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**AN ANALYSIS OF  
THE INVESTMENT RELATED CHARACTERISTICS  
OF NEW YORK FARMERS**

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### **Abstract**

Data from a random sample of Upstate New York commercial farms (over \$10,000 gross sales) were used to identify investment related characteristics, investigate the relationship between these characteristics and level of investment, and study the investment decision making process of farmers. Average annual farmer investment in machinery and equipment exceed that for other types of assets. Average age at replacement exceed IRS normal service lives for most assets. Age, education, risk tolerance, goals, management ability and farm size were related to net (expansion) investment; income expectations, urban proximity and interest rate were not. Written calculations were made for only 31 percent of the expansion investments farmers made. Other farmers, salesmen and lenders were the most important external information sources used to evaluate investments.

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*Eddy L. LaDue and Joseph H. Kwiatkowski\**

**Introduction**

New York farmers have approximately \$2.5 billion invested in farm buildings (USDA, June 1988), and another \$1.6 billion invested in machinery and equipment (USDA, November 1988). Of this \$4.1 billion investment, the USDA estimates that nearly 10 percent is consumed by economic depreciation and must be replaced annually for the level of investment to be maintained<sup>1</sup>. At the individual farm level, New York dairy farms participating in Cornell's Dairy Farm Business Summary project experienced average annual machinery investments of \$13,000 to \$17,000 and real estate investments of \$10,000 to \$16,000 per year during the 1979-83 period. Even during the financially stressed period of 1984-87, average investment on these farms was approximately \$13,000 for machinery and \$11,000 for real estate (Smith, Knoblauch and Putnam 1988, and prior issues).

Capital investment of this magnitude has important ramifications for the state economy in that variations in investment could materially influence the level of economic activity. It is particularly important for firms that provide services for farmers, such as agricultural suppliers and lenders. Investment in agriculture will induce changes in the types of products, technology and services that are demanded by farmers. Understanding the relationship between farmer characteristics and investment and the process of investment decision making should contribute to improving market efficiency in the agricultural sector.

Purpose of This Publication

The purpose of this publication is to: (1) provide information on the investment related characteristics of New York farms and farmers, (2) determine the basic relationships between these characteristics and the level of investment which can be observed with simple tabular methodology, and (3) investigate the investment decision making process of farmers. The selection of investment behavior variables studied in this analysis was based on the literature review of LaDue and Brase and the investment model developed in LaDue, Miller and Kwiatkowski. The analysis presented is designed to provide a better understanding of the relationship between farm operator characteristics and investment and to provide a base for investigations of investment behavior using more complex behavioral models and more sophisticated analysis techniques.

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- \* The authors are Professor and Research Support Specialist, Department of Agricultural Economics, Cornell University. Helpful comments by Robert Milligan and Michael Kelleher on an earlier draft are gratefully acknowledged. Partial support for this research was provided by the Niagara Mohawk Power Corporation, Syracuse, NY.

<sup>1</sup> The rate of capital consumption estimated by the USDA (USDA, November 1988, Table 4) divided by the total value of farm buildings, machinery and motor vehicles (USDA, June 1988) averaged 9.7 percent for 1983-87. Excludes operator dwellings.

The remainder of this publication is divided into five sections covering; (1) data and analysis issues, (2) farm investment patterns, (3) the relationship between investment and farmer, and farm characteristics, (4) the investment decision process, and (5) summary and conclusions.

### The Data

The source of data for this publication is the 1987 Farm Management and Energy Survey, which was conducted by the New York Agricultural Statistics Service for the Departments of Agricultural Economics and Agricultural Engineering of Cornell University with funds provided by the Niagara Mohawk Power Corporation. The survey was a stratified random sample of farms in Upstate New York which include all of New York State except Long Island, New York City and the suburban counties adjacent to New York City (Putnam, Rockland and Westchester). Farms were defined as enterprises engaged in agricultural production with agricultural sales of \$10,000 or more. The survey was designed to collect a wide range of information on farms with regard to energy use, economic performance, management indicators and operator characteristics.

Surveyed producers were selected from a listing of farms maintained by the New York State Agricultural Statistics Service. This list is designed to be as complete a listing of all farms as can be reasonably maintained. A random sample of farms was selected from the listing after stratifying all farms by type of farm and amount of sales. In addition, dairy farms were also stratified by region (Kelleher and Bills). Data were collected by on site interviews with operators of 1,068 farms.

Some of the farmers surveyed could not, or refused to, provide some elements of data requested. For example, some felt that debt and investment data were too personal to provide. Because some of these farms would have the data to be included in some analysis but not others, the results of various analyses could be influenced by whether a particular group of farms was excluded or included. To avoid providing incomparable data as much as possible, the original 1,068 surveyed farms were divided into two groups to separate the farms with essentially complete financial and investment information from farms with substantial missing data. Questionnaires containing two or fewer missing responses about farm receipts, expenses, assets and debts, and no more than 10 missing responses to 294 potentially investment related variables, were categorized as the high response group. The remaining questionnaires (the low response group) had 11 or more missing responses overall, or three or more missing responses in the specific topic areas.

There were 756 farms in the high response group and 312 farms in the low response group. Mean values of some variables were compared to determine whether the two groups represented different populations (Table 1). The means of most of the variables were not significantly different between the two groups. However, means of farm size were significantly different with 367 acres for the high response group and 450 acres for the low response group. Apparent differences between the groups for the other variables could result from nonresponse bias in the low response group.

**Table 1.** *Statistical Comparison of Mean Values of Selected Variables for Two Groups of Survey Respondents Upstate New York Farms, 1986*

Variable	Group One <sup>a</sup>	Group Two <sup>b</sup>	T-value <sup>c</sup>	Prob-ability <sup>d</sup>
Operator's Age	48.7 (755)	49.9 (311)	0.20	.84
Operator's Edu. <sup>e</sup>	2.36 (754)	2.24 (311)	-1.69	.09
Acres Operated	367.3 (755)	450.6 (312)	2.49	.01
---Dollars---				
Gross Receipts	216,404 (753)	241,179 (167)	1.03	.30
Total Expenses.	187,863 (750)	222,205 (121)	1.28	.20
Farm Real Estate	362,094 (753)	425,040 (125)	1.00	.32
Real Estate Debts	92,055 (752)	71,844 (107)	-1.01	.31
Machinery Assets	109,775 (756)	170,891 (117)	0.93	.35
Machinery Debts	27,001 (755)	12,144 (104)	-3.41	.00
Livestock Assets	89,842 (756)	78,642 (118)	-.09	.39
Livestock Debts	10,467 (755)	5,240 (108)	-1.94	.05
Crop Inventory	33,161 (752)	33,401 (112)	0.02	.98
Crop Debts	6,262 (754)	1,072 (111)	-3.38	.00
Feed & Fert. Inven.	6,975 (756)	4,541 (116)	-1.40	.16
Feed & Fert. Debts	1,106 (755)	33 (113)	-3.16	.00
Accounts Rec.	16,565 (755)	12,102 (115)	-1.05	.29
<u>Expansion Investment for</u>				
Farm Land	18,605	11,084	-1.49	.14
Buildings	12,831	11,689	.37	.71
Livestock	6,400	4,107	-1.01	.31
Machinery	10,981	6,583	-1.00	.32

- a 756 farms with virtually complete responses to financial data, unweighted means.
- b 312 farms with many missing responses to financial data, unweighted means.
- c Assuming variances are not equal.
- d Probability that the mean values of both groups are equal.
- e Represents completion of high school plus some college (less than B.S. degree).
- ( ) Number of observations.

Source: 1987 Farm Management and Energy Survey.

Although average farm size may be slightly larger, it is unlikely that the investment behavior relationships under study would be significantly different for the whole group than for the 756 farms, especially after adjusting strata weights. This is because, except for farm size, means of most (12 of 15) other principal variables were not significantly different between the two groups (Table 1). Further, using

the high response sample (756 farms) has the practical advantage that it avoids the necessity of readjusting the weights for each analysis. That is, farms with missing data are automatically dropped from the tabulations, which biases the weighting computation.

### General Characteristics of Farms Analyzed

For the surveyed farms analyzed in this publication, operators had an average age of 49, and about 13 years of schooling (Table 2). He or she operated 246 acres and sold approximately \$127,000 of farm products. Total farm assets were approximately \$423,000 per farm, of which \$259,000 was real estate and \$75,000 was machinery and equipment. Farm debts amounted to about \$86,000, including \$57,000 for real estate and \$18,000 for machinery. Average farm net worth was about \$338,000. Although not every farm provided data on all items, limiting the calculation to only farms providing all the values listed did not significantly change the absolute or relative values.

### **Investment Patterns**

Considerable insight into investment behavior can be inferred from year to year investment patterns. This section provides an overview of the level and nature of farm investment in Upstate New York in recent years. Throughout the discussion, two measures of investment are used: (1) average total (replacement and expansion investment) for 1985 and 1986 for all farms, and (2) the investment made for the most recent expansion on farms that expanded during 1980-86.

#### Investment in 1985-86

Average new investment in farm assets per farm in 1986 was \$15,100, of which \$6,400 was in machinery and equipment, \$3,400 in farm land, \$2,700 in livestock, \$2,000 in buildings and \$500 in land improvements (Table 3). In 1985, investment per farm was \$3,700 less or \$11,400 per farm. The distribution of investment among categories was similar in 1985 and 1986.

The rate of investment, using the estimated 1986 asset values for upstate farms as the base, was 3.6 percent overall and was 8.6 percent for machinery, 4.5 percent for livestock and 2.3 percent for all real estate (Table 4). These amounts include total expenditures for both replacement and expansion investment.

