. Vegetable and horticultural farms required the most labor inputs, with 6.3 and 5.4 full-time worker equivalents, respectively (table 17). General livestock and other dairy farms reported the least labor inputs. Seasonal labor was significantly higher on vegetable and tree fruit farms than on other farm types. Tree fruit farms also reported the largest amounts of hired management, averaging 510 hours per year. Poultry and horticultural farms averaged the most full-time workers with 6,400 and

Table 15. Average farm investment expenditures by type of farm, Upstate New York, 1985 and 1986

Type of farm	1985	1986
	- - - Dollars - - -	
Cash crop	9,391	11,537
Dairy	10,129	11,667
General livestock	9,301	7,889
Grape	2,277	139
Horticulture	8,920	15,670
Poultry	3,195	11,378
Tree fruit	9,811	10,223
Vegetable	10,028	16,095
Miscellaneous	13,323	16,224
Other dairy[a]	6,061	11,116

[a] Other dairy includes farms selling milk for only part of 1986 (because of the Dairy Termination Program, farm sale, or other reason), and heifer raising operations with no reported milk sales in 1986.

Table 16. Average gross receipts, net cash farm income, and nonfarm income by type of farm, Upstate New York, 1986

Type of farm	Gross receipts	Net cash farm income	Nonfarm income
		- - - Dollars - - -	
Cash crop	112,457	23,161	17,577
Dairy	134,421	20,384	5,582
General livestock	34,328	(721)	14,561
Grape	56,828	4,249	17,083
Horticulture	143,123	25,075	8,231
Poultry	751,543	31,064	7,940
Tree fruit	118,520	2,861	11,321
Vegetable	281,432	25,409	8,380
Miscellaneous	139,513	33,003	7,885
Other dairy[a]	77,957	31,956	7,853

[a] Other dairy includes farms selling milk for only part of 1986 (because of the Dairy Termination Program, farm sale, or other reason), and heifer raising operations with no reported milk sales in 1986.

Table 17. Average hours worked per year for paid farm workers and unpaid family labor by type of farm, Upstate New York, 1986

Type of farm	Paid farm workers				Unpaid family labor[b]	Full-time worker equivalents[c]
	Hired managers	Full-time	Part-time	Seasonal		
	- - - Hours per year - - -					
Cash crop	190	1,090	250	1,350	210	2.2
Dairy	80	2,360	700	110	1,120	3.3
General livestock	100	340	500	80	530	1.6
Grape	110	1,460	410	1,610	210	2.1
Horticulture	180	5,850	1,820	3,410	170	5.4
Poultry	290	6,400	2,070	130	910	5.2
Tree fruit	510	1,380	870	5,330	170	3.8
Vegetable	290	5,690	1,750	5,520	510	6.3
Miscellaneous	370	3,420	520	670	370	3.1
Other dairy[a]	*	1,190	400	20	300	2.0

* Less than 10 hours per year.

[a] Other dairy includes farms selling milk for only part of 1986 (because of the Dairy Termination Program, farm sale, or other reason), and heifer raising operations with no reported milk sales in 1986.

[b] Excluding operator(s) labor.

[c] A full-time worker equivalent is defined as 2,760 hours (230 hours/month x 12 months) worked per year.

5,850 hours per year, respectively. Dairy farms reported little hired management or seasonal help.

Farm Demographics by Type of Farm

Differences in ownership, age of operator, and farm size were examined across farm type (tables 18-21). Individual ownership is the most common form across all types of farms. Tree fruit farms are the most concentrated, with 81 percent of the farms individually owned (table 18). In contrast, 53 percent of the horticultural farms and 54 percent of the vegetable farms are individually owned. Twenty-two percent of the vegetable farms are owned by corporations or limited partnerships, as compared with only 4 percent of the dairy farms.

The age of primary operator differs across farm type. Sixty-one percent of the poultry and other dairy farms are operated by individuals over 55 years (table 19). This contrasts with only 25 percent of the general livestock farms and 30 percent of the dairy farms. Over half of the general livestock farms are operated by individuals in the 45-54 age category. Miscellaneous and poultry farms reported the fewest operators under 35 years, with 3 and 5 percent, respectively. In contrast, 21 percent of horticultural farms and 17 percent of the dairy farms have a primary operator under 35. Distribution of dairy farms is close to uniform across age groups for those over 35 years.

Differences in the distribution of gross receipts across farm type are quite striking. Sixty-two percent of poultry farms reported $250,000 or more in gross receipts (table 20). In contrast, only 2 percent of the grape and general livestock farms have that level of sales. Few dairy farms are very small or very large, with 81 percent of the dairies having between $40,000 and $249,999 in gross receipts. Seventy-five percent of the general livestock farms and 50 percent of the tree fruit farms report less than $40,000 of gross receipts. Vegetable farms exhibit a bimodal distribution with few medium-sized farms.

When farmland operated replaces gross receipts as the measure of farm size, distributions of farms shift significantly for most types of farms. Sixty-eight percent of the poultry farms operate less than 250 acres of farmland (table 21). Cash crop and miscellaneous farms operate the largest acreages, with 40 and 34 percent, respectively, operating 500 acres or more. Few dairy and cash crop farms operate less than 100 acres of farmland. In contrast, 74 percent of horticultural farms operate less than 100 acres of farmland.

Dairy Production Technology

Dairy farms were disaggregated by milking system technology (table 22) to investigate production and profitability attributes of each system. Pipeline milking systems are the most common type in Upstate New York, accounting for 47.5 percent of the systems. Bucket milkers were reported by 32.9 percent of the dairy farms. Milking parlors were reported by 19.6

Table 18. Distribution of farm ownership by type of farm, Upstate New York, 1986

Type of farm	Type of ownership			
	Individual	Partnership	Corporation or limited partnership	Nonresponse or other
	- - - Percent - - -			
Cash crop	72	16	13	*
Dairy	77	18	4	*
General livestock	78	4	17	1
Grape	75	9	16	*
Horticulture	53	33	14	*
Poultry	65	20	10	5
Tree fruit	81	8	9	2
Vegetable	54	24	22	*
Miscellaneous	75	9	15	1
Other dairy[a]	78	16	5	1

[a] Other dairy includes farms selling milk for only part of 1986 (because of the Dairy Termination Program, farm sale, or other reason), and heifer raising operations with no reported milk sales in 1986.

* Less than 1 percent.

Table 19. Distribution of farms by age of primary operator and farm type, Upstate New York, 1986

Type of farm	Age of principal operator			
	Under 35	35-44	45-54	55 or over
		- - - Percent - - -		
Cash crop	10	25	24	41
Dairy	17	26	27	30
General livestock	4	15	56	25
Grape	9	16	28	47
Horticulture	21	9	36	34
Poultry	5	20	14	61
Tree fruit	15	20	17	48
Vegetable	7	24	22	47
Miscellaneous	3	31	41	26
Other dairy[a]	8	11	20	61

[a] Other dairy includes farms selling milk for only part of 1986 (because of the Dairy Termination Program, farm sale, or other reason), and heifer raising operations with no reported milk sales in 1986.

* Less than 1 percent.

Table 20. Distribution of farms by gross farm receipts and type of farm, Upstate New York, 1986

Type of farm	Gross farm receipts			
	$10,000-$39,999	$40,000-$99,999	$100,000-$249,999	$250,000 or more
	- - - Percent - - -			
Cash crop	39	14	38	9
Dairy	9	39	42	10
General livestock	75	20	3	2
Grape	42	44	12	2
Horticulture	36	34	13	17
Poultry	12	11	15	62
Tree fruit	50	17	22	11
Vegetable	41	15	9	35
Miscellaneous	26	24	43	7
Other dairy[a]	45	26	26	3

[a] Other dairy includes farms selling milk for only part of 1986 (because of the Dairy Termination Program, farm sale, or other reason), and heifer raising operations with no reported milk sales in 1986.

Table 21. Distribution of farms by farmland operated and type of farm, Upstate New York, 1986

Type of farm	Acres			
	1-99	100-249	250-499	500 or more
	- - - Percent - - -			
Cash crop	6	28	26	40
Dairy	2	25	50	23
General livestock	28	34	34	4
Grape	58	29	3	10
Horticulture	74	19	1	6
Poultry	31	37	13	19
Tree fruit	29	46	15	9
Vegetable	27	34	14	25
Miscellaneous	19	28	18	34
Other dairy[a]	*	55	29	16

* Less than 1 percent.

[a] Other dairy includes farms selling milk for only part of 1986 (because of the Dairy Termination Program, farm sale, or other reason), and heifer raising operations with no reported milk sales in 1986.

Table 22. Dairy farm productivity, profitability and labor use by type of milking system technology, Upstate New York, 1986

Item	Parlor with automatic takeoff	Parlor without automatic takeoff	Pipeline	Buckets
Percent of dairy farms	6.5	13.1	47.5	32.9
		- - - Per farm - - -		
Net cash farm income ($)	53,488	28,532	20,397	10,565
Electric expense ($)	9,184	5,626	4,368	2,630
All labor and management[a]	6.36	3.91	3.12	2.82
Family labor[a,b]	1.62	1.70	1.65	1.79
Paid labor[a]	4.30	1.78	1.00	0.56
Milk cows (number)	178	102	66	44
		- - - Per cow - - -		
Milk production (lbs.)	15,360	14,577	14,553	11,830
Milking time (min./day)	3.0	3.5	3.6	4.8
		- - - Per cwt. of milk production - - -		
Gross receipts ($)	13.93	13.92	13.10	13.11
Total expenses[c] ($)	12.19	12.12	10.96	11.11

[a] Expressed as full-time equivalents of labor, which is 2,760 hours per year for this study.

[b] Includes farm operator(s).

[c] Total cash expenses, including interest paid.

percent of dairy farms, with approximately one-third of those having automatic takeoffs.

The four milking system technologies are quite different in terms of size of farm, labor efficiency, and profitability. Farms reporting milking parlors with automatic takeoffs average $53,488 of net cash farm income, 178 cows, and over 6 full-time worker equivalents per farm (table 22). In contrast, those with bucket milkers average $10,565 of net cash farm income, 44 cows, and just under 3 workers per farm. Farms reporting milking parlors without automatic takeoffs have fewer cows, less profit, and use less labor than do farms reporting milking parlors with automatic takeoffs. Pipeline farms are superior to bucket milkers, but rank behind both parlor technologies in terms of size and profits. Rate of production was highest on farms having milking parlors with automatic takeoffs, averaging 15,360 pounds of milk per cow (table 22). Pipelines and other milking parlors reported similar production at approximately 14,500 pounds per cow. Bucket milking systems had significantly lower production, at 11,830 pounds per cow. Milking time (minutes per cow) follows a pattern similar to production per cow.