Clearly, machinery is the most important annual investment item on New York farms. Over 40 percent of the average farm investment was machinery in both 1985 and 1986. Also, the rate of investment in machinery was more than twice as high as the rate for other assets.

Average 1986 investment per farm varied considerably by farm type (Table 5). Dollar investment ranges from \$31,900 for horticulture businesses to \$3,100 for grape farms. Dairy farms, which constitute 72 percent of surveyed farms, invested \$14,400, which is slightly less than the overall average of \$15,100.



Table 2. Selected Operator and Farm Characteristics  
of Surveyed Farms  
Upstate New York Farms, 1986

Characteristics	All 756 Farms		Average for Farms Reporting All Items <sup>a</sup>
	Number Reporting	Average Value	
Operator Age (years)	755	49.1	48.9
Operator Education (years)	754	13	13
Total Crop Acres Operated	755	246	245
Total Farm Receipts	753	\$127,154	\$126,583
Total Farm Expenses	750	\$108,028	\$107,183
<u>Farm Assets</u>			
Real Estate	753	\$259,094	\$253,186
Machinery & Equipment	756	74,566	74,500
Livestock	756	59,663	58,851
Crops Stored	752	17,965	17,910
Feed, Fertilizer, Seed	756	3,499	3,466
Accounts Receivable	755	9,096	9,186
Total Farm Assets		\$423,883 <sup>b</sup>	\$417,099
<u>Farm Debts</u>			
Real Estate	752	\$ 56,854	\$ 57,551
Machinery & Equipment	755	17,886	18,218
Livestock	755	6,863	7,055
Crops Stored	754	3,557	3,627
Feed, Fertilizer, Seed	755	569	585
Total Farm Debt		\$ 85,729 <sup>b</sup>	\$ 87,036
<u>Farm Net Worth</u>		\$338,154 <sup>b</sup>	\$330,063

<sup>a</sup> Weighted averages of 732 sample farms which provided data for all items listed in this table.

<sup>b</sup> Based on average values for component items listed.

Source: 1987 Farm Management and Energy Survey.

Some of the difference by farm type certainly reflects investment patterns of different types of businesses. However, some of the differences are also consistent with the economic status of the various product markets. For example, grape farms were under considerable price stress with declining grape prices. Thus, this low level of investment by grape farms reflects this situation.

Replacement investment was clearly more important than expansion for most farm businesses. Investment for replacement purposes was over 70 percent of total investment or \$10,900 per farm in 1986. Higher than

average replacement investment was reported by nondairy livestock (\$14,500) and horticulture farms (\$12,400), while producers of grapes and miscellaneous products reported the lowest replacement investment; \$3,100 and \$3,800, respectively. Replacement investment on dairy farms amounted to \$10,700 which was slightly below the average for all farms. For the average New York farm, replacement investment is two and one-half times greater than expansion investment.

**Table 3.** *Capital Investment by Asset Category  
Upstate New York Farms, 1985 and 1986*

Asset Category	Average Per Farm	
	1985	1986
---Thousand Dollars---		
Farm Land	2.4	3.4
Land Improvements	.6	.5
Buildings	1.7	2.0
Livestock	1.8	2.7
Machinery & Equipment	4.9	6.4
Total	11.4	15.1

Source: 1987 Farm Management and Energy Survey.

**Table 4.** *Rate of Investment  
Upstate New York Farms, 1986*

Asset Category	Value Per Farm <sup>a</sup>	Investment Per Farm	Rate of Investment
	--Thousand Dollars--		-Percent-
Real Estate, Buildings and Land Improvements	259.1	6.0	2.3
Livestock	59.5	2.7	4.5
Machinery & Equipment	74.3	6.4	8.6
Other	30.6	-	-
Total	423.5	15.1	3.6

<sup>a</sup> For 736 farms that reported all values.

Source: 1987 Farm Management and Energy Survey.

Table 5.

*Capital Investment by Type of Farm  
Upstate New York Farms, 1986*

Farm Type <sup>a</sup>	Percent of Farms	Average Investment		
		Expansion	Replacement	Total
---Thousand Dollars---				
Egg Producers	1	b	9.6	b
Vegetable & Potato	7	11.0	11.9	22.9
Grape	2	b	3.1	b
Tree Fruit	2	7.5	10.8	18.3
Horticulture	1	19.5	12.4	31.9
Dairy	72	3.7	10.7	14.4
Other Livestock	9	b	14.5	b
Other Crops	5	b	11.6	b
Miscellaneous	1	b	3.8	b
Total	100	4.2	10.9	15.1

<sup>a</sup> Generally indicates principal produce sold. However, because of the stratification procedure used for the survey, farms could be classified in a commodity category that was not the principal product in terms of gross sales. (See Kelleher and Bills).

<sup>b</sup> Too few observations.

Source: 1987 Farm Management and Energy Survey.

### Expansion Investment

Although expansion investment is much smaller than replacement investment, it is very important to the future direction and efficiency of agriculture. Changes in technology most frequently occur as part of expansion. Approximately 38 percent of upstate farms undertook at least one expansion in the 1980-86 period (Table 6). Of these, 39 percent (15 percent of all farms) undertook more than one expansion. Alternatively, over 60 percent of farms did not expand their operation during that seven year period. The average expansion for the 1980-86 period was \$80,400. There was no apparent trend in the size of expansions over the seven year period.

The proportion of farms expanding over the 1980-86 period ranged from 16 percent for egg producers to 55 percent for horticultural businesses (Table 7). The frequency of expansion appears to reflect, at least in part, the opportunities in those industries during the time period. Egg and grape producers in New York were under financial pressure during much of the period, while horticultural producers were enjoying expanding opportunities. Dairy farms experienced very good and poor periods during the seven years and were about average in their overall frequency of expansion.

Table 6.

*Distribution of Farms by Year  
of Most Recent Expansion  
Upstate New York Farms*

Year of Most Recent Expansion	Percent of All Farms	Average Investment
-Thousand Dollars-		
1980	3.9	31.0
1981	3.8	231.6
1982	4.8	80.8
1983	5.1	53.5
1984	4.8	116.0
1985	5.6	44.1
1986	9.7	42.6
1980-86	37.8 <sup>a</sup>	80.4

<sup>a</sup> 39 percent of these farms (14.6 percent of all farms) expanded more than once in the 1980-86 period.

Source: 1987 Farm Management and Energy Survey.

Table 7.

*Proportion of Farms Expanding and Investment per  
Expansion for Asset Categories by Farm Type  
Upstate New York Farms, 1980-86*

Farm Type	Percent of Farms Expanding	Average Investment per Expansion				Total
		Farm Land	Bldgs. & Struc.	Live- stock	Mach. & Equip.	
---Thousand Dollars---						
Egg Producers	16	a	a	a	a	a
Veg. & Potato	42	48	29	1	24	102
Grapes	32	42	11	6	4	63
Tree Fruit	43	31	2	0	9	42
Horticulture	55	20	27	0	11	58
Dairy	36	25	21	12	19	77
Other Lvstk.	42	23	19	3	7	52
Other Crops	51	33	4	3	86	126
Misc.	35	a	a	a	a	a
Total	38	29	20	9	22	80

<sup>a</sup> Too few observations.

Source: 1987 Farm Management and Energy Survey.

Farms classified as producers<sup>2</sup> of "other" crops (mostly grain farms) had the largest average size expansion during the 1980-86 period (\$126,000), followed by vegetable and potato farms (\$102,000). Lower than average size expansions were made by tree fruit, other livestock and horticulture farms.

Farm land was the largest item of expenditure in expansions; average investment was \$29,000. Above average investments in land were made by vegetable and potato farms, grape producers and other crop farms.

Investment in machinery and equipment was the second largest category of expenditure in expansions, averaging \$22,000 per farm overall. Largest machinery investments were made by producers of other crops (mostly grains) and vegetables and potatoes. Average building investment per expansion was only slightly less than machinery investment.

The distribution of expansion investment expenditures among the asset categories (Table 8) was consistent with farm type. Buildings represented a large proportion of total investment for vegetable/potato farms, horticulture businesses and dairy farms; likely used for building storage, production space, and livestock housing, respectively. Animal producers tended to invest in buildings, except egg producers who were apparently buying land rather than buildings. Grape and tree fruit farms invested primarily in real estate with some machinery purchases.

The average rate of expansion in 1986 for all surveyed farms was approximately 1.2 percent without netting out transfer of assets among farms, which could not be determined (Table 9). Rates of 1986 expansion were greatest for tree fruit, horticulture, vegetable and potato and miscellaneous farms. Less than average rates of expansion were exhibited by egg, grape and nondairy livestock farms.

### Investment in Individual Assets

Data were collected on investments in a selected group of large items and a selected group of small items. The large investment group included, silos, tractors, self propelled harvesters, self propelled windrowers and air blast sprayers. The small investment group included, manure spreaders, silo unloaders, weed sprayers, cultivators, chisel plows and silage blowers.

Respondents indicated the age of the newest item for each of the types of assets that existed in the business. A considerable amount of the equipment on farms is quite old (Table 10). The average age of many items approaches or exceeds the normal useful life ranges specified by the Internal Revenue Service. Except for chisel plows (which became widely used recently) and manure spreaders, about a quarter or more of the machine items are at least 15 years old.

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<sup>2</sup> Because of the stratification procedure used, surveyed farms could be classified in a commodity category that was not the principal product in terms of sales (see Kelleher and Bills).

Table 8.

*Distribution of Expansion Investment  
by Asset Category and Farm Type  
Upstate New York Farms*

Farm Type	Farm Land	Bldgs. & Structures	Livestock	Mach. & Equipment	Total
---Percent---					
Egg Producers	a	a	a	a	a
Veg. & Potato	38	44	1	17	100
Grape	84	4	1	11	100
Tree Fruit	61	3	b	36	100
Horticulture	42	49	b	9	100
Dairy	27	39	16	18	100
Other Lvstk.	45	26	8	21	100
Other Crops	42	8	1	49	100
Misc.	a	a	a	a	a
Total	35	35	10	20	100

a Too few observations.

b Less than 1.0 percent.

Source: 1987 Farm Management and Energy Survey.

Table 9.

*Rate of 1986 Expansion Investment by Farm Type  
Upstate New York Farms*

Farm Type	Rate of Expansion <sup>a</sup>
Egg Producers	b
Veg. & Potato	1.8
Grape	b
Tree Fruit	2.6
Horticulture	2.7
Dairy	1.2
Other Livestock	b
Other Crops	b
Misc.	b
Total	1.2

a 1986 expansion investment as a percent of end-of-year asset values minus total 1986 expansion investment.

b Too few observations.

Source: 1987 Farm Management and Energy Survey.

Table 10.

*Age Distribution of Newest Item on  
Individual Farms, Selected Investment Items  
Upstate New York, 1986*

Age (Years)	Silo	Tractor	Self Propelled		Air Blast Sprayer	
			Harvester	Windrower		
---Percent of Farms with Item---						
Under 5	14	26	22	19	16	
5 - 9.9	28	31	19	36	30	
10 - 14.4	17	20	22	22	22	
15 or over	41	23	37	23	32	
Median Age	18	8	10	9	10	
-----						
	Manure Spreader	Silo Unloader	Weed Sprayer	Culti- vator	Chisel Plow	Blower
---Percent of Farms with Item---						
Under 5	37	23	17	11	27	16
5 - 9.9	40	37	19	19	44	27
10 - 14.4	16	19	25	18	22	30
15 or over	7	21	39	52	7	27
Median Age	5	8	10	15	6	10

Source: 1987 Farm Management and Energy Survey.

Although investment in machinery and buildings frequently connotes purchase of new items, a very significant portion of purchases were for used items (Table 11). Large items were more frequently purchased used than small items. The greater investment for large items apparently justifies the greater investigation time and somewhat higher risk (of getting a lemon) connected with purchase of a used item. Of all the items for which data were collected, manure spreaders were most frequently purchased new.

Farmers are more likely to buy new when items are being replaced than when purchasing for expansion or efficiency reasons. For large items, only 33 percent of the items purchased were used when a replacement was occurring compared to 48 and 59 percent, respectively, when the purchase was for an expansion or to improve efficiency. For small items, 22 percent of purchases for replacement were used items compared to 26 and 41 percent, respectively, for expansion or efficiency.

The proportion of items purchased used shown in Table 11, may be higher than normal because of the timing of the survey. During 1985-86, agriculture was in the middle of a recession. Prices of most agricultural products were depressed from earlier levels and the outlook for significant price increases was dim. A number of farmers were leaving agriculture and

others were reducing their machinery inventories. Thus, there was a large amount of used machinery available and many farmers were interested in buying used items because they had fewer available funds and the economic outlook dictated caution.

**Table 11.** *Proportion of Investment Items Purchased Used  
Upstate New York, 1985-86*

Investment Item	Used Items as Percent of Total	Total Number Purchased <sup>a</sup>
<u>Large</u>		
Silo	28	50
Tractor	46	155
Self Propelled Harvester	47	21
Self Propelled Windrower	33	9
Air Blast Sprayer	20	5
Total	41	240
<u>Small</u>		
Manure Spreader	16	134
Silo Unloader	23	55
Weed Sprayer	35	37
Cultivator	47	21
Chisel Plow	41	22
Blower	38	50
Total	27	319

<sup>a</sup> Surveyed farms reported on only one large and one small item.

Source: 1987 Farm Management and Energy Survey.

Considerable variability exists in the ages at which most items are normally replaced (Table 12). A number of large items were replaced at a relatively early age (less than five years) but very few of the smaller items were replaced within five years. The age of most replaced items was less than the median age of newest items for cultivators and air blast sprayers. This may have resulted from the fact that most of the items were little used and very few were being replaced. The farms that were replacing them were likely making considerable use of them and, thus, replaced them at an early age.

Larger farms tend to replace items more quickly than smaller farms (Table 13). Those farms could be expected to use items more heavily and, thus, wear them out more rapidly. Those farms may also have more funds available for timely replacement than many of the smaller farms.



**Table 12. Age Distribution of Items Replaced When Purchases are Made Selected Investment Items Upstate New York, 1985-86**

Age (Yrs)	Silo	Tractor	Self Propelled		Air Blast Sprayer	
			Harvester	Windrower		
---Percent of Replaced Items---						
Under 5	0	6	21	22	53	
5 - 9.9	7	27	13	15	27	
10 - 14.4	9	20	40	63	20	
15 or over	84	47	26	0	0	
Median Age	21	14	10	12	5	
-----						
	Manure Spreader	Silo Unloader	Weed Sprayer	Culti-vator	Chisel Plow	Blower
---Percent of Replaced Items---						
Under 5	9	0	1	0	0	5
5 - 9.9	44	10	14	50	73	22
10 - 14.4	26	36	12	12	0	30
15 or over	21	54	73	38	27	43
Median Age	9	15	15	10	8	15

Source: 1987 Farm Management and Energy Survey.

**Table 13. Relationship Between Farm Size and Age of Items When Replaced Upstate New York Farms, 1985-86**

Item	Total Farm Assets (\$1,000)		
	Under 300	300 - 599	600 or more
---Median Age When Replaced---			
Silo	30	20	20
Tractor	16	14	11
Manure Spreader	11	8	7
Silo Unloader	20	12	15
Blower	15	10	12

Source: 1987 Farm Management and Energy Survey.

## Relationship Between Investment and Farmer Characteristics

The literature on farm investment behavior indicates that farmers' personal characteristics influence the amount and timing of investment (Brase and LaDue). This section summarizes the relationship between those factors and investment as exhibited by respondents to the 1987 Farm Management and Energy Survey.

Three measures of investment are used in this analysis: (1) *1986 investment* is the amount invested in 1986. Because 1986 was the most recent year at the time of the survey, these data include the total amount of investment made by these New York farms during 1986. Data on total investment and expansion investment are available so that separation of replacement investment from expansion investment is possible. (2) *1985-86 investment* is the average of investments made in 1985 and 1986. Total investment data were collected from all farms for both years. Expansion data were collected only on the most recent expansion. Thus, the separation of expansion from replacement investment for these two years assumes that farms with an expansion in 1986 did not also expand in 1985. Although business expansion in successive years is possible, it is rare. Because of the time required for expansion, most farmers who expanded in two years in a row would call the activity one expansion and identify it as an expansion in one of the years involved. (3) *1980-86 expansion investment* refers to the most recent expansion of this business during the 1980-86 period. Some farms had more than one expansion during the 1980-86 period so these data do not indicate the total investment for the seven years.

The "1986 rate of expansion" is the 1986 expansion investment (measure (1) above) divided by estimated before-expansion value of assets. The before-expansion value of assets is the end of 1986 value of farm assets minus the expansion investment. Values were calculated for each farm. The values presented are averages for all farmers in a group including those who did not, as well as those who did, expand.

In the analysis that follows, average 1985-86 investment (measure (2) above) is separated into expansion and replacement amounts. Replacement investment for each year was calculated by subtracting expansion investment from total investment. The remainders were averaged, this became 1985-86 replacement investment. Average 1985-86 expansion investment is the amount of the 1985 or 1986 expansion divided by two, or zero if no expansion occurred in either year.

The "percent of farms expanding once or more" indicates the proportion of farms that expanded sometime during the 1980-86 period. Farms that expanded twice or more during the 1980-86 period were identified. However, data on the exact number, dollar amount and timing of expansions other than the most recent were not collected. An indication of total expansion investment is obtained by combining the information on the frequency of expansion with the average size of expansions.

### Age

The life cycle theory of farm investment indicates that the investment would be relatively modest for young farmers because they have

few assets for loan security and modest borrowing capacity. Investments increase as the farm operator expands the business with growing income and improved borrowing capacity. As the operator approaches retirement investment declines and, in some cases, disinvestment takes place. This theory implies that investment should increase with age up to that age where farmers start to consider retirement in their planning and then investment should decline.

The amount of investment made by age group (Table 14) is consistent with the life cycle theory, although maximum investment occurs at a relatively early age (35-44 years). Apparently the ability to invest is important in limiting investment only for the relatively young. Alternatively farmers may reach an acceptable business size relatively early in life. Thus, reduced investment for those above 35-44 years may at least initially be the result of less desire to expand further, rather than the incorporation of expected retirement in the planning decision process.

Table 14. *Relationship of 1985-86 Investment to Age of Farm Operator Upstate New York*

Age of Operator	Average 1985-86 Investment <sup>a</sup>			1986 Rate of Expansion <sup>a</sup>
	Expansion	Replacement	Total	
	-Percent-			
25-34	\$ 2,900	\$11,100	\$14,000	2.9
35-44	4,400	14,000	18,400	.07
45-54	3,400	8,800	12,200	1.1
55-64	2,000	8,500	10,500	0.8
65 plus	4,200	6,900	11,100	1.1
All	\$ 3,400	\$10,100	\$13,500	1.2

<sup>a</sup> Average value for all farmers including those who did and those who did not expand.

Source: 1987 Farm Management and Energy Survey.