Gross receipts and total cash expenses were examined on a production unit (hundredweight of milk sold) basis. Pipeline systems reported the lowest unit costs, followed by bucket milkers. Both milking parlor systems reported similar and higher unit costs. Lower unit costs for the nonparlor systems can be explained by the fact that labor on pipeline and bucket milker farms are dominated by unpaid family labor. The majority of labor on the larger parlor farms comes from paid employees.

Summary of Electrical Expense and Equipment

Electric expense on farms comprise 3-5 percent of total production expenses across farm type. Although not a major factor in production expenses, electricity is often an important factor in the production technology of most agricultural commodities. Electricity is critical in materials handling of final products, inputs, and waste materials. Refrigeration, lighting, and ventilation play a major role in producing the quality and quantities of agricultural commodities demanded of current farm operators.

Poultry farms averaged $14,571 in total electric expenses (table 23). This amount is significantly higher than other types of farms because of the large size of poultry farms on average, and because of the large ventilation, lighting, and materials handling requirements of modern poultry production technology. Vegetable and dairy farms also require substantial amounts of electricity, with average expenses of $4,278 and $4,319, respectively. Grape farms reported only $761 in electrical expense.

Total wattage of electrical lighting loads follows a distribution quite similar to electric expense across farm type (table 24). Poultry farms again require the largest amount on average, with 11,140 total watts. Horticultural producers utilize lighting in greenhouses and are also large

Table 23. Average annual electric expense by type of farm for Upstate New York, 1986

Type of farm	Electric expense
	Dollars
Cash crop	1,970
Dairy	4,319
General livestock	1,165
Grape	761
Horticulture	3,206
Poultry	14,571
Tree fruit	2,101
Vegetable	4,278
Miscellaneous	2,555
Other dairy[a]	2,542

[a] Other dairy includes farms selling milk for only part of 1986 (because of the Dairy Termination Program, farm sale, or other reason), and heifer raising operations with no reported milk sales in 1986.

users with 5,060 total watts of lighting. Cash crop, general livestock, and grape farms use little electrical lighting for production.

General Farm Electrical Equipment

Many different types and sizes of electrical equipment were reported in the survey. Crop and feed handling equipment have been some of the most important electrical equipment used to mechanize and modernize farms over the past 50 years. Silo unloaders and augers/elevators are the most frequently reported crop and feed equipment on 57.4 and 52.7 percent of farms, respectively (table 25). Electric blowers and hammer mills were reported by less than 2 percent of the farms. Silo unloaders and augers/elevators were quite similar in terms of total electric motors, with approximately 17,000 each (table 25). However, total horsepower is quite different with 81,300 horsepower for silo unloaders and 19,000 horsepower for augers/elevators.

More general electric equipment such as air compressors, water pumps, and ventilation fans are quite common on farms in Upstate New York. Ventilation fans, water pumps, and tractor block heaters were reported by over 75 percent of all farms, with an average of more than one of each per farm (table 26). Electric space heaters were less common, reported by only 27 percent of the farms.

Ventilation fans were disaggregated by type of farm to examine differences in use. Ventilation fans are used in agriculture primarily for removing excess heat and moisture from livestock structures. Ventilated storage of fruits and vegetables is another use on crop farms. Dairy farms were the dominant user of ventilation fans; 90 percent of all dairy farms reported a total of 26,900 electric motors for ventilation fans (table 27). A high proportion of poultry and horticultural farms reported ventilation fans.

Occurrence of electric equipment also varies across farm size. Silo unloaders and augers/elevators are reported on over 50 percent of the farms with more than $40,000 in gross receipts, but less than 30 percent of the time on smaller farms (table 28). Further, over half of the total horsepower reported for silo unloaders occurs on farms with $100,000-$249,999 in gross receipts (table 29). Roller mills, augers/elevators, hay dryers, and grain dryers follow similar distributions of horsepower. Gutter cleaner horsepower is distributed somewhat differently, with 38 percent of the horsepower reported on farms with gross receipts of $40,000-$99,999.

Manure Handling Equipment on Livestock Farms

Animal wastes are often removed from livestock barns two or more times per day. Electric gutter cleaners are the predominant removal method, with 75 percent of the dairy, poultry, and general livestock reporting at least one unit (table 30). Electric alley scrapers were reported by only 1 percent of the livestock farms. Farms that did not report electric-powered equipment likely removed manure with tractor scrapers, skid steer loaders, or by manual labor. Only 8 percent of the

Table 24. Average annual major electrical lighting loads by type of farm, Upstate New York, 1986

Type of farm	Total wattage
Cash crop	1,370
Dairy	2,990
General livestock	1,470
Grape	1,000
Horticulture	5,060
Poultry	11,140
Tree fruit	2,090
Vegetable	2,110
Miscellaneous	3,120
Other dairy[a]	1,780

[a] Other dairy includes farms selling milk for only part of 1986 (because of the Dairy Termination Program, farm sale, or other reason), and heifer raising operations with no reported milk sales in 1986.

Table 25. Electric-powered equipment for crop and feed handling for all farms, Upstate New York, 1986

Electric equipment	Percent of farms reporting	Total electric motors	Total horsepower
	Percent	Number	Horsepower
Silo unloader	57.4	17,200	81,300
Auger/elevator	52.7	17,900	19,000
Hammer mill	1.5	400	1,500
Roller mill	12.4	1,900	6,800
Feeder	11.2	3,600	4,300
Electric blower	0.9	700	1,300
Hay dryer	5.6	1,200	6,100
Grain dryer	6.0	2,100	9,200
Feeding cart	4.0	900	1,100

Table 26. Miscellaneous electric-powered equipment for all farms, Upstate New York, 1986

Electric equipment	Percent reporting	Total number
	Percent	Number
Tractor block heaters	75	23,700
Electric welders	72	10,700
Air compressors	85	13,000
Hot water heater	78	12,300
Water pump	88	17,100
Electric heaters	27	4,900
Ventilation fans	76	35,600

Table 27. Electric-powered ventilation fans by type of farm, Upstate New York, 1986

Type of farm	Percent reporting	Total electric motors	Total horsepower
	Percent	Number	Horsepower
Cash crop	29	900	500
Dairy	90	26,900	9,200
General livestock	26	400	100
Grape	9	100	*
Horticulture	76	2,600	300
Poultry	91	2,000	100
Tree fruit	51	600	200
Vegetable	32	700	500
Miscellaneous	34	500	200
Other dairy[a]	79	900	300

* Confidential because of limited number of responses.
[a] Other dairy includes farms selling milk for only part of 1986 (because of the Dairy Termination Program, farm sale, or other reason), and heifer raising operations with no reported milk sales in 1986.

Table 28. Selected electric-powered equipment by size of farm, Upstate New York, 1986

Item	Gross farm receipts			
	$10,000-$39,999	$40,000-$99,999	$100,000-$249,999	$250,000 or more
	- - - Percent reporting - - -			
Crop and Feed				
Silo unloader	15	57	59	69
Auger/elevator	29	58	60	64
Roller mill	*	8	20	24
Feeding cart	*	2	9	3
Hay dryer	*	2	12	7
Grain dryer	1	5	9	12
Manure Equipment				
Gutter cleaner	32	79	70	42
Ram pump	*	*	5	11

* Less than 1 percent.

Table 29. Total horsepower for selected electric-powered equipment by size of farm, Upstate New York, 1986

Item	Gross farm receipts			
	$10,000-$39,999	$40,000-$99,999	$100,000-$249,999	$250,000 or more
Crop and Feed				
Silo unloader	3,600	18,600	44,500	14,300
Auger/elevator	1,300	4,800	9,200	3,600
Roller mill	100	1,600	3,600	1,500
Feeding cart	*	*	900	100
Hay dryer	100	600	4,400	1,000
Grain dryer	200	1,200	5,500	2,300
Manure Equipment				
Gutter cleaner	3,000	13,400	15,600	3,100
Ram pump	*	200	2,000	1,400

* Confidential because of limited number of responses.

Table 30. Electric-powered manure handling equipment for dairy, poultry, and general livestock farms, Upstate New York, 1986

Item	Percent reporting	Total electric motors	Total horsepower
	Percent	Number	Horsepower
Gutter cleaner	75	11,000	32,600
Alley scraper	1	*	*
Manure mixer	a	NA	*
Stacker	a	NA	*
Ram pump	4	NA	3,500
Unloading pump	1	NA	*

NA = Not available.

* Confidential because of limited number of responses.

[a] Less than 1 percent.

livestock farms reported manure storage. Approximately half of those with manure storage use an electric ram pump to load manure into the storage facility (table 30). No more than 1 percent of the livestock farms report any electric-powered unloading or handling equipment for the stored manure.

Poultry Equipment

Approximately 70 percent of all poultry farms reported electrical equipment to gather, wash, and cool the eggs produced (table 31). Slightly less (57 percent) had equipment to grade or sort the eggs by size. Egg gathering equipment had significantly more electric motors than did the other equipment.

Table 31. Electric-powered equipment for egg-handling poultry farms, Upstate New York, 1986

Item	Percent reporting	Total horsepower
	Percent	Horsepower
Egg gatherer	71	1,300
Egg grader	57	100
Egg washer	69	100
Egg cooler	67	100

Tree Fruit and Vegetable Equipment

Special electric-powered equipment for handling or storage was a relatively rare occurrence on tree fruit and vegetable farms. Less than 15 percent of the farms reported a sorter, washer, bagger, or unloader (table 32). Twenty-one percent of the fruit and vegetable farms reported refrigerated storage. In contrast, only 5 percent of the fruit and vegetable farms have controlled atmosphere storage.

Milk Handling Equipment on Dairy Farms

Dairy farms were disaggregated by region to determine differences in milk handling equipment saturations (see figure 1). Thirty-four percent of all Upstate New York dairies use a bucket milking system (table 33). Incidence of bucket milker systems was highest in the western plains (41 percent) and lowest in the eastern region (17 percent). Over half of the dairy farms in the eastern and northern regions use pipeline milking systems. Milking parlors are most common in the western plains and eastern regions. As expected, bulk tanks and vacuum pumps were reported by essentially all dairy farms. Precoolers and in-line coolers were used by 11 and 2 percent, respectively, of the dairies to reduce the cost of cooling milk. Heat recovery systems, which use waste heat from a bulk tank compressor to heat water, were reported by 30 percent of the dairy farms.