Clearly young farmers were trying the hardest to expand. A higher proportion of the young (25-34 year) than any other age group expanded their businesses (Table 15) and their rate of expansion (percent increase in assets) was far above that for other age groups (Table 14). However, the amount of investment was less (Table 14) and the size of individual expansion was smaller than that for farmers who were somewhat older. That credit capacity may be limiting investment by the young is supported by their low percent equity (Table 16).

Operator age is negatively correlated with years of education, risk tolerance, innovativeness and managerial capacity (Table 16). Older farmers completed their education in times when many did not complete high

school and most did not go to college. Over time, the general level of schooling has increased. The lower level of risk tolerance can be explained either as an economic response to higher equity levels (they have more to lose) or that older workers have more vivid memories of difficult financial times, such as the depression, leading them to be more conservative. Innovativeness may result from the higher levels of investment in that those making more investments are more likely to invest in modern facilities and equipment which would include innovative items. The higher level of management ability is likely related to the higher levels of education and, possibly, a more aggressive management posture forced by necessity. For example, during the 1980s, many farmers found ways to reduce costs that were not used when prices were higher.

Table 15. *Relationship of 1980-86 Expansion Investment to Age of Farm Operator Upstate New York*

Age of Operator	Percent of Operators	Farms Expanding		Average Investment Per Expansion <sup>a</sup>
		Once or More	Twice or More	
		---Percent <sup>b</sup> ---		
25-34	14	47	20	\$ 55,200
35-44	24	44	13	120,000
45-54	29	40	16	68,900
55-64	21	30	11	65,800
65 plus	12	23	15	70,800
All	100	38	15	\$ 80,400

<sup>a</sup> For farms that expanded, most recent expansion only.

<sup>b</sup> Of operators in row category.

Source: 1987 Farm Management and Energy Survey.

Since all four of these factors would normally be expected to be positively related to investment, their negative correlation with age could be contributing to the relationship observed in Tables 14 and 15. In particular, they likely result in a decline in investment at an earlier age and more rapidly than would be observed solely as a result of life cycle influences.

### Education

Education is expected to be positively correlated to investment. The theory is that those with greater education will have greater management ability, either because of what they have learned, or because of the higher level of intellectual ability required to enter BS or graduate level programs. Economically, higher levels of management ability would be

expected to require more other resources to reach an optimum combination of inputs. Operationally, we would expect better managers to have higher incomes, making greater investment possible, and to have the ability to plan expansion of, and effectively manage, larger businesses.

Table 16.

*Relationship Between Age of Operator  
and Other Investment Related Variables  
Upstate New York Farms, 1986*

Age of Operator	Value of Assets	Amount of Debt	Percent Equity	Years of Education
17-34	\$377,308	\$103,193	66	13.4
35-44	459,542	123,004	68	13.0
45-54	419,945	86,527	80	12.4
55-64	444,911	58,604	87	12.2
65 or More	371,645	40,817	93	11.5
All	422,976	86,043	78	12.5
Correlation	-0.008	-0.198	0.415	-0.310
P Value <sup>d</sup>	(0.81)	(0.0001)	(0.0001)	(0.0001)
	Years of Experience	Risk Tolerance <sup>a</sup>	Innovativeness Index <sup>b</sup>	Management Index <sup>c</sup>
17-34	12.0	1.54	0.60	2.65
35-44	18.3	1.43	0.51	2.44
45-54	28.3	1.53	0.45	2.23
55-64	36.9	1.26	0.51	2.19
65 or More	47.1	1.33	0.39	2.16
All	27.7	1.43	0.50	2.32
Correlation	0.822	-0.091	-0.078	-0.135
P Value <sup>d</sup>	(0.0001)	(0.012)	(0.075)	(0.0002)

<sup>a</sup> Range of one to three with; one = risk averse, three = risk tolerance, two = neither.

<sup>b</sup> Range of zero to three with three indicating highest level of innovativeness, dairy farms only.

<sup>c</sup> Range of one to four with four indicating highest level of management.

<sup>d</sup> The probability that there is no linear relationship between the variables. Correlations are computed using actual ages not grouped data.

Source: 1987 Farm Management and Energy Survey.

The data clearly indicate a positive relationship between education and investment, particularly expansion investment (Table 17). Those with more education expanded more frequently and the average size of expansion was larger (Table 18).

Table 17. *Relationship of 1985-86 Investment to Farm Operator Education Upstate New York*

Age of Operator	Average 1985-86 Investment <sup>a</sup>			1986 Rate of Expansion <sup>a</sup>
	Expansion	Replacement	Total	
				-Percent-
No High School	\$ 1,200	\$ 7,200	\$ 8,400	0.7
High School	2,700	9,600	12,300	1.0
Some College	3,300	10,300	13,600	0.7
College BS	8,500	15,600	24,100	3.1
All	\$ 3,400	\$10,100	\$13,500	1.2

<sup>a</sup> For all farmers including those who did and those who did not expand.

Source: 1987 Farm Management and Energy Survey.

Table 18. *Relationship of 1980-86 Expansion Investment to Farm Operator Education Upstate New York*

Operator Education	Percent of Operators	Farms Expanding		Average Investment Per Expansion <sup>a</sup>
		Once or More	Twice or More	
				---Percent <sup>b</sup> ---
No High School	20	30	11	\$ 47,300
High School	50	38	13	54,600
Some College	15	44	13	88,800
College Degree	15	45	26	172,200
All	100	38	15	\$ 80,400

<sup>a</sup> For farms that expanded, most recent expansion only.

<sup>b</sup> Percent of row categories.

Source: 1987 Farm Management and Energy Survey.

In general, operators with more education operated larger farms and in both absolute and relative terms used more debt (Table 19). Operators with more education tended to be younger and more innovative and have greater management ability. All of these factors would tend to reinforce the implication (from Tables 17 and 18) that education affects investment.

Table 19.

*Relationship Between Education  
and Other Investment Related Variables  
Upstate New York Farms, 1986*

Operator Education	Age of Operator	Management Index <sup>a</sup>	Innovativeness Index <sup>b</sup>
No High School	55.4	2.01	0.30
High School	49.7	2.21	0.48
Some College	44.3	2.56	0.58
College BS	42.3	2.86	0.80
Graduate	51.3	2.76	1.23
All	49.1	2.32	0.50
Correlation	-0.314	0.280	0.201
P Value <sup>d</sup>	(0.0001)	(0.0001)	(0.0001)

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	Risk Tolerance <sup>c</sup>	Value of Assets	Value of Debts	Percent Equity
No High School	1.42	\$302,375	\$ 54,265	0.82
High School	1.41	379,137	79,495	0.78
Some College	1.45	577,176	106,457	0.79
College BS	1.43	526,827	120,904	0.71
Graduate	1.67	996,968	222,993	0.72
All	1.43	423,000	86,000	0.78
Correlation	0.018	0.217	0.190	-0.126
P Value <sup>d</sup>	(0.6165)	(0.0001)	(0.0001)	0.0011

<sup>a</sup> Range of one to four with four indicating highest level of management.

<sup>b</sup> Range of zero to three with three indicating highest level of innovativeness, dairy farms only.

<sup>c</sup> Range of one to three with; one = risk averse, three = risk tolerance, two = neither.

<sup>d</sup> P Value indicates the probability that there is no linear relationship between the variables.

Source: 1987 Farm Management and Energy Survey.

### Experience

Farming experience is expected to improve managerial capacity. However, experience was negatively and only modestly related to management index (Table 20). Further, as might be expected, experience was highly correlated with age. Likely as a result of this relationship to age, experience was negatively related to level of education. Experience was unrelated to innovativeness.

It appears that the effect of experience on investment is overshadowed by the close relationship between experience and age.

Investment during 1985-86 was curvilinearly related to experience with peak investment occurring at 15-20 years (Table 21). Farmers with less than 10 years of experience were more likely to expand and expanded more frequently during the 1980-86 period than those with more experience (Table 22). The size of expansion investments peaked at five to 10 years of experience, corresponding very closely to the relationship found for age.

Table 20. *Relationship Between Years of Farm Experience and Other Investment Related Variables Upstate New York Farms, 1986*

Years of Experience	Innovativeness Index <sup>a</sup>	Management Index <sup>b</sup>	Risk Tolerance <sup>c</sup>	Age of Operator
0 - 4.9	1.12	2.56	1.34	48.1
5.0 - 9.9	0.51	2.40	1.70	33.6
10.0 - 14.9	0.55	2.66	1.69	35.4
15.0 - 19.9	0.45	2.48	1.44	39.2
20.0 - 24.9	0.52	2.45	1.35	42.9
25 or More	0.48	2.17	1.36	56.8
All	0.50	2.32	1.42	49.0
Correlation	-0.040	-0.132	-0.128	0.822
P Value <sup>d</sup>	(0.357)	(0.0003)	(0.0004)	(0.0001)
	Value of Assets	Amount of Debt	Years of Education	Percent Equity
0 - 4.9	583,248	67,157	12.7	87
5.0 - 9.9	488,708	111,312	14.1	74
10.0 - 14.9	369,983	96,148	13.6	67
15.0 - 19.9	410,642	121,559	13.0	68
20.0 - 24.9	489,586	129,054	12.9	71
25 or More	417,447	66,537	12.0	85
All	422,896	86,164	12.5	78
Correlation	-0.028	-0.172	-0.377	0.336
P Value <sup>d</sup>	(0.431)	(0.0001)	(0.0001)	

<sup>a</sup> Range of zero to three with three indicating highest level of innovativeness, dairy farms only.

<sup>b</sup> Range of one to four with four indicating highest level of management.

<sup>c</sup> Range of one to three with; one = risk averse, three = risk tolerance, two = neither.

<sup>d</sup> The probability that there is no linear relationship between the variables.

Source: 1987 Farm Management and Energy Survey.



Table 21.

*Relationship of 1985-86 Investment  
to Farm Operator Experience  
Upstate New York*

Years Experience	Average 1985-86 Investment <sup>a</sup>			1986 Rate of Expansion <sup>a</sup>
	Expansion	Replacement	Total	
				-Percent-
0 - 4.9	\$ 1,100	\$ 8,200	\$ 9,300	1.6
5 - 9.9	5,500	7,100	12,600	8.7
10 - 14.9	3,300	10,700	13,900	0.9
15 - 19.9	6,400	14,800	21,200	0.8
20 - 24.9	3,000	14,700	17,700	0.9
25 plus	2,700	8,300	11,000	0.8
All	\$ 3,400	\$10,100	\$13,500	1.2

<sup>a</sup> For all farmers including those who did and those who did not expand.

Source: 1987 Farm Management and Energy Survey.

Table 22.

*Relationship of 1980-86 Expansion Investment  
to Farm Operator Experience  
Upstate New York*

Years Experience	Percent of All Farms	Farms Expanding		Average Investment Per Expansion <sup>a</sup>
		Once or more	Twice or More	
				---Percent---
0 - 4.9	2.5	60	20	\$ 78,600
5 - 9.9	4.6	80	20	170,800
10 - 14.9	12.7	40	20	62,300
15 - 19.9	14.4	46	16	97,600
20 - 24.9	9.7	38	18	70,400
25 plus	56.1	31	12	62,600
All	100.0	38	15	\$ 80,400

<sup>a</sup> For farms that expanded, most recent expansion only.

Source: 1987 Farm Management and Energy Survey.

The independent effect of experience appears to be small. It may be that for most farm operators 20 years of experience is to a large degree a few years of experience repeated several times rather than a strong cumulative learning activity.

## Goals

Farm operators were asked if they planned to leave farming in the next 10 years. Eleven percent of the farm operators expected to sell their farms and retire and five percent planned to sell the farm and switch to a different occupation. Six percent planned to leave farming by passing the farm onto a family member (five percent) or another current operator (one percent). Those leaving farming tended to be older with somewhat smaller businesses and less debt (Table 23). Consistent with expectations, those planning to leave had considerably lower investment, particularly expansion investment in 1985-86 (Table 24).

Those farmers who did not plan to leave farming within the next 10 years were asked to indicate from a list of seven, their primary goal over the next 10 years (see Table 25 for the list of goals). About one quarter of the farmers indicated that their primary goal was to stay in business (Table 27). These farmers had significantly lower farm incomes than all other groups planning to continue farming (Table 25). Nonfarm income was also considerably below average. The number of hours worked per week was high, leverage was above average and management ability below average. Thus, those whose primary goal was to stay in business appear to be operating farms where continuation is far from assured. These farms had nearly the lowest level of investment in 1985-86 of all groups who expected to stay in farming. Expansion investment was particularly low (Table 26). These farms also expanded less in the 1980-86 period (Table 27). The average size of expansions was less than 70 percent of all farms. The proportion expanding more than once was below everyone except those planning to leave farming.

One fifth of farmers' primary goal was to increase profits. These farmers generally had above average incomes, management ability and innovativeness, and were relatively young (Table 25). Their 1985-86 investment, particularly expansion investment, was considerably above average (Table 26). During the entire 1980-86 period, their frequency of expansion was above average but the size of their investment was somewhat below average.

Eleven percent of the farmers primary goal was to either increase leisure or improve family living. These operators tended to be older with below average size farms and debt levels (Table 25). Those operators desiring to improve family living were also working the fewest number of hours per week of all groups. Although these two groups have many similarities, their investment behavior was different. Those desiring to improve family living generally invested at very low levels (Table 26). Those desiring increased leisure had above average investment in 1985-86 and an above average frequency of expansion during 1980-86 but their expansions were generally quite small in size.

Six percent of the farmers primary goal was to reduce borrowing. These farms tended to have far above average debt levels, low nonfarm incomes, good management ability and put in long work weeks (Table 25). They had high rates of investment in 1985-86 and had been expanding at a rapid rate during 1980-86 (Table 26). Their frequency of expansion and the size of their expansions were both high. It appears that their current goal to reduce debt results from a high rate of increase in debt over the past few years.

Table 23.

*Relationship Between Occupational Plans  
and Investment Related Factors  
Upstate New York Farms, 1986*

10 Year Occupational Plan	Percent of Farms	Operator Age	Percent Equity	Years of Education	Nonfarm Income
Current Oper. to Continue	78	46.6	75	12.7	7,539
Farm Passes to Family Member or One Current Oper.	6	61.6	92	11.7	5,405
Farm to be Sold as Operator(s) Retire or Switch Occupation	16	56.0	85	11.9	10,864
Total	100	49.0	78	12.5	7,917

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	Years of Experience	Net Cash Income	Value of Assets	Amount of Debt	Management Index <sup>a</sup>	Innov. Index <sup>b</sup>
Current Oper. to Continue	25.7	20,304	431,016	97,302	2.38	0.55
Farm Passes to Family or One Current Oper.	39.8	13,648	350,218	34,834	2.12	0.65
Farm to be Sold as Operator(s) Retire or Switch Occupation	32.6	15,647	385,654	54,312	2.12	0.24
Total	27.6	19,136	418,750	86,454	2.32	0.50

- <sup>a</sup> Range of one to four with four indicating highest level of management.  
<sup>b</sup> Range of zero to three with three indicating the highest level of innovativeness, dairy farms only.

Source: 1987 Farm Management and Energy Survey.

Clearly, operator goals influence investment behavior. However, it is also clear that goals change over time. For example, those who now want to reduce borrowing were increasing their borrowing at a rapid rate during the immediately preceding seven year period. One limitation of the data reported here is that the goals are for the next 10 years and the investment data are for the last seven years.

Table 24.

*Relationship of 1985-86 Investment  
to Farm Operator's 10-Year Occupational Plans  
Upstate New York*

10-Year Plans	Average 1985-86 Investment <sup>a</sup>			1986 Rate of Expansion <sup>a</sup>
	Expansion	Replacement	Total	
				-Percent-
Farm Passes to Family Member or one Current Operator	\$ 4,423	\$ 8,742	\$13,165	0.6
Farm will be Sold as Operators Retire	591	5,506	6,098	0.22
Current Operator(s) Continue	3,900	11,100	15,000	1.5
All	\$ 3,400	\$10,100	\$13,500	1.2

<sup>a</sup> For all farmers including those who did and those who did not expand.

Source: 1987 Farm Management and Energy Survey.

Goals also change with operator age (Table 28). Older farmers are (1) less likely to want to expand, (2) less likely to see increasing profits or net worth as their primary goal, (3) more likely to desire improvements in family living, and (4) more likely to be planning to leave farming. This changing goal structure undoubtedly contributes to the observed decline in investment with advancing age. The changing goals are part of or lead to the life cycle of farming that was referred to in the discussion of age.

### Risk Tolerance

Operators were asked to indicate whether, compared to other farmers, they were more likely to choose (1) a capital investment with anticipated high profits but with the possibility of high loss, or (2) a capital investment with anticipated lower profits but less chance of loss. Those indicating (1) were labelled risk tolerant. Those indicating (2) were labelled risk averse. Those indicating neither presumably have average risk aversions. This provides three levels of risk aversion but does not correspond to the frequency used trichotomy: risk averse, risk neutral, risk lover.

Table 25.

*Relationship Between Primary Goal and  
Other Investment Related Factors  
Upstate New York*

Operator's Primary Goal	Operator Age	Percent Equity	Value of Assets	Net Cash Farm Income
Expand Operation	46.5	75	494,600	20,351
Increase Leisure	50.6	87	398,074	23,966
Reduce Borrowing	46.5	61	478,648	22,925
Increase Profits	44.4	75	457,859	22,562
Increase Net Worth	41.8	71	457,832	24,491
Improve Living	51.7	81	301,146	21,789
Stay in Business	47.8	76	409,899	15,684
Leave Farming	57.6	87	397,533	15,443
Total	49.1	78	423,829	19,208

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	# Unpaid Workers <sup>a</sup>	Operator Hrs./Wk.	Nonfarm Income	Management Index <sup>b</sup>	Innov. Index <sup>c</sup>
Expand Operation	0.19	66.5	12,931	2.36	0.44
Increase Leisure	0.11	68.8	5,540	2.63	0.69
Reduce Borrowing	0.28	79.1	5,330	2.68	0.48
Increase Profits	0.30	66.3	8,854	2.43	0.63
Increase Net Worth	0.11	68.9	7,220	2.55	0.74
Improve Living	0.42	60.7	8,577	2.29	0.41
Stay in Business	0.33	71.2	6,214	2.22	0.47
Leave Farming	0.05	62.6	9,126	2.10	0.34
Total	0.23	67.5	7,912	2.32	0.50

<sup>a</sup> Full time equivalent.

<sup>b</sup> Range of one to four with four indicating highest level of management.

<sup>c</sup> Range of zero to three with three indicating the highest level of innovativeness, dairy farms only.

Source: 1987 Farm Management and Energy Survey.

The risk tolerant farmers tended to be younger and more innovative with larger farms, higher debt levels, higher nonfarm income levels and better management skills (Table 29). However, they made up only 12 percent of the total (Table 31). Seventy percent to the farmers perceived themselves as being more risk averse than other farmers.

By all measures, risk tolerant farmers invested more than the other two groups. Their 1985-86 expansion investment was nearly five times the level of the other groups (Table 30). Their 1986 rate of expansion, 1980-86 frequency of expansion and the average size of expansion were much higher (Table 31).

Somewhat surprisingly, there was little difference in investment behavior of the other two groups. Those indicating that they were more risk averse than other farmers invested slightly less than those indicating neither, but the difference was quite small.