Table 32. Electric-powered equipment for product handling and storage on tree fruit and vegetable farms, Upstate New York, 1986

Item	Percent reporting	Total electric motors	Total horsepower
	Percent	Number	Horsepower
Sorter	13	313	148
Washer	6	39	84
Unloader	3	63	94
Bagger	10	311	254
Storage			
Controlled atmosphere	5	102	1,412
Refrigerated	21	1,308	2,384

Table 33. Electric-powered equipment for milk handling on dairy farms by region, Upstate New York, 1986[a]

Item	Region				
	Total	Southern Tier	Western Plains	Eastern	Northern
	- - - Percent reporting - - -				
Bucket milkers	34	35	41	17	36
Pipeline	46	49	30	56	52
Herringbone parlor	16	13	23	24	9
Other parlor	4	3	6	3	3
Bulk tank	99	98	100	100	100
Precoder	11	10	15	15	8
In-line cooler	2	2	1	3	3
Milk transfer pump	66	72	64	69	61
Vacuum pump	99	97	99	100	99
Heat recovery system	30	33	24	34	30

[a] See figure 1 for description of regions.

Electricity Use in Farm Households

Approximately 81 percent of the farms reported a household connected to the electrical service of the farm business. There were significant differences in occurrence of a household across type of farm (table 34). Eighty-six percent of the dairy farms reported a household with the farm business. In contrast, only 28 percent of the horticultural producers had a house with the business. Occurrence of a house on other types of farms ranged from 62-80 percent.

The predominant type of space heating system used in farm households (47 percent) were forced hot air systems (table 35). Hot water heat (26 percent) and wood or coal stoves (17 percent) were also quite common space heating systems. Only 2 percent of the farm households used electric baseboard heat.

Oil and wood were the most common fuels used for space heating of farm households at 44 and 37 percent, respectively (table 36). Fifty-nine percent of the farm households reported using a second fuel to supplement their primary heating system. Wood was the most common supplemental fuel. Electricity was rarely reported as the primary heating fuel, but it was the predominant fuel used for hot water heating and cooking (table 36). As expected, natural gas was rarely used on farms because of its limited distribution in rural areas.

Refrigerators, freezers, washers, dryers, and color televisions are the most frequently reported electric appliances in farm households (table 37). Microwave ovens and VCRs are also quite common with 67 and 61 percent of the farm households reporting one or more. Personal computers are still a relatively rare occurrence in farm households as only 12 percent reported having one or more.

Conservation measures such as wall and ceiling insulation and storm windows were reported by 76, 79, and 87 percent of farm households (table 38). Clock thermostats and faucet flow restricters were the least common conservation measures reported. Water heater blanket insulation was reported by only 15 percent of the farm households.

Summary

The 1987 Farm Management and Energy Survey was conducted to assemble detailed information on the structure of farms and patterns of electric energy use in Upstate New York. The survey sets the stage for the first comprehensive assessment of electric energy use in New York agriculture since the 1930s. Expenses for electrical energy are only a small fraction of total production expenses for New York agriculture but electric-powered equipment underpins the technology now used to manage production inputs and to prepare raw farm commodities for markets.

Table 34. Farms metered for electric power use with one or more dwelling units, by type of farm, Upstate New York, 1986

Type of farm	Percent
Cash crop	62
Dairy	86
General livestock	66
Grape	60
Horticulture	28
Poultry	72
Tree fruit	79
Vegetable	63
Miscellaneous	75
Other dairy[a]	80

[a] Other dairy includes farms selling milk for only part of 1986 (because of the Dairy Termination Program, farm sale, or other reason), and heifer raising operations with no reported milk sales in 1986.

Table 35. Space heating systems used in farm households, Upstate New York, 1986[a]

Space heating system	Percent
Electric baseboard	2
Forced hot air	47
Steam	3
Hot water	26
Wood or coal stove	17
Other	5
Total	100

[a] Percentages are based on farms metered for electric power use with one or more dwelling units.

Table 36. Primary fuels used in farm households, Upstate New York, 1986[a]

Fuel	Space heating		Hot water	Cooking
	Primary	Supplemental[b]		
	- - - Percent reporting- - -			
Oil	44	19	14	NA
Natural gas	12	1	12	8
Bottled gas	1	1	8	21
Electricity	1	6	61	67
Coal	3	1	*	NA
Wood	37	28	3	1
Other	2	3	2	3

* Less than 1 percent.
NA = Not applicable.
[a] Percentages are based on farms metered for electric power use with one or more dwelling units.
[b] Fifty-nine percent of the households on farm electric meters reported supplemental space heating fuels.

Table 37. Electric appliances in farm households, Upstate New York, 1986[a]

Item	Yes	No
	- - - Percent reporting - - -	
Frost free refrigerator	83	17
Manual defrost refrigerator	28	72
Frost free freezer	29	71
Manual defrost freezer	71	29
Water pump	53	47
Black and white television	35	65
Color television	92	8
VCR	62	59
Clothes washer	96	4
Dishwasher	54	46
Portable heater	33	67
Waterbed heater	13	87
Fireplace/woodstove	52	48
Personal computer	12	88
Microwave	67	31
Clothes dryer	96	4

[a] Percentages are based on farms metered for electric power use with one or more dwelling units.

Table 38. Conservation measures used in farm households, Upstate New York, 1986[a]

Item	Yes	No
	- - - Percent reporting - - -	
Wall insulation	76	24
Ceiling insulation	79	21
Subfloor insulation	15	85
Clock thermostat[b]	9	91
Water heater blanket	15	85
Pipe insulation	13	87
Low flow showerhead	27	73
Faucet flow restricter	10	90
Storm windows	87	13
Double or triple windows	49	51
Plastic window covers	25	75
Other	4	96

[a] Percentages are based on farms metered for electric power use with one or more dwelling units.

[b] Clock thermostats are used on electric hot water heaters.

While focused primarily on patterns of energy use, the survey complements other data sources in the Department of Agricultural Economics and information published by State and Federal agencies. For example, the survey included a relatively ambitious attempt to assemble comprehensive information on the utilization of farm labor in New York agriculture. The results provide an unprecedented view of labor use across several farm types -- data previously unavailable from published sources. Similarly, an effort was made to systematically describe the qualitative features of the management applied to New York farm businesses. Management inputs, not labor inputs, have historically been under-enumerated in production agriculture.

Returning to electrical energy use, the survey data can be used to compute indices which relate commodity production to unit energy use and to estimate total electrical loads. These indices can be calibrated to variations in the structure and size of farm operations. Predictive models can be developed to disentangle on-farm and farm household energy use and assess the impact of introducing electric-saving technologies for handling production inputs and raw farm commodities. Results from such analyses have direct implications for the formation of pricing policy by electric utilities and for the design of programs to foster the conservation of electric energy on farms.

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APPENDIX A

NEW YORK AGRICULTURAL STATISTICS SERVICE

1 Winners Circle
Albany, New York 12235

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DEPARTMENT OF AGRICULTURAL ECONOMICS
CORNELL UNIVERSITY

1987 FARM MANAGEMENT AND ENERGY SURVEY

County	Region	ID	Stratum
Starting Time		002	

1. During 1986 did this operation produce or sell at least $10,000 worth of agricultural products or spend at least $10,000 for feed, seed, equipment or other supplies for the purpose of producing agricultural products on this operation?

☐ **YES** - Continue

☐ **NO** - Skip to back page, enter Completion Code "2" in box 001 and conclude interview.

2. What is the legal form of operation for this farm?

1 = Individually Operated
2 = Partnership
3 = Limited Partnership
4 = Corporation
..... Enter Code
If Code is 1 or 2 - Go to Question 3 [029]

2a. Are there more than 15 stockholders or partners involved with this farming operation?

☐ **YES** = 1
☐ **NO** = 2
..... Enter Code [856]

3. Now I would like to ask you about the total acres in this operation during 1986.

	All Land Acres	Crop Land Acres	Total Rent Dollars
a. Land owned	701	416	
b. Land Rented from Others			
(1.) Cash rent	478	798	768
(2.) Share rent	766	625	650
(3.) Rent free	475	497	
c. All Land Rented to Others (Cash rent, share rent, rent free)	868	426	
d. Then the total land you operated is (a+b-c)	995	331	

4. How many miles is this farm from the nearest city of over 20,000 people? ..... Miles [504]

5. Is any part of your farm within 1 mile of the nearest village?

☐ **YES** - Continue ☐ **NO** - Go to Question 6

a. How close is your farm boundary to the nearest village? ..... Tenths of Mile [483] 0._

6. Do you plan to continue farming this land for at least the next 10 years?

☐ **YES** - Go to Question 8 ☐ **NO** - Continue

7. Since you do not expect to be farming this land 10 years from now, which of the following best describes your expectation of what will happen to this farm business?

a. The farm business will be passed on to the next generation 1
b. At least one current operator will continue the business 2
c. The farm will be sold as current operators retire 3
d. The farm will be sold as current operators switch to other employment 4

Enter Code [937]

Enumerator Note: Go to Section B

8. What is your primary goal for this operation over the next 10 years?

a. Expand Operations 1
b. Increase Leisure Time 2
c. Reduce Borrowing 3
d. Increase Profits 4
e. Increase Net Worth 5
f. Improve Family Living 6
g. Stay in Business 7

Enter Code [047]

B. EDUCATION, EXPERIENCE AND LABOR

NOTE: Complete Column A if individual operation, limited partnership or corporation.

Complete Columns A and B if partnership reported on face page.

Now I need information on education and work experience.

	A Operator	B Partner
1. Age ..... Years	050	405
2. Sex 1 = Male, 2 = Female ..... Enter Code	046	508
3. Education Code: (Highest level attained) 1 = < 12 years, 2 = 12 years High School Graduate, 3 = Some College, 4 = BS or BA Degree, 5 = Graduate Degree ..	579	234
	480 Office Use	538 Office Use
4. College major of highest degree attained: Operator _____ Partner _____	818	543
5. Number of years work experience off farm (after age 14)	879	810
6. Number of years work experience on farm (after age 14)	959	618
7. Average number of hours worked on farm per week during 1986		

a. If you have more than 1 partner, list the average hours worked per week during 1986.

Partner 2 .... Hrs. 093

Partner 3 .... Hrs. 894

B. EDUCATION, EXPERIENCE AND LABOR

8. Did you have any family labor or other workers on this farm during 1986, either paid or unpaid?

☐ YES - Continue ☐ NO - Go to Section C

a.

Unpaid Labor	Number of workers	Number of weeks per year	Hours per week code
Children Under 14	581	782	450
Other Unpaid Labor	474	072	584

b.