**Table 26.** *Relationship of 1985-86 Investment to Farm Operator's Primary Goal Upstate New York*

Primary Goal	Average 1985-86 Investment <sup>a</sup>			1986 Rate of Expansion <sup>a</sup>
	Expansion	Replacement	Total	
				-Percent-
Expand	\$12,000	\$18,400	\$30,400	3.2
Increase Profits	5,600	13,500	19,100	2.8
Increase Net Worth	1,800	7,500	9,300	0.3
Reduce Borrowing	3,900	12,700	16,600	1.5
Improve Living	1,200	7,300	8,500	0.5
Increase Leisure	4,200	15,800	20,000	1.7
Stay in Business	1,600	7,700	9,300	0.6
Leave Farming	1,700	6,400	8,100	0.3
All	\$ 3,400	\$10,100	\$13,500	1.2

<sup>a</sup> For all farms expanding and not expanding.

Source: 1987 Farm Management and Energy Survey.

**Table 27.** *Relationship of 1980-86 Expansion Investment to Farm Operator's Primary Goal Upstate New York*

10-Year Plans	Percent of All Farms	Farms Expanding		Average Investment per Expansion <sup>a</sup>
		Once or more	Twice or More	
				---Percent---
Expand	6	53	23	\$ 85,100
Increase Profits	22	43	20	70,300
Increase Net Worth	6	55	18	61,000
Reduce Borrowing	6	47	28	154,300
Improve Living	5	30	10	46,900
Increase Leisure	6	38	20	38,700
Stay in Business	26	36	9	54,700
Leave Farming	23	28	9	135,100
All	100	38	15	\$ 80,400

<sup>a</sup> For farms that expanded, most recent expansion only.

Source: 1987 Farm Management and Energy Survey.

Table 28.

*Relationship of Operator's Age and Goals  
Upstate New York, 1986*

Primary Goal	Percent of Farms	Operators Age				
		17-34	35-44	45-54	55-64	65 or more
---Percent---						
Expand	4	6	6	5	1	3
Increase Profits	23	36	27	22	16	7
Increase Net Worth	6	18	5	5	5	2
Reduce Borrowing	6	6	6	10	5	0
Improve Living	5	2	6	7	3	11
Increase Leisure	6	10	3	4	7	13
Stay in Business	27	18	35	33	15	22
Leave Farming	23	4	12	14	48	42
All	100	100	100	100	100	100

Source: 1987 Farm Management and Energy Survey.

### Owner Equity

The data on owner equity represent January 1, 1987, values and, thus, are at the end of the period for which investment data were collected. Thus, the percent equity is the result rather than a cause of the investment behavior observed. Approximately one-third of these commercial farms had less than 70 percent equity in their businesses (Table 32). Nearly one-quarter had no debt.

The lower equity farmers were generally younger and somewhat more risk tolerant. Total farm and nonfarm income was similar for all groups except the extremes, highest and lowest equity farms. There was some tendency for nonfarm income to be higher for farms with higher equity.

The level of owner equity appears to have a relatively modest and predictable effect on operator goals (Table 33). The strongest relationship is that as equity increases, the probability that the farmer plans to leave farming in the next 10 years rises. This undoubtedly reflects the fact that higher equity farmers tend to be older. Predictably as the equity level increased, the importance of reducing borrowing declines.

### Income Expectations

One of the factors driving any investment decision is the perceived profitability of the investment. Since the returns to any investment occur in the future, expected future prices and costs are a major determinant of profitability. To obtain some information on expectations, farmers were asked to indicate how they expected net cash farm income and nonfarm income to change from 1986 to 1990. They were also asked how much their income

had changed from 1980 to 1986 and from 1985 to 1986. About a fifth of the farms saw little change in farm income from 1980 to 1986 (Table 34). The rest of the farms were evenly distributed between those experiencing major income increases and experiencing major income decreases. Between 1985 and 1986, half the farms had relatively constant incomes and the rest were evenly distributed between increasing and decreasing incomes.

Table 29. *Relationship Between Risk Tolerance and Other Investment Related Variables*

Risk Tolerance	Operator Age	Innov. Index <sup>a</sup>	Value of Assets	Percent Equity
Tolerant	45.6	0.64	567,364	72
Neither	49.5	0.37	373,875	76
Averse	49.6	0.51	407,781	80
All	49.1	0.50	421,877	78
Correlation	-0.079	0.034	0.120	-0.112
P Value <sup>b</sup>	(0.028)	(0.43)	(0.001)	(0.003)
-----				
	Net Cash Income	Nonfarm Income	Amount of Debt	Management Index <sup>c</sup>
Tolerant	10,063	12,969	138,410	2.56
Neither	13,351	6,030	84,984	2.30
Averse	20,777	7,497	76,900	2.28
All	19,166	7,927	85,961	2.32
Correlation	0.040	0.069	0.137	
P Value <sup>b</sup>	(0.264)	(0.058)	(0.0002)	

<sup>a</sup> Range of zero to three with three indicating the highest level of innovativeness, dairy farms only.

<sup>b</sup> The probability that there is no linear relationship between the variables.

<sup>c</sup> Range of one to four with four indicating highest level of management.

Source: 1987 Farm Management and Energy Survey.

Contrary to the rather even dispersion of income changes found in farm incomes, nonfarm incomes showed some tendency to increase. More farmers experienced a 10 to 50 percent increase in nonfarm income for both 1980 to 1986 and 1985 to 1986 than experienced a similar decrease.

A naive expectations approach would assume future incomes to be similar to the level experienced currently or in the recent past. Income expectations for only one-third of the farmers were consistent with this approach (Table 35). Compared to the current level of farm income, one-third expected incomes to be similar by 1990. However, 50 percent expected



1990 income to be 10 to 50 percent higher and 55 percent expected increases of some size compared to only 13 percent who expected decreases. Furthermore, the results were basically the same for all 1986 income levels.

**Table 30.** *Relationship of 1985-86 Investment to Farm Operator's Risk Tolerance Upstate New York*

Risk Tolerance	Average 1985-86 Investment <sup>a</sup>			1986 Rate of Expansion <sup>a</sup>
	Expansion	Replacement	Total	
				-Percent-
Tolerant	\$10,700	\$17,500	\$28,200	1.9
Neither	2,500	9,800	12,300	0.8
Averse	2,300	8,700	11,000	1.2
All	\$ 3,400	\$10,100	\$13,500	1.2

<sup>a</sup> For all farms expanding and not expanding.

Source: 1987 Farm Management and Energy Survey.

**Table 31.** *Relationship of 1980-86 Expansion Investment to Risk Tolerance Upstate New York*

Risk Tolerance	Percent of All Farms	Farms Expanding		Average Investment Per Expansion <sup>a</sup>
		Once or more	Twice or More	
				---Percent---
Tolerant	12	56	19	\$164,000
Neither	18	33	15	63,600
Averse	70	36	14	61,000
All	100.0	38	15	\$ 80,400

<sup>a</sup> For farms that expanded, most recent expansion only.

Source: 1987 Farm Management and Energy Survey.

Taking the naive expectations one step further, about 30 percent of the farms expected the change in income during 1986 to 1990 to be similar to that experienced during 1980 to 1986 (Table 36, average of diagonal

elements). Regardless of the historical income change about half of the farmers expected their income to increase 10 to 50 percent by 1990. The greatest dispersion occurred among farms with large (over 50 percent) historical decreases. Twenty-eight percent expected a large improvement in income while a similar percentage expected the precipitous income decline to continue.

**Table 32.** *Relationship of Percent Equity and Selected Factors  
Upstate New York Farms, 1986*

Percent Equity	Risk Tolerance	Operator Age	Net Cash Income	Nonfarm Income
Under 50	1.56	39.9	15,532	6,678
50 - 59.9	1.48	43.4	25,265	7,360
60 - 69.9	1.55	45.5	23,657	7,305
70 - 79.9	1.42	47.0	22,536	5,625
80 - 89.9	1.37	46.0	17,769	11,094
90 - 99.9	1.42	50.1	19,928	9,424
100	1.28	57.4	18,021	6,414
All	1.42	48.5	19,834	7,727
Correlation	-0.983	0.362	-0.046	0.041
P Value <sup>a</sup>	(0.030)	(0.0001)	(0.226)	(0.281)

---

	Farm Debt	Farm Assets	Percent of Farms
Under 50	205,746	328,955	12.7
50 - 59.9	192,817	445,478	9.0
60 - 69.9	163,366	456,646	10.9
70 - 79.9	114,627	429,798	11.8
80 - 89.9	76,365	522,998	13.2
90 - 99.9	19,815	426,560	18.8
100	0	363,247	23.6
All	88,672	417,378	100.0
Correlation	-0.552	0.040	
P Value <sup>a</sup>	(0.0001)	(0.296)	

<sup>a</sup> The probability that there is no linear relationship between the variables.

Source: 1987 Farm Management and Energy Survey.

Similar results were obtained when the 1986 to 1990 income change was compared to the 1985 to 1986 change. The proportion expecting the future rate of change to be similar to the past was only slightly lower (27

percent). Also about half expected a 10 to 50 percent increase in the future regardless of past experience.