Paid Labor	Number of workers	Number of weeks per year	Hours per week code	Average dollars per week
				Dollars
Hired Manager	920	973	663	912
Full Time Hired Labor	737	485	619	752
	587	068	909	838
	061	439	656	989
Part Time Hired Labor	583	929	775	718
	039	988	877	593
	411	049	687	564
Seasonal Labor	753	188	536	730
	356	407	671	527
	456	649	981	720

Hours per Week Codes

1 = Less than 20 hours
2 = 20 to 39 hours
3 = 40 to 59 hours
4 = 60 to 80 hours
5 = Greater than 80 hours

C. ELECTRICAL SERVICE

Now I would like to look at your farm electric bills to obtain information about the type of service you have and electrical energy usage. [100]

1. For the last bill covering electrical usage in 1986, what was the: Office Use

   a. Billing period ending date _____ [179]

   b. Billing period starting date _____ [141]

2. Was the electrical usage on this bill (item 1) read or estimated?

   1 = Read
   2 = Estimated ..... Enter Code [199]

3. What is the billing frequency?

   ☐ Monthly - Complete lines 1-13 of Electrical Usage Table

   ☐ Bimonthly - Complete lines 1-7 of Electrical Usage Table

4. What rate type do you pay?

   ☐ Flat Rate - Complete column A of Table

   ☐ Demand Rate - Complete column B of Table

   ☐ Time-of-Use Rate - Complete column C of Table

   Office Use [146]

5. Electrical Usage Table

	A	B		C	
Billing Period (List Most Recent First)	Flat Rate	Demand Rate		Time-of-Use Rate	
				Off Peak	On Peak
	KWH	KWH	KW	KWH	KWH
1	120	128	178	166	149
2	175	125	192	126	136
3	197	124	119	148	105
4	152	113	102	171	150
5	123	109	110	129	174
6	165	104	157	138	160
7	161	106	167	122	176
8	118	185	187	194	153
9	140	195	173	117	111
10	155	147	158	137	163
11	181	164	112	168	183
12	115	169	103	127	114
13	107	172	121	143	151

Enumerator Note: Fill out a supplement for each additional electrical account.

C. ELECTRICAL SERVICE

6. What was your farm's total electrical bill in 1986? ..... $ 316

7. What is the amperage or amps of the electrical entrance to the main barn? ..... AMPS 448

8. Is a dwelling included on the farm meter?

☐ **YES** - Continue ☐ **NO** - Go to Section D

9. Now I need to get some information about the dwellings included on the farm electric meter.

	Dwelling #1	Dwelling #2	Dwelling #3
a. Type of dwelling (see codes)	530	644	789
b. Age of dwelling (see codes)	451	335	756
c. Total number of residents	673	862	707
Under two years old	415	744	885
2 to 5 years old	576	814	528
6 to 12 years old	491	239	642
13 to 17 years old	793	568	521
18 to 34 years old	608	670	686
35 to 61 years old	749	572	657
62 to 64 years old	778	713	423
65 years old and over	724	419	563
d. Number of floors	714	925	781
e. Number of rooms	847	961	935
f. Number of rooms closed off for winter	992	748	743
g. Heating system (see codes)	435	921	489
h. Main heating fuel (see codes)	772	467	680
i. Supplemental heating fuel (see codes)	605	872	390
j. Water heating (see fuel codes)	967	825	539
k. Age of water heating system	884	396	785
l. Cooking range fuel (see fuel codes) .	896	910	425

Dwelling Types

1 = Single Family
2 = Duplex
3 = Mobile home
4 = Other (Specify) _____

Dwelling Age

1 = < 2 years
2 = 2-4 years
3 = 5-7 years
4 = 8-20 years
5 = 21-40 years
6 = 41+ years

Heating System

1 = Electric baseboard
2 = Electric heat pump
3 = Forced hot air
4 = Steam
5 = Hot water
6 = Wood or coal stove
7 = Space/room heaters
8 = Other (Specify) _____

Fuel Codes

1 = Oil
2 = Natural Gas
3 = Bottled Gas
4 = Electricity
5 = Coal
6 = Wood
7 = Other (Specify) _____

C. ELECTRICAL SERVICE

The following questions refer to the primary residence on the farm electric meter.

10. How many of the following appliances do you have and use in your household?

	Number		Number
Frost Free Refrigerator ..	333	Dishwasher	976
Manual Defrost Refrigerator	432	Dehumidifier	786
Frost Free Freezer	823	Ceiling or Paddle Fan	452
Manual Defrost Freezer ...	455	Attic & Whole House Fan ..	955
Water Pump(home use only)	517	Portable Fan	806
Sump Pump	816	Portable Electric Heater .	464
Black & White Television .	674	Waterbed Heater	734
Color Television	946	Fireplace or Wood Stoves .	936
Video Cassette Recorder ..	859	Personal Computer	712
Clothes Washer	420	Microwave Oven	933

11. What type of clothes dryer do you have?

1 = Electric
2 = Natural Gas
3 = Bottled Gas
4 = None

..... Enter Code 629

12. For the home refrigerator that is used most often, what features does it have? (Enter "1" for each feature that applies)

	Yes = 1
Single door	776
Two doors, one above the other	808
Two doors, side by side	958
Automatic Ice Maker	747
Cold water or ice available through the door .	850
Frost Free refrigerator and freezer	177
Refrigerator only is frost free	746
Manual defrost	133

13. Which of the following energy conservation measures do you have in this home? (Code "1" next to all applicable conservation measures.)

	Yes = 1		Yes = 1
Wall Insulation	290	Low Flow Showerheads	196
Ceiling Insulation	802	Flow Restrictors on Faucets .	870
Basement & Subfloor Insulation	466	Storm Windows	403
Clock Thermostat	898	Double or Triple Glazed Windows	943
Insulation Blanket on Water Heater	582	Plastic Window Covers	846
Water Heater Pipe Insulation	418	Other (Specify _____) .	960

14. For each of the following that is used at this residence, what is the fuel type?

	Enter Code
Swimming pool heater	853
Sauna	783
Hot tub, spa or Jacuzzi	865

Fuel Code

1 = Electricity
2 = Gas
3 = Another Fuel

D. FIELD CROP PRODUCTION

1. During 1986, did you produce more than $1,000 worth of field crops?

☐ **YES** - Continue ☐ **NO** - Go to Section E

I would like to obtain information about your 1986 field crop production.

Crop	Acres Harvested	Yield per acre	Total Production	Unit Code
Corn for Grain — Ear Corn	131	751	132	617
Corn for Grain — Shelled Corn	134	817	135	965
Corn for Silage	139	433	142	620
Oats for Grain	388	983	391	684
Wheat for Grain	685	880	690	993
Dry Hay	286	944	289	857
Haylage or Green Chop	834	569	835	502
Dry Beans	230	509	233	495
Barley for Grain	006	496	011	084
Soybeans	628	996	631	863
Rye for Grain	473	860	476	952
Other Field Crops	897	773	899	803

Unit Codes

1 = Bushels
2 = Tons
3 = Pounds

E. FRUIT, VEGETABLE AND POTATO PRODUCTION

1. During 1986, did you produce more than $1,000 worth of fruit, vegetables or potatoes?

☐ **YES** - Continue ☐ **NO** - Go to Section F

2. I would like to obtain information about your 1986 fruit and vegetable production.

FRUIT

	Acreage of bearing age	Harvested Production	Unit Code
Apples	831	697	454
Grapes	761	742	401
Pears	108	705	867
Peaches	794	942	438
Tart Cherries	116	586	716
Sweet Cherries	558	757	881

Fruit Unit Codes

1 = Bushels
2 = Tons
3 = Pounds

Other fruits or berries for which you had sales in 1986.

Fruit/Berry	Acres

VEGETABLES

	Acres Harvested	Harvested production	Units	Lbs. per unit
Potatoes	421	232	180	950
Onions	585	799	488	493
Sweet Corn	819	565	407	459
	---	---	---	---
	---	---	---	---
	---	---	---	---

E. FRUIT, VEGETABLES AND POTATOES

3. Do you have any controlled atmosphere or refrigerated storage facilities?

☐ YES - Continue ☐ NO - Go to Question 4

SPECIAL PROCESSING EQUIPMENT

	Controlled Atmosphere				Refrigerated Storages			
	Building 1		Building 2		Storage 1		Storage 2	
Capacity	601 cu.ft.		386 cu.ft.		759 cu.ft.		978 cu.ft.	
Number of rooms.....	520		486		524		676	
Months in use (1986) Month emptied (code)	254		715		728		871	
Month filled (code) .	533		615		470		162	
Age ..... (Years)	790		611		839		590	
	653		901		562		417	
Compressors Number of compressors	518	745	471	941	589	288	723	655
Number of motors ...	652 .__	182 .__	829 .__	878 .__	994 .__	599 .__	453 .__	938 .__
Horsepower	580		591		507		588	
Evaporators Number of evaporators	156	647	727	472	851	739	928	282
Number of motors ...	511 .__	242 .__	505 .__	549 .__	477 .__	523 .__	913 .__	848 .__
Horsepower	889		956		990		638	
Usage Description .. 1 = Run in cycles 2 = Run continuously	630		424		526		826	
Condensers Number of condensers	672	844	735	765	574	721	659	762
Number of motors ...	301 .__	683 .__	500 .__	481 .__	398 .__	154 .__	632 .__	923 .__
Horsepower	462		529					
Atmosphere Generators Number of generators	854	688	616	876				
Number of motors ...	665 .__	915 .__	997 .__	541 .__				
Horsepower	216		570					
CO2 Scrubbers Number of scrubbers	911	733	815	732				
Number of motors ...	607 .__	522 .__	484 .__	949 .__				
Horsepower								

E. FRUIT, VEGETABLES AND POTATOES

4. Now I would like to list any other electrical processing equipment such as sorters, packers, washers, waxers or unloaders.