**Table 33.** *Relationship Between Percent Equity and Operator's Primary Goal  
Upstate New York Farms, 1986*

Percent Equity	Expand Operation	Increase Leisure	Reduce Borrowing	Increase Profits	
---Percent of Farms---					
Under 40	0	0	12	32	
40 - 59.9	5	6	14	17	
60 - 79.9	6	3	11	29	
80 - 99.9	6	7	2	24	
100	a	10	1	17	
All	4	6	6	23	
---Percent of Farms---					
	Increase Net Worth	Improve Living	Stay in Business	Leave Farming	Total
---Percent of Farms---					
Under 40	9	8	29	10	100
40 - 59.9	13	1	32	12	100
60 - 79.9	4	6	24	17	100
80 - 99.9	6	4	30	21	100
100	5	9	20	38	100
All	6	5	27	23	100

<sup>a</sup> Less than 0.5 percent

Source: 1987 Farm Management and Energy Survey.

Net cash farm income was estimated for 1980 and 1985 from the 1986 income and the change in income between those years as indicated by the farmer. When income stayed within 10 percent, the earlier year value was assumed to equal the 1986 value. When income changed by 10 to 50 percent or over 50 percent, the actual change was assumed to be 30 percent and 60 percent, respectively. A composite historical net income was then calculated by weighting the 1980, 1985 and 1986 incomes, 25 percent, 50 percent and 25 percent, respectively. With this procedure, the more recent year is weighted more heavily than the past and the 1986 value was weighted less because it was not known when the 1985 investments were made.

Composite income was weakly related to expansion investment and quite strongly related to replacement investment (Table 37). It appears that increased income facilitates replacement of existing items more than it encourages additional new investment.

Table 34. *Distribution of Actual Changes in Income  
Upstate New York Farms*

Percent Change in Income	Farm Income		Nonfarm Income	
	1980 to 86	1985 to 86	1980 to 86	1985 to 86
---Percent of Farms---				
+50 or more	6	2	13	5
+10 - 50	36	23	29	20
+/-10	22	52	27	64
-10 - 50	32	22	18	8
-50 or more	4	1	13	3
All	100	100	100	100

Source: 1987 Farm Management and Energy Survey.

Table 35. *Relationship Between Current and Expected Farm Income  
Upstate New York Farms*

1986 Net Cash Farm Income (\$000)	Expected Change in Net Farm Income from 1986-90				
	+50% or more	+10-50%	±10%	-10-50%	-50% or more
---Percent of Farms---					
Zero or Negative	10	47	28	6	9
Under 9.9	2	52	33	4	9
10 - 19.9	2	54	36	4	4
20 - 29.9	1	52	27	10	10
30 - 49.9	7	50	38	4	1
50 or more	6	47	30	6	11
All	5	50	32	6	7

Source: 1987 Farm Management and Energy Survey.

Expected income appears to have only a slightly greater impact on investment than historical and current income (Table 38). Again, the relationship to replacement investment is much stronger than the relationship to new investment.

#### Management Index

The management index was constructed by combining two subindices that reflect management practices. Subindex A was constructed from responses

about frequency of use of production and financial records with four levels. The lowest level (one) indicates no use of crop or livestock production records, nor financial records. Level two indicates use of either production or financial records at least annually. Level three indicates annual use of both production and financial records. Level four denotes use of both production and financial records more frequently than annually.

**Table 36.** *Comparison of Actual 1980 to 1986 with Expected 1986 to 1990 Change in Net Cash Farm Income Upstate New York Farms*

Income Change From 1980 to 85	Expected Change from 1986 to 1990				-50% or more
	+50% or more	+10-50%	+10%	-10-50%	
---Percent of Farms---					
+50% or more	17	55	8	19	1
+10 - 50%	5	53	32	5	5
+/- 10%	-	42	44	5	9
-10 - 50%	1	50	32	8	9
-50% or more	28	40	3	1	28

Source: 1987 Farm Management and Energy Survey.

**Table 37.** *Relationship of 1985-86 Investment to Composite Net Farm Income Upstate New York*

Composite Net Farm Income <sup>b</sup> (\$000)	Average 1985-86 Investment <sup>a</sup>			1986 Rate of Expansion <sup>a</sup>
	Expansion	Replacement	Total	
Zero or Negative	\$ 3,700	\$ 8,600	\$12,300	1.2
1 - 9.9	1,700	5,400	7,100	0.7
10 - 19.9	2,400	6,200	8,600	1.0
20 - 29.9	2,500	9,400	11,900	2.9
30 - 39.9	2,600	9,700	12,300	1.3
40 - 49.9	2,300	18,500	20,800	0.6
50 - 74.9	10,700	24,800	35,500	1.2
75 or more	8,700	24,600	33,300	0.8
All	\$ 3,400	\$10,100	\$13,500	1.2

<sup>a</sup> For all farms.

<sup>b</sup> Constructed from a weighted sum of 1980, 1985 and 1986 net cash farm income (25 percent, 50 percent and 25 percent, respectively).

Source: 1987 Farm Management and Energy Survey.

Table 38.

*Relationship of 1985-86 Investment  
to Expected 1990 Income  
Upstate New York*

Expected Income	Average 1985-86 Investment <sup>a</sup>			1986 Rate of Expansion <sup>a</sup>
	Expansion	Replacement	Total	
				-Percent-
Zero or Negative	\$ 2,800	\$ 9,100	\$11,900	1.1
Under \$9,999	1,200	4,800	6,000	0.4
10,000-19,999	2,100	5,000	7,100	3.0
20,000-29,999	3,100	9,400	12,500	0.6
30,000-39,999	3,600	10,000	13,600	0.7
40,000-49,999	1,800	14,300	16,100	0.7
50,000-74,999	4,200	19,600	23,800	1.5
75,000 or more	15,500	33,000	48,500	1.2
All	\$ 3,400	\$10,100	\$13,500	1.2

<sup>a</sup> For all farms.

Source: 1987 Farm Management and Energy Survey.

Subindex B, also with four levels, was constructed from yes/no responses about four practices: (1) obtaining two or more price quotes for major purchases (such as feed, fertilizer or chemicals), (2) tracking current market prices of commodities sold, (3) writing down short term goals and comparing actual performance to those goals, and (4) periodically reviewing the management responsibilities of the operator (self), family members and/or employees. Index level one denotes use of none or one of these practices. Levels two, three and four indicate the number of the mentioned management practices that are used.

The final management index combined subindices A and B as indicated in the following matrix.

Subindex B	Subindex A			
	One	Two	Three	Four
	---Management Index---			
One	1	1	2	3
Two	2	2	3	3
Three	3	3	3	4
Four	3	3	3	4

One of the working hypotheses adopted for this analysis was that management practices should relate positively with investment behavior. Hence an index was developed to test this proposition. The intent of this index is to measure the use of appropriate practices that make up good management, rather than use measures that represent the results of good management, such as milk per cow or net income.

The management index is positively related to net cash income and the turnover ratio, indicating the expected results of improved management practices (Table 39). That better managers have higher education levels follows from the effect of education on management practices observed in Table 19. The management index is positively related to farm size. This may result from an effort to reach an optimum combination of resources, which would require more "other" assets to complement the larger management resources, or from the improved income of better managers making more expansion possible.

The better managers generally had lower equity levels. This could result from the efforts to expand size or from better managers having more confidence in their ability to handle added credit. However, at least part of the relationship could result from the positive relationship between the management practices index and age. Younger farmers tend to have higher education levels and higher management practice levels, but they also have lower equity levels. Thus, the higher equity levels of poorer managers may be a result of the passage of time rather than a direct result of management ability.

Better managers tended to be more risk tolerant. Better managers may believe that they can manage a higher level of risk or their experience may indicate that they are generally able to minimize the probability of high loss situations when they exist.

Support for the general relationship between management level and frequently used management indicators appears in Table 40. Milk production per cow increased with the management level. It also appears that better managers tend to be more innovative.

In general, management level is highly positively correlated with investment. The level and the rate of expansion during 1985-86 was much higher for farmers with better management (Table 41). The strong relationship between management and replacement investment results at least in part from the larger businesses operated by better managers.

Better managers tended to expand more frequently and invest more when expanding (Table 42). Although the frequency of expanding two or more times during the 1980-86 period was quite irregularly related to the management level, the relationship remained decidedly positive.

### Innovativeness

An innovativeness index was constructed for dairy farms from responses to questions about use or nonuse of four technologies; (1) milking parlor with automatic take-off's, (2) pre-cooler or in-line cooler,

(3) heat recovery system, and (4) isoacid feed additives. Dairies that used any three or all four of these technologies are given an index rating of three (highest), use of any two are rated two, use of one is rated one, and use of none of these technologies is rated zero.

**Table 39.** *Relationship of Management Index and Other Investment Related Variables*

Management Index <sup>a</sup>	Net Cash Income	Percent Equity	Value of Assets	Turnover Ratio <sup>b</sup>
Four	38,965	68	683,825	37
Three	19,735	75	463,702	36
Two	16,054	79	379,793	36
One	13,898	86	302,367	31
All	19,450	78	425,073	35
Correlation	0.151	-0.266	0.228	0.078
P Value <sup>c</sup>	(0.0001)	(0.0001)	(0.0001)	(0.034)
	Operator Age	Years of Education	Risk Tolerance <sup>d</sup>	
Four	45.4	13.5	1.49	
Three	48.3	12.8	1.46	
Two	49.7	12.4	1.42	
One	51.3	11.9	1.35	
All	49.1	12.5	1.42	
Correlation	-0.142	0.260	0.074	
P Value <sup>c</sup>	(0.0001)	(0.0001)	(0.041)	

<sup>a</sup> Constructed from responses to questions about use of financial and production records, obtaining price quotes, tracking market prices, reviewing performance toward goals and managing personnel.

<sup>b</sup> Gross farm income divided by total farm investment, expressed as a percent.

<sup>c</sup> The probability that there is no linear relationship between the variables.

<sup>d</sup> Range of one to three with; one = risk averse, three = risk tolerance, two = neither.

Source: 1987 Farm Management and Energy Survey.