Equipment code	Number of motors	Size (H.P.)	Months Used (Circle Months)	Office Use	
832	482	902 .—	1 2 3 4 5 6 7 8 9 10 11 12	592	193
	750	545 .—		256	460
677	812	449 .—	1 2 3 4 5 6 7 8 9 10 11 12	330	931
	637	561 .—		874	693
430	519	830 .—	1 2 3 4 5 6 7 8 9 10 11 12	573	412
	291	516 .—		145	487
924	954	957 .—	1 2 3 4 5 6 7 8 9 10 11 12	270	377
	622	537 .—		861	689
461	770	760 .—	1 2 3 4 5 6 7 8 9 10 11 12	547	907
	344	621 .—		667	725
922	259	719 .—	1 2 3 4 5 6 7 8 9 10 11 12	362	277
	479	359 .—		490	244
189	763	431 .—	1 2 3 4 5 6 7 8 9 10 11 12	645	963
	429	566 .—		384	298
679	540	904 .—	1 2 3 4 5 6 7 8 9 10 11 12	820	969
	532	711 .—		610	738

Equipment Codes

1 = Sorter
2 = Packer/Bagger
3 = Washer
4 = Waxer
5 = Unloader
6 = Other (Specify) _____

5. Do you have an electric forklift?

☐ **YES** ↓

☐ **NO** - Go to Section F

a. What is the horsepower of your electric forklift? ..... Horsepower 626 .—

F. NURSERY AND GREENHOUSE

1. During 1986, did you have sales of nursery and greenhouse crops or turfgrass sod totaling more than $1,000?

☐ **YES** - Continue ☐ **NO** - Go to Section G

2. How many acres were used for outdoor nursery stock and sod production in 1986? (If None go to question 3.)

Outdoor Nursery Stock	Acres
a. Container grown nursery stock	577 .
b. Conventionally grown nursery stock	813 .
c. Turfgrass sod production	406 .
TOTAL ACRES	917 .

3. How many greenhouses do you operate? ..... Number 875
(If none, go to Section G.)

4. Complete the following table for your greenhouses reported above.

Greenhouses	Square Footage
a. Greenhouse area under single pane glass	634
b. Greenhouse area under double pane glass	354
c. Greenhouse area under permanent acrylics	492
d. Greenhouse area under polyethylene	144
TOTAL AREA COVERED	245

G. DAIRY

1. During 1986, did you have sales of milk or milk products totaling more than $1,000?

☐ **YES** - Continue ☐ **NO** - Go to Section H

2. Were you in the Dairy Whole Herd Buyout Program during 1986?

1 = Yes
2 = No
..... Enter Code [308]

3. How many months were you producing milk in 1986? ..... Number [414]

4. What was the average number of dairy stock on hand during 1986?

	Number
Total Milk Cows (Including Dry Cows)	[804]
Dairy Calves and Replacement Heifers	[934]

5. How many pounds of milk were sold from this farm in 1986? .....

LBS/DAY	or	TOTAL LBS in 1986
[731]		[661]

6. Now I need to ask about your daily milking schedule.

Milking	Starting Time (Military)	BARN 1 Milking Duration Hours:Minutes	BARN 2 Milking Duration Hours:Minutes	Office Use	
First	836	:	:	764	284
Second	410	:	:	927	498
Third	380	:	:	427	796

7. Were these cows milked in a parlor?

☐ **YES** - Continue ☐ **NO** - Go to Question 8

a. What type of parlor?
1 = Carousel
2 = Herringbone
3 = Polygon
4 = Side Opening
5 = Other (Specify _____)
..... Enter Code [499]

b. What is the age of the parlor? ..... Years [767]

c. How many stalls are in the parlor? ..... Number [882]

d. How many milking units are in the parlor? ..... Number [578]

G. DAIRY

e. What cow preparation method is used?

☐ Dry ↓

☐ Wet ↓

What temperature was the wet preparation?

1 - Tepid
2 - Cold
} ... Enter Code [613]

f. Is this operation equipped with automatic takeoff?

1 - Yes
2 - No
} .... Enter Code [858]

8. Does this operation milk in a barn equipped with an around the barn pipeline?

☐ **YES** - Continue ☐ **NO** - Go to Question 9

a. How many milking units are used? ..... Number [560]

9. Does this operation milk into buckets?

☐ **YES** - Continue ☐ **NO** - Go to Question 10

a. How many milking units are used? ..... Number [979]

b. Is there a milk transfer system used?
1 = Yes
2 = No
} ... Enter Code [633]

10. How often is milk picked up? ..... 1 = Daily, 2 = Every other day, 3 = Varies by season Code [726]

11. How many bulk tanks do you use? ..... Number [190]

NOTE: If NONE - Go to Question 12

a. What is the capacity and age of each tank? .....

	Gallons	Age
#1	339	513
#2	409	964
#3	636	706

G. DAIRY

12. What horsepower is your milker vacuum pump? ..... HP [777]

13. What horsepower is your milk transfer pump? ..... HP [534]

14. Do you use a precooler?

☐ **YES** ☐ **NO** - Continue

Indicate Type: 1 = Shell in Tube; 2 = Plate; 3 = Other Specify _____ .. Enter Code [971]

15. Do you have an inline cooler?

☐ **YES** - 15a. What horsepower is your inline cooler (Compressor/Ice Builder)? ..... HP [926]

☐ **NO** - Continue

16. Do you have a heat recovery system?

☐ **YES** - Continue ☐ **NO** - Go to Question 17

a. How many gallons are in your heat recovery system? .... Gallons [769]

b. What is the make and model of your system?

_____ Office Use [465]

c. What is the tempered water used for? _____ Office Use [280]

17. How much water is drawn for pipeline washing (per cycle)? . Gallons [494]

18. Now I need information on pipeline water use.

Indicate water temperature used for the following functions:

Water Temperature Codes: 1 = Hot; 2 = Tepid; 3 = Cold; 4 = None

	Enter Temperature Code
Pre Rinse	[807]
Wash	[968]
Rinse	[413]
Sanitize	[780]
Parlor Cleanup	[914]

G. DAIRY

19. What type and capacity of housing or confinement did this dairy operation have in 1986? (Complete table below.)

Structure (Specify)	Structure Code	Dairy Code	Capacity (Number of head)
	699	432	855
	811	664	918
	682	945	740
	758	436	510
	887	159	953
	704	296	370

Structure Code

1 = Stanchion or Tie Stall Barn
2 = Freestall Barn
3 = Loose Housing Barn

Dairy Codes

1 = Cows
2 = Calves & Heifers
3 = Combination

20. How many months were milking cows kept outside for more than 4 hours per day? ..... Months [293]

21. Have you ever used isoacid feed additives?

☐ **YES** - Continue ☐ **NO** - Go to Section H

a. When did you first use them?

_____ Month _____ Year Office Use [468]

b. Are you still using them?

1 = Yes
2 = No
} ..... Enter Code [692]

H. LIVESTOCK

1. During 1986, did you have sales of livestock (other than dairy or poultry) totaling more than $1,000?

☐ **YES** - Continue ☐ **NO** - Go to Section I

	Average Number During 1986	Number Sold in 1986
Beef Cows for Breeding	919	822
Beef Heifers for Breeding	531	916
Steers and Heifers for Market	754	695
Sows used for Breeding	908	559
Feeder Pigs	691	903
Market Hogs	852	262
Sheep and Lambs	639	864
Other Livestock _____	---	
_____	---	

OTHER LIVESTOCK (EXCLUDING DAIRY & POULTRY)

2. What type of housing or confinement did this operation have for livestock (other than dairy or poultry) in 1986?

Structure (Specify)	Structure Code	Livestock Code	Capacity (Number of head)
	698	231	741
	821	382	575
	708	598	977
	422	873	603

Structure Codes

1 = Confinement Barn
2 = Loose Housing Barn

Livestock Codes

1 = Beef
2 = Hogs
3 = Sheep and Lambs
4 = Other livestock
5 = Combination

I. POULTRY

1. During 1986, did you have sales of eggs totaling more than $1,000?

☐ **YES** - Continue ☐ **NO** - Go to Question 10

2. What was the average number of laying hens on hand during 1986? ..... Number [668]

3. How many eggs were sold in 1986? ..... Dozen [801]

4. How many poultry houses do you have? ..... Number [930]

5. What is the total capacity of your poultry houses? ..... Number of Birds [827]

6. Now I would like to ask you about your electrical **egg gatherers.** Check if None ☐

House Number (Optional)	Size (H.P.)	Starting Time (Military)	Hours per day
	771	334	869
	886	567	970
	635	809	641
	951	784	458
	826	612	332
	648	779	962
	966	643	805
	404	702	883

7. Now I would like to talk about your electrical **egg graders and washers.** Check if None ☐

House Number (Optional)	Equipment Code	Size (H.P.)
	755	972
	837	696
	906	833
	428	947
	791	542

Equipment Codes

1 = Egg grader
2 = Egg washer

I. POULTRY

8. Complete the following table for your egg cooling and storage facilities. Check if None ☐

	Cooler #1		Cooler #2	
Capacity	571 cu. ft.		544 cu. ft.	
Age ..... Years	624		940	
Compressors				
Number of compressors	845		389	
Number of motors	694	932	437	895
Horsepower	866 .___	678 .___	986 .___	546 .___
Evaporators				
Number of evaporators	191		792	
Number of motors	975	888	627	700
Horsepower	774 .___	982 .___	463 .___	849 .___
Condensers				
Number of condensers	681		991	
Number of motors	787	600	535	788
Horsepower	651 .___	710 .___	469 .___	675 .___

9. Do you have a heat recovery system?

1 = Yes
2 = No

..... Enter Code 170 ☐

10. During 1986, did you have sales of other poultry totaling more than $1,000?

☐ **YES** - Continue ☐ **NO** - Go to Section J

11. Now I would like to ask you about your other poultry.

	Number of Birds	
	Capacity	Quantity Sold 1986
Pullets	184	548
Broilers	795	623
Turkeys	939	525
Ducks	669	900

J. CROP AND FEED HANDLING

1. Do you have any electrical equipment for crop or feed handling? 999 1

☐ **YES** - Continue ☐ **NO** - Go to Section K

2. Now I would like to talk about your electrical feed or crop handling equipment.

Equipment Code	Number of Motors	Size H.P.	For Silo Unloaders Only: Feed or Material	Office Use
029	856	701 .__	798	
	416	478 .__		
768	766	625 .__	497	
	650	475 .__		
868	426	995 .__	483	
	331	504 .__		
937	047	050 .__	480	
	046	579 .__		
818	879	959 .__	234	
	405	508 .__		
538	543	810 .__	894	
	618	093 .__		
581	782	450 .__	584	
	474	072 .__		

Equipment Codes

1 = Silo Unloader
2 = Auger/Elevator
3 = Hammer Mill
4 = Roller Mill
5 = Feeder
6 = Electric Blower
7 = Hay Dryers
8 = Grain Dryers
9 = Feeding Carts
10 = Other Electrical

Feed Codes for Silo Unloaders

1 = Haylage and Hay Silage
2 = Corn Silage
3 = High Moisture Corn

3. What is the maximum number of silo unloaders that were used at any one time in 1986? ..... Number 920

Enumerator: Was electrical feed handling equipment listed?

☐ **YES** - Continue ☐ **NO** - Go to Section K

4. What times each day do you begin using electric feeding equipment? (Enter time in military time.)

1	2	3	4
973	663	912	737

5	6	7	8
485	619	752	587

K. MANURE HANDLING SYSTEMS

1. **Enumerator:** Were dairy, livestock or poultry reported earlier?

☐ **YES** - Continue ☐ **NO** - Go to Section L

2. Is manure handled with electrical equipment?

☐ **YES** - Continue ☐ **NO** - Go to Section L

3. Now I would like to ask about your electrical manure handling equipment & its usage.

Type of Equipment	Number	Horsepower	Starting Time (Military)
Manure Collection Equipment Gutter Cleaner	068	909 .__	838
	061	439 .__	656
Alley Scraper	989	583 .__	929
	775	718 .__	039
Manure Loading Equipment Stacker	988	877 .__	593
Ram Pump	411	049 .__	687
Compressed Air	564	753 .__	188
Manure Mixing Equipment Mixer	536	730 .__	356
Oxidation Wheel	408	671 .__	527
Manure Unloading Equipment Pump	456	649 .__	981

Enumerator Note: If manure is not stored, go to Section L.

4. What form is manure stored in?

1 = Solid
2 = Semi-solid
3 = Liquid
4 = More than 1 form

..... Enter Code [720]

5. What type of storage facility is used?

1 = Above ground tank
2 = Below ground tank
3 = Lagoon
4 = Oxidation Ditch
5 = Other _____

..... Enter Code [100]

6. How many months capacity is in your storage facility? ..... Months [179]

7. During which season is manure unloading done?

1 = Spring
2 = Summer
3 = Fall
4 = Winter
5 = Year Round
6 = Other Combination

..... Enter Code [141]

L. WATER SYSTEMS

1. Do you have any non-household water heaters?

☐ **YES** - Complete table ☐ **NO** - Go to Question 2

Heater	Capacity (Gallons)	Fuel Code	Age (Years)
#1	199	146	120
#2	175	197	152
#3	123	165	161

Fuel Codes

1 = Oil
2 = Natural Gas
3 = Bottled Gas
4 = Electric
5 = Other _____

2. Do you have any heated livestock waterers?

☐ **YES** - How many? ..... Number [118]

☐ NO - Continue

3. Do you have your own water system?

☐ **YES** - Continue ☐ **NO** - Go to Question 5

4. I would like the following information for each of your water sources. (wells, springs, surface water)
Enumerator Note: For springs and surface water ignore depth question.

Source	Pump Horsepower	Flowrate (G.P.M.)	Well Depth (Feet)
#1	140	155	181
#2	115	107	128
#3	125	124	113

5. Did you irrigate in 1986?

☐ **YES** - Continue ☐ **NO** - Go to Section M

a. How many acres did you irrigate in 1986? ..... Acres [109]

b. What powers your irrigation pump?

1 = Diesel
2 = Electric ..... Enter Code [104]
3 = Other

Enumerator: If no electric irrigation pumps go to Section M

c. What size is your largest electric irrigation pump? ..... HP [106]

M. VENTILATION, HEATING, AND OTHER ELECTRICAL EQUIPMENT

1. Now I would like to ask you about your (non-household) ventilation and electric heating systems.

Equipment	Size	Total Number	Number that are high efficiency	Enterprise Code	Control Code	Age
Ventilation Fans	HP .__	185	195	147	164	169
Fans	HP .__	172	178	192	119	102
Fans	HP .__	110	157	167	187	173
Fans	HP .__	158	112	103	121	166
Heating Electric Heater	Watts	126		148		171
Electric Heater	Watts	129		138		122

Enterprise Code

1 = Dairy
2 = Poultry
3 = Other Livestock
4 = Fruit, Vegetables, Potatoes
5 = Greenhouse
6 = Other

Control Codes

1 = Manual
2 = Automatic

2. Other electrical equipment

How many of the following items do you have?

	Number
Tractor Block Heaters	194
Electric Welders	117
Air Compressors	137
Other (Specify)	
_____	---
_____	---
_____	---

N. NON-HOUSEHOLD LIGHTING

1. Now I would like to ask you about the electric lighting in each of your farm buildings.

   NOTE: (Include only major uses of lights)

Utilization Code	Bulb Type	Watts per Bulb	Number of Bulbs	POULTRY ONLY Schedule of Use	
				Starting (Military)	Hours / Day
168	127	143	149	136	105
150	174	160	176	153	111
163	183	114	151	200	279
241	299	246	220	275	297
252	223	265	261	218	240
255	281	215	207	228	225
224	213	209	204	206	285
295	247	264	269	272	278
292	219	202	210	257	267
287	273	258	212	203	221
266	226	248	271	229	238
222	294	217	237	268	227
243	249	236	205	250	274
260	276	253	211	263	283
214	251	300	379	341	399

Utilization Codes

1 = Dairy Main Barn
2 = Milking Parlor
3 = Milk Room
4 = Poultry Building
5 = Other Livestock
6 = Fruit or Vegetable Storage
7 = Nursery or Greenhouse
8 = Outdoor Security Lights
9 = Other

Bulb Types

1 = Incandescent
2 = Flourescent
3 = High Pressure Sodium
4 = Low Pressure Sodium
5 = Metal Halide
6 = Mercury Vapor

O. MANAGEMENT PRACTICES

Enumerator Note: The following frequency codes will be used throughout this section:

Frequency Codes

1 = Weekly
2 = Monthly
3 = Quarterly
4 = Annually
5 = Not used

1. Do you prepare or have prepared for you an income statement?

☐ **YES** - Continue ☐ **NO** - Go to Question 2

a. How often do you use an income statement? ..... Frequency Code [346]

b. Does your income statement include:

	1=Yes 2=No
Changes in inventory	[320]
Changes in accounts receivable	[375]
Changes in accounts payable	[397]

2. Do you prepare or have prepared for you a balance sheet?

☐ **YES** - Continue ☐ **NO** - Go to Question 3

a. How often do you use a balance sheet? ..... Frequency Code [352]

3. **Enumerator**: Were crops, vegetables, fruit or nursery reported earlier?

☐ **YES** - Continue ☐ **NO** - Go to Question 7

4. Do you keep production records for your crops?

☐ **YES** - Continue ☐ **NO** - Go to Question 7

5. Where do you keep these records?

1 = Computer
2 = Specialized Record Keeping Forms
3 = Piece of Paper or Plain Notebook

..... Enter Code [323]

6. Please indicate how often you use the following records:

	Frequency Code
Production per acre	[365]
Production for individual field or block	[361]
Cost of production	[318]

O. MANAGEMENT PRACTICES

7. **Enumerator:** Were dairy or beef cattle reported earlier?

☐ **YES** - Continue ☐ **NO** - Go to Question 11

8. Do you keep herd records?

☐ **YES** - Continue ☐ **NO** - Go to Question 11

9. Where do you keep these records?

1 = Computer
2 = Specialized Record Keeping Forms
3 = Piece of Paper or Plain Notebook

..... Enter Code [340]

10. Please indicate how often you use the following records:

	Enter Code
Herd productivity records	[355]
Individual cow records	[381]
Herd health records	[315]

Frequency Codes

1 = Weekly
2 = Monthly
3 = Quarterly
4 = Annually
5 = Not Used

	1=Yes 2=No
11. Do you routinely call or obtain price quotes from 2 or more firms for major purchases such as feed, fertilizer and chemicals? ...	[307]
12. Do you routinely track the current market prices of the major commodities you sell?	[328]
13. Do you write down short term goals (less than 1 year) and compare actual performance to those goals?	[325]
14. Do you periodically review and change as appropriate the management responsibilities of yourself (the operator), family members, and/or hired employees?	[324]

15. What is the horsepower of the largest tractor used on your farm in 1986? ..... HP [313]

P. FARM INCOME AND EXPENSES

1. What were your total gross receipts for agricultural products sold during 1986 (include CCC forfeitures and government payments)? .... $ [309]

2. Please indicate the percent of receipts or actual receipts for each of the following categories.

TYPE OF OPERATION	COMMODITIES INCLUDED	TOTAL RECEIPTS DOLLARS (or) PERCENT	
Crops	Corn, Small Grains, Soybeans, Dry Edible Beans, Hay	304	306
Horticulture	Nursery and Greenhouse Products	385	395
Grapes	Grapes	347	364
Fruit	Tree Fruit, Other Small Fruit, and Berries	369	372
Vegetables	All Vegetables, Melon Crop, and Strawberries	378	392
Potatoes	Potatoes	319	302
Dairy	Milk and Cream, Sales of Dairy Cows, Heifers, and Dairy Bulls	310	357
Poultry	Chickens, Eggs, Turkeys, Ducks and Other Poultry	367	387
Other Livestock	Cattle, Calves, Hogs, Sheep, Goats Wool and Mohair	373	358
Miscellaneous	Government Payments, Custom Work, Horses, Ponies, Bees and Honey, Maple Syrup	312	303
	TOTAL	321	100%

Enumerator: If actual receipts reported verify total with item 1

3. What were total farm expenses (including interest paid) in 1986? .. $ [366]

   a. Of the above expenses, what was the interest expense? ..... $ [326]

4. What was your total nonfarm income in 1986? ..... $ [348]

Enumerator

1 = Records used
2 = Estimated

..... Enter Code [371]

P. FARM INCOME AND EXPENSES

5. How did your 1986 farm and non-farm income compare with 1985 and 1980? (Enter codes from table below)

	1985	1980
Net Cash Farm Income	329	322
Non-Farm Income	338	394

CODES

1 = Larger by 50% or more
2 = Larger by 10-50%
3 = Same (± 10%)
4 = Smaller by 10-50%
5 = Smaller by 50% or more

6. How do you expect your 1990 farm and non-farm income to compare with your 1986 farm and non-farm income? (Enter codes from table)

	1990
Net Cash Farm Income	317
Non-Farm Income	337

7. Now I need to ask you about major changes in your operation from January 1, 1986 to January 1, 1987. (Report changes only if greater than $3,000)

	Dollar Value Change
a. Estimate the changes in the value of your inventory between January 1, 1986 and January 1, 1987	--- ±
b. Estimate the change in the value of your accounts payable between January 1, 1986 and January 1, 1987	--- ±
c. Estimate the change in the value of your accounts receivable between January 1, 1986 and January 1, 1987	--- ±

Q. CAPITAL ASSETS AND INVESTMENTS

1. Please report the current asset value and outstanding debt for real estate and non-real estate property owned by this operation on January 1, 1987.

January 1, 1987

	Value $	Outstanding Debt $
Real Estate		
a. Farmland, buildings and improvements	350	374
b. Personal residence if not included in a. above	360	376
Non-Real Estate		
c. Machinery and equipment	353	311
d. Livestock	363	383
e. Crops stored on or off the farm (include crops under CCC loans)	314	351
f. Feed, fertilizer, seed, veterinary and other supplies	316	448
g. Accounts receivable	530	
h. Personal assets, autos, savings, etc.	451	673
i. Other debt, unsecured family loans, etc.		415

2. Then the total value of your assets and your outstanding debts is (Sum of each column) .....

576	491

Is that correct?

☐ **YES** - Continue ☐ **NO** - Make corrections and continue

Q. CAPITAL ASSETS AND INVESTMENTS

3. Did you borrow money for the farm business in 1986?

☐ **YES** - Go to question 3a ☐ **NO** - Go to question 3b

Credit Source Codes

1 = Farmers Home Administration
2 = Commercial Bank
3 = Production Credit Association
4 = Federal Land Bank
5 = Insurance Company
6 = Dealer
7 = Manufacturer
8 = Relatives
9 = Other _____
10 = Never Borrow

a. Please list the two major credit sources you used:

1. _____
2. _____

Enter Codes [793] [608]

b. What sources would you have borrowed money from in 1986 if it had been necessary to do so:

1. _____
2. _____

Enter Codes [749] [778]

4. Compared to other farmers are you: (Indicate only one)

☐ More likely to choose a capital investment with anticipated high profits but with the possibility of high loss .. 1

☐ More likely to choose a capital investment with anticipated lower profits but less chance of loss ... 2

Enter Code [724]

Enumerator: If respondent replies "neither" enter code '3'.

Q. CAPITAL ASSETS AND INVESTMENTS

5. Was there an expansion on this farm from 1980 to 1986?

Yes = 1

☐ **YES** - Continue

Was there more than 1 expansion during 1980-86? .. 714 [ ]

☐ **NO** - Go to Question 8

6. Now I would like to ask you about your most recent expansion.

a. What type of expansion occurred? _____

b. What year did the expansion occur? ..... 847 [ ]

c. What was the primary enterprise that was involved in the expansion? ..... Enter Code 992 [ ]

Enterprise Code

1 = Dairy
2 = Poultry
3 = Other Livestock
4 = Greenhouse
5 = Fruit, vegetables, potatoes
6 = Crops
7 = Other _____

d. For the above investment, how much was spent on:

	Dollars
Farm real estate	453 [ ]
Buildings and Structures	772 [ ]
Livestock	605 [ ]
Machinery & Equipment (Include value of trade-in)	967 [ ]
Then the total cost of the expansion was	884 [ ]

Q. CAPITAL ASSETS AND INVESTMENTS

7. Now I would like to ask you the following questions about your decision to make this expansion.

a. What sources of information were most important in deciding to make this expansion?

	Code
Most Important Source ..	896
Second Most Important ..	644
Third Most Important ...	335

Source Codes

1 = Salesperson/manuf. lit.
2 = Paper or magazine article
3 = Cooperative Extension Service
4 = Lender
5 = Consultant
6 = Other producers
7 = Advertisements
8 = Other: _____

b. Was financing used to make this particular expansion?

☐ **YES** - What was the interest rate? ..... % 862 .

☐ **NO** - Would you have made this expansion if financing had been necessary?

1 = Yes
2 = No
} ..... Enter Code 744

c. Were tax calculations made when deciding to make this expansion?

1 = Yes
2 = No
} ..... Enter Code 814

d. Was your decision to make this particular expansion based on: (Check one) ..... Enter Code 239

☐ 1 = Written calculations

Source of Calculations (1=Yes)		Calculations Used (1=Yes)	
Own calculations	568	Partial budget	961
Extension agent	670	Cash flow analysis	748
Lender	572	Payback period	921
Salesman/manufacturer .	713	Net present value or internal rate of return .	467
Hired consultant	419		
Other: _____ .	925	None of the above	872

NOTE: Go to Question 8 after completing items for written calculations.

☐ 2 = Mental calculations of profitability or benefits - Go to Question 8

☐ 3 = Past experience - Go to Question 8

Q. CAPITAL ASSETS AND INVESTMENTS

8. Estimate the value of investments made in 1985 and 1986 for the following categories:

Category	Dollars	
	1985	1986
Farm Real Estate	825	396
Land Improvements	910	789
Buildings	756	707
Livestock	885	528
Total Machinery and Equipment	642	521

9. Now I would like to ask you about some specific farm assets that you have on this farm.

Investment	Age of Newest Item	Purchases in 1985 - 1986				
		Dollars Invested		Purchased 1=New 2=Used	Reason for Purchase 1=replacement 2=expansion 3=efficiency	Age of item replaced, (when applicable)
		1985	1986			
Category A						
Silos	686	657	423	563	781	935
Tractors	743	489	680	390	539	785
Self propelled harvesters	425	333	432	823	455	517
Self propelled windrower	816	674	946	859	420	976
Air blast sprayer	786	452	955	806	464	734
Category B	936	712	933	629	776	808
Manure spreader	958	747	850	177	746	133
Silo unloader	290	802	466	898	582	418
Weed sprayer	196	870	403	943	846	960
Cultivator	853	783	865	131	751	132
Chisel plow	617	134	817	135	965	139
Blowers						

Enumerator Note: Choose the first investment item (from top to bottom) from Category A and Category B. These investments will be referred to as Investment A and Investment B on the next page.

Investment A: _____

Investment B: _____

Q. CAPITAL ASSETS AND INVESTMENTS

Enumerator: Complete the questions on this page for Investment A, then repeat for Investment B.

10. Now I would like to ask some questions about your decision to make this investment (Investment A or B.)

a. What sources of information were most important in deciding to make this investment?

Code

	A	B
Most Important Source ..	433	388
Second Most Important ..	142	983
Third Most Important ...	620	391

Source Codes

1 = Salesperson/manuf. lit.
2 = Paper or magazine article
3 = Cooperative Extension Service
4 = Lender
5 = Consultant
6 = Other producers
7 = Advertisements
8 = Other: _____

b. Was financing used to make this particular expansion?

☐ **YES** - What was the interest rate? ..... %

A	B
684 .	685 .

☐ **NO** - Would you have made this investment if financing had been necessary?

1 = Yes
2 = No
} ..... Enter Code

A	B
880	690

c. Were tax calculations made when deciding to make this investment?

1 = Yes
2 = No
} ..... Enter Code

A	B
993	286

d. Was your decision to make this particular investment based on: (Check one) ..... Enter Code

A	B
944	289

☐ 1 = Written calculations

Source of Calculations (1=Yes)

	A	B
Own calculations ...	857	834
Extension agent	569	835
Lender	502	230
Salesman/manufacturer	509	233
Hired consultant ...	495	006
Other: _____ .	496	011

Calculations Used (1=Yes)

	A	B
Partial budget	084	628
Cash flow analysis ...	996	631
Payback period	863	473
Net present value or internal rate of return	860	476
None of the above	952	897

☐ 2 = Mental calculations of profitability or benefits - Complete Investment B questions or go to back page.

☐ 3 = Past experience - Complete Investment B questions or go to back page.

Thank you for your cooperation with this survey.

Would you like a copy of the results? **YES** = 1 Enter Code 099

Enumerator _____

Interview Date _____

Completion Code 1. Completed 2. Non-Farm 3. Refusal 4. Inaccessible	
Completion Code	001
Ending Time	003
Enumerator	098

APPENDIX B

List Frame of Farm Operators

The sampling frame for this study defines a list of farm operators from Upstate New York counties as the target population for the study. The farm list for this study was assembled by the New York State Agricultural Statistics Service.[1] The list contains names and addresses of farm operators, along with control data on type and size of farm enterprises. The availability of such a comprehensive list of farm operations with control data allow the use of efficient sampling procedures to capture rare enterprise occurrences and to account for the variability in size of New York farms.

Constructing and maintaining a relatively complete, current and unduplicated list of farm operators is a difficult task. A standard system of maintaining the list has been in use across the U.S. since 1976 by the National Agricultural Statistics Service (NASS). A statistical decision model is used by the Service to reduce the probability of list duplication. Control data are updated for each farm operation in approximately one of every three years. Constant updates of control data are critical to maintain sampling efficiency.

Sample Stratification

The stratification plan was based on the structure of the New York farm sector. Primary stratification was by enterprise type, secondary stratification was by value of gross receipts, and geographical substratification was developed for dairy farms. Final delineation of strata involves a total of 31 cells (appendix B, table 1).

Stratification by Enterprise Type

Because of enterprise diversity, farm type is commonly controlled when data are assembled for analysis of production agriculture. Early studies of electrical energy use on New York farms (Bucknam, 1929; Keepper, 1938; and Stippler and Peterson, 1945) also classified farms by type to isolate differences in electrical use patterns and electrical equipment clusters on farms. Stratification produces the greatest gains in sampling efficiency when variance between strata means is maximized (which simultaneously minimizes variance within strata). Clearly, differences between average electric expense across farm type should produce gains in sampling efficiency. Equipment clusters were also expected to be similar within farm enterprise type.

Unfortunately, many farms in the sampling universe are multiproduct firms. Thus, a decision rule is needed to classify farms by type. Two alternatives were considered:

[1] The New York State Agricultural Statistics Service is the branch of the National Agricultural Statistics Service, USDA.

Appendix B, Table 1. Stratified random sample cells and distribution of target population proportions by strata

				Percent of farms
1.	Poultry	a.	$10,000-$99,999	.28
		b.	$100,000-$249,999	.17
		c.	$250,000+	.26
2.	Vegetable	a.	$10,000-$99,999	2.99
		b.	$100,000-$249,999	1.42
		c.	$250,000+	1.12
3.	Grapes	a.	$10,000-$99,999	1.81
		b.	$100,000+	.25
4.	Tree fruit	a.	$10,000-$99,999	1.34
		b.	$100,000+	.52
5.	Horticulture	a.	$10,000-$99,999	.83
		b.	$100,000+	.30
6.	Dairy	a.	$10,000-$99,999	
			i. Eastern	3.94
			ii. Southern Tier	10.18
			iii. Western Plains	5.76
			iv. Northern	9.62
		b.	$100,000-$249,999	
			i. Eastern	4.01
			ii. Southern Tier	8.36
			iii. Western Plains	7.02
			iv. Northern	10.38
		c.	$250,000-$499,999	
			i. Eastern	.71
			ii. Southern Tier	1.01
			iii. Western Plains	1.92
			iv. Northern	1.18
		d.	$500,000+	.92
7.	Other livestock	a.	$10,000-$99,999	11.56
		b.	$100,000-$249,999	.67
		c.	$250,000+	.09
8.	Other crops	a.	$10,000-$99,999	8.67
		b.	$100,000-$249,999	.54
		c.	$250,000+	.13
9.	Miscellaneous	a.	$10,000-$99,999	2.01
		b.	$100,000+	.06

Source: Unpublished data, New York Agricultural Statistics Service.

(1) Stratification based on Standard Industrial Classification (SIC) code. Classification is based on the agricultural commodity which returns the majority of cash receipts for a given calendar year. Size of enterprise is the decision point for allocating farms to one, and only one, strata.

(2) Stratification based on appearance rather than on dominance of enterprise (acreage or number of livestock) for each farm on the list frame. The farm population for each strata is allocated in a sequential manner, starting with the agricultural commodity having the rarest occurrence in the farm universe.

The sequential approach was used in this study. This procedure conforms to standard NYASS procedures for list frame selection. It makes optimum use of the control data available for each element in the list frame. The sequential selection order for this survey was:

(a) poultry;
(b) vegetables;
(c) grapes;
(d) tree fruit;
(e) horticultural products;
(f) dairy;
(g) other livestock;
(h) other crops[2];
(i) miscellaneous.

When establishing strata population domains, the hierarchy of the selection order placed each farm operation in one, and only one, strata. For example, a farm with a combination of dairy cattle, vegetable acreage, and grape acreage was allocated to the first strata on the list from which production from an enterprise generated $1,000 or more of gross sales on the farm. In this case, the farm was placed in the vegetable strata population regardless of relative sizes of the three enterprises.

Deciding the relative merit of these alternatives largely depends on the quantity and quality of information available for the target population. Control data was limited for the NYASS list frame. Year-to-year changes in relative prices and production of various commodities greatly reduce the utility of maintaining SIC codes for list units. Thus, SIC codes are not a part of the list frame record. Approximation of SIC codes was possible, however, with estimated yields (production/unit) and prices. Mean yield data were adequate for aggregate estimates of production but were considered inadequate for sample selection, which required accurate allocation of individual farms to appropriate strata. Control data were available to classify by the inventory of production units. For many agricultural commodities, distribution of farms classified by SIC code closely mirror farms classified by production units. Farm operations were

[2] Strata h and i were residual cells. Other crops are farms producing grains or field crops. Miscellaneous farms are all those from the list not classified into another stratum.

stratified by method 2 because of the lack of control data needed for accurate SIC coding of farms on the list frame.

Substratification by Size of Farm Operation

Stratification by a measure of farm size was chosen to further increase sampling efficiency. Size of the farm is an important determinant of farm electrical consumption. Stratifying farms based on past electrical consumption was considered, but control data were unavailable. However, gross farm receipts were chosen as a very good proxy variable for stratification, based on farm electrical consumption. Historical data from the Economic Research Service (ERS) of the United States Department of Agriculture (USDA) aggregated to the state level show that gross farm receipts were highly correlated with farm electrical expenses ($r = .977$).

Another reason to stratify based on farm size is that certain production technologies and, hence, configurations of electric-using appliances, are correlated with farm size. Milking parlors, automated poultry housing and controlled atmosphere storage are a few examples of the equipment items which occur more frequently on larger farms.

Geographic Substrata for Farms Producing Dairy Products

Dairy production dominates Upstate New York agriculture. To generate additional sampling precision, the dairy strata were substratified into four geographic regions (figure 1). The regions chosen follow county boundaries but reflect soil and climatic differences within the Upstate area. Cell population counts were obtained from NYASS and a plan to allocate the sample across strata was devised.

Allocation of Sample into Strata

Two methods of sample allocation were considered: proportional to farm number,[3] and a modified Neyman allocation which optimizes the sample according to mean farm size within strata. The final sample allocation chosen was the modified Neyman sample.

Samples with optimal allocation for farm size, as measured by gross farm receipts, should produce gains in precision for variables highly

---

[3] Samples allocated proportionally by farm number have equal sampling fractions in all strata. Given by:

$$\frac{n_i}{N_i} = \frac{n}{N} \quad \text{for all } i.$$

This distribution would produce a self-weighting sample, and population estimates are made without weighted adjustments. Samples allocated proportionally should produce efficient estimates of variables highly correlated with farm numbers and are always as precise as with a simple random sample.

correlated with farm size. Distribution of farms from such allocation are proportioned according to aggregate gross receipts per stratum. Total electrical expense, commodity production and farm investment have historically been highly correlated with gross farm receipts. The first optimal allocation considered was the Neyman allocation:[4]

$$n_i = \frac{N_i S_i}{\sum_{i=1}^{31} N_i S_i} n,$$

where S_i = standard error of per farm gross receipts per strata. Estimates of population means and totals will include a weighting factor (N_i/n_i) for each observation to calculate a weighted estimate. Notice from the equation that under this approach strata that have the most variance in gross receipts will be oversampled. To obtain an unbiased and precise estimate from the Neyman allocation, stratum variance must be known. Unfortunately, there were no control data which could be used to determine a useful estimate of stratum variance for this study. Without prior knowledge of stratum variance, a well-intended analyst may reduce sampling efficiency when disproportionate sampling is introduced.

Because strata variance was unknown, it was assumed that standard error was proportionate to the mean farm size per stratum.[5] Then an approximation of the Neyman allocation was given by:

$$n_i = n \frac{Y_i}{Y}$$

where Y = aggregate gross farm receipts for target population;
Y_i = aggregate gross farm receipts for the i^{th} stratum;

and notice:

$$\frac{n_i}{N_i} = \bar{Y}_i \frac{n}{Y}$$

where

$$\bar{Y}_i = \frac{Y_i}{N_i} .$$

With this allocation, each unit's probability of selection was approximately proportionate to mean farm size. Thus, large and relatively rare occurrence farms were selected at a higher rate than with a proportional allocation. As a practical constraint, no more than 50 percent of the target population from any strata were selected in the sample.[6] Distribution

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[4] From Hansen, *Sample Survey Methods and Theory*, page 209.

[5] From Hansen, *Sample Survey Methods and Theory, Volume 1*, page 215.

[6] Because the list frame maintained by NYASS is used for continued survey work, efforts were made to reduce target population survey fatigue.

of the target population by final sample design are shown in appendix B, table 1.

A final sample size of 1800 farm operations was selected to obtain statistically reliable estimates from most survey questions for the target population and subpopulations. Budgetary constraints placed a practical upper bound on sample size.

Appendix B, table 2 shows the distribution of the selected sample, completed surveys, nonfarm respondents, and appropriate strata weight. Seventy-four percent of those contacted provided information about their farm operation. There were 1068 completed farm interviews, and 270 classified as nonfarms. The weight assigned to each sample farm can be interpreted as the number of farms it represents in the target population.[7] Nonfarm respondents represent the portion of the sample not meeting the required definition of a farm. The occurrence of nonfarms in the selected sample was primarily due to changes in farm operations since list frame control data were gathered. The strata with the greatest proportions of nonfarm respondents were the small farms from the more general categories of other livestock, other crops and miscellaneous.

The use of a disproportionate stratified random sample proved satisfactory in meeting overall study objectives. The sample design obtained a disproportionate number of rare occurrence farms, which enabled other study group members to model farm structure in greater detail than most previous studies. Also, the estimates of the standard error for many variables appear to be quite small, indicating the expected increases in precision over a simple random sample design. The major drawback of the disproportionate stratified random sample design was the additional computations needed to calculate the desired statistics. This problem has been largely overcome by the choice of SAS as the major analytical software. The SAS software incorporates a weight statement as part of each subroutine to calculate the desired statistics.

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[7] The strata weight W_j was calculated as follows:

$$W_j = \frac{T_j}{C_j + R_j}$$

where T_j = number of target population farms from the j^{th} strata;
C_j = number of completed interviews from the j^{th} strata;
R_j = number of nonfarm respondents from the j^{th} strata.

Appendix B, Table 2. Selected sample, completed surveys, and nonfarm respondents by strata

Enterprise type	Gross receipts	Selected sample	Completed surveys	Nonfarm respondents	Strata weight[a]
Egg producers	$10,000-$99,999	21	11	5	3.563
	$100,000-$249,999	18	13	2	2.400
	$250,000+	26	14	0	3.786
Vegetables and potatoes	$10,000-$99,999	25	17	4	29.476
	$100,000-$249,999	40	25	2	10.889
	$250,000+	105	69	6	3.093
Grapes	$10,000-$99,999	37	15	9	15.625
	$100,000+	23	16	1	3.059
Tree fruit	$10,000-$99,999	25	9	6	18.533
	$100,000+	35	17	2	5.632
Horticulture	$10,000-$99,999	25	15	4	9.105
	$100,000+	30	20	3	2.696
Dairy	$10,000-$99,999				
	i. Eastern	45	24	14	21.474
	ii. Southern Tier	75	39	28	31.493
	iii. Western Plains	55	26	15	29.098
	iv. Northern	72	23	19	47.452
	$100,000-$249,999				
	i. Eastern	85	62	9	11.704
	ii. Southern Tier	160	119	11	13.323
	iii. Western Plains	140	94	15	13.339
	iv. Northern	200	120	18	15.587

- continued -

Appendix B, Table 2. Selected sample, completed surveys, and nonfarm respondents by strata (continued)

Strata	Gross receipts interval	Selected sample	Completed surveys	Nonfarm respondents	Strata weight[a]
Dairy (cont.)	$250,000-$499,999				
	i. Eastern	48	34	6	3.700
	ii. Southern Tier	50	42	0	5.000
	iii. Western Plains	80	52	4	6.845
	iv. Northern	55	35	7	5.810
	$500,000+	95	63	6	2.754
Other livestock	$10,000-$99,999	50	21	23	54.455
	$100,000-$249,999	32	16	0	8.176
	$250,000+	8	5	0	3.000
Other crops	$10,000-$99,999	45	12	22	52.824
	$100,000-$249,999	33	16	2	6.222
	$250,000+	12	9	0	2.889
Miscellaneous	$10,000-$99,999	45	11	26	11.270
	$100,000+	5	3	1	3.250
Total		1,800	1,068	270	15.454

[a] The strata weight W_j was calculated as follows:

$$W_j = \frac{T_j}{C_j + R_j}$$

where T_j = number of target population farms from the j^{th} strata;
C_j = number of completed interviews from the j^{th} strata;
R_j = number of nonfarm respondents from the j^{th} strata.

Thus, for the first strata, a weight of 3.563 indicates that each completed interview farm represents 3.563 farms in the target population.

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