Innovative farms tend to be more profitable farms that make more efficient use of capital (Table 43). Net cash income and the turnover ratio were strongly related to innovativeness. Innovative farms tended to be larger farms. Most innovation requires some investment and some innovations (parlors with automatic takeoffs) require a considerable amount. Innovativeness is also positively correlated with milk per cow, the level of management and risk tolerance.



Table 40. *Effect of Management Level on Milk Per Cow  
and Innovativeness  
Upstate New York Dairy Farms*

Management Level <sup>a</sup>	Milk Per Cow	Innovativeness Index <sup>b</sup>
Four	15,202	1.08
Three	13,661	0.60
Two	12,958	0.42
One	12,311	0.26
All	13,250	0.50
Correlation	0.215	0.302
P Value <sup>c</sup>	(0.0001)	(0.0001)

- <sup>a</sup> Constructed from responses to questions about use of financial and production records, obtaining price quotes, tracking market prices, reviewing performance toward goals and managing personnel.
- <sup>b</sup> Range from zero to three with three indicating the highest level of innovativeness.
- <sup>c</sup> The probability that there is no linear relationship between the variables.

Source: 1987 Farm Management and Energy Survey.

Table 41. *Relationship of 1985-86 Investment  
to Farm Management Index  
Upstate New York*

Management Level <sup>b</sup>	Average 1985-86 Investment <sup>a</sup>			1986 Rate of Expansion <sup>a</sup>
	Expansion	Replacement	Total	
Four	\$ 9,700	\$20,900	\$30,600	1.2
Three	4,000	10,400	14,400	1.9
Two	1,200	9,700	10,900	0.4
One	1,500	5,400	6,900	0.9
All	\$ 3,400	\$10,100	\$13,500	1.2

- <sup>a</sup> For all farms expanding and not expanding.
- <sup>b</sup> Constructed from responses to questions about use of financial and production records, obtaining price quotes, tracking market prices, reviewing performance toward goals and managing personnel.

Source: 1987 Farm Management and Energy Survey.

Table 42.

*Relationship of 1980-86 Expansion Investment  
to Farm Management Index  
Upstate New York*

Management Level <sup>a</sup>	Percent of All Farms	Farms Expanding		Average Investment Per Expansion <sup>b</sup>
		Once or more	Twice or More	
---Percent---				
Four	12	58	27	\$116,000
Three	40	43	8	104,900
Two	19	37	19	49,000
One	29	28	5	27,600
All	100	38	15	\$ 80,400

<sup>a</sup> Constructed from responses to questions about use of financial and production records, obtaining price quotes, tracking market prices, reviewing performance toward goals and managing personnel.

<sup>b</sup> For farms that expanded, most recent expansion only.

Source: 1987 Farm Management and Energy Survey.

Investment during 1985-86 increased sharply with degree of innovation (Table 44). Expansion investment by innovative farmers was many times as large as noninnovative farmers. The larger replacement investment was at least in part the result of the larger businesses they operate.

Farmers who adopt one or more of the innovations included in the index were more likely to expand than those who adopted none of them. However the number of the innovations adopted appeared to have little impact on expansion frequency (Table 45). The size of individual expansions was strongly related to the number of innovations adopted. Those who adopted at least three of the innovations invested over twice as much per expansion as those who adopted only one. This is particularly striking since only one of the technologies involved required major investment.

### Farm Size

Larger farm businesses have more replacement investment and, thus, total investment because they have more assets to maintain (Table 46). Larger farms also tended to expand more. Obviously larger farms have expanded more in the past. This tendency to expand appears to continue to exhibit itself, with vigor, even for those who have achieved relatively large size. Part of this likely results from the greater opportunities from expansion that larger size provides. However, another part may be a basic behavioral characteristic of these farmers.

**Table 43.** *Relationship Between Innovativeness Index and Other Investment Related Variables*

Innovativeness Index <sup>a</sup>	Milk Per Cow	Management Index <sup>b</sup>	Net Cash Income
Three	15,793	3.0	58,739
Two	16,347	3.0	36,882
One	14,671	2.5	21,575
Zero	12,202	2.0	14,186
All	13,245	2.2	19,177
Correlation	0.341	0.302	0.249
P Value <sup>c</sup>	(0.0001)	(0.0001)	(0.0001)
-----			
	Risk Tolerance <sup>d</sup>	Value of Assets	Turnover Ratio
Three	1.64	972,606	46
Two	1.35	663,840	42
One	1.42	488,853	37
Zero	1.43	339,463	34
All	1.43	419,424	35
Correlation	0.016	0.306	0.144
P Value <sup>c</sup>	(0.71)	(0.0001)	(0.0011)

<sup>a</sup> Range of zero to three with three indicating the highest level of innovativeness.

<sup>b</sup> Constructed from responses to questions about use of financial and production records, obtaining price quotes, tracking market prices, reviewing performance toward goals and managing personnel.

<sup>c</sup> The probability that there is no linear relationship between the variables.

<sup>d</sup> Range of one to three with; one = risk averse, three = risk tolerance, two = neither.

Source: 1987 Farm Management and Energy Survey.

#### Type of Ownership

Expansion investment varies considerably by form of ownership. Partnerships invest more than individual proprietorships and corporations invest more than partnerships. This is clearly evident for 1985-86 investment (Table 47). Replacement investment follows the same pattern.

Frequency of expansion during the 1980-86 period and likelihood of expanding more than once were both successively higher for partnerships and corporations, respectively (Table 48). Also, the average size of investment was larger for partnership than proprietorship and much larger for corporations than partnerships.

Table 44.

*Relationship of 1985-86 Investment  
to Index of Innovation  
Upstate New York Dairy Farms*

Innovation Index <sup>a</sup>	Average 1985-86 Investment <sup>b</sup>			1986 Rate of Expansion <sup>b</sup>
	Expansion	Replacement	Total	
				-Percent-
Three	\$18,600	\$28,000	\$46,500	1.9
Two	4,700	19,500	24,200	0.6
One	4,100	12,400	16,500	2.7
None <sup>c</sup>	1,500	6,500	7,900	0.7
All	\$ 2,900	\$ 9,600	\$12,500	1.2

<sup>a</sup> Indicates adoption of dairy technologies; automatic takeoffs, in-line cooler or pre-cooler, heat recovery system, or use of isoacid feed.

<sup>b</sup> For all dairy farms.

<sup>c</sup> Dairy farms without technologies listed above.

Source: 1987 Farm Management and Energy Survey.

Table 45.

*Relationship of 1980-86 Expansion Investment  
to Index of Innovation  
Upstate New York Dairy Farms*

Innovation Index <sup>a</sup>	Percent of Dairy Farms	Farms Expanding		Average Investment Per Expansion <sup>b</sup>
		Once or more	Twice or More	
				---Percent---
Three	3	50	20	\$ 66,567
Two	7	61	21	46,693
One	26	50	16	30,085
None <sup>c</sup>	64	27	8	23,451
All	100	36	12	\$ 28,160

<sup>a</sup> Indicates adoption of dairy technologies; automatic takeoffs, in-line cooler or pre-cooler, heat recovery system, or use of isoacid feed.

<sup>b</sup> For farms that expanded, most recent expansion only.

<sup>c</sup> Dairy farms without technologies listed above

Source: 1987 Farm Management and Energy Survey.

Table 46. *Relationship of 1985-86 Expansion Investment  
and Farm Size  
Upstate New York Farms*

Jan. 1, 1985 Value of Assets  (\$1,000)	Average 1985-86 Investment			1985-86 Rate of Expansion <sup>a</sup>  -Percent-
	Expansion	Replacement	Total	
Under 99.9	\$ 1,300	\$ 1,800	\$ 3,100	3.5
100 - 299	1,200	4,900	6,100	0.7
300 - 499	1,600	9,400	11,000	0.4
500 - 699	5,400	12,800	18,200	0.9
700 - 899	10,300	28,200	38,500	1.3
Over 900	15,900	33,000	48,900	1.0
All	\$ 3,300	\$10,000	\$13,300	0.9

<sup>a</sup> Average of 1985 plus 1986 expansion investment divided by 1985 assets.

Source: 1987 Farm Management and Energy Survey.

Table 47. *Relationship of 1985-86 Investment  
to Type of Ownership  
Upstate New York*

Form of Ownership	Average 1985-86 Investment <sup>a</sup>			1986 Rate of Expansion <sup>a</sup>  -Percent-
	Expansion	Replacement	Total	
Individual	\$ 1,500	\$ 7,700	\$ 9,200	1.2
Partnership	7,200	14,400	21,600	1.0
Corporation	14,200	26,500	40,700	1.7
All	\$ 3,400	\$10,100	\$13,500	1.2

<sup>a</sup> For all farms.

Source: 1987 Farm Management and Energy Survey.

At first brush, these results would appear to be the results of differences in farm size. Larger farms invest more (Table 46) and partnerships are generally larger than proprietorships and corporations are generally larger than partnerships. However, part of the observed result must be due to the characteristics of the business form, or the people who own these businesses, rather than size.

**Table 48.** *Relationship of 1980-86 Expansion Investment to Type of Ownership Upstate New York*

Type of Ownership	Percent of All Farms	Farms Expanding		Average Investment Per Expansion <sup>a</sup>
		Once or more	Twice or More	
---Percent---				
Individual	75	36	13	\$ 50,300
Partnership	19	47	17	86,400
Corporation	6	50	27	345,600
All	100	38	15	\$ 80,400

<sup>a</sup> For farms that expanded, most recent expansion only.

Source: 1987 Farm Management and Energy Survey.

When farms of approximately the same size are compared, partnerships and corporations invest more (Table 49). Corporations with \$100,000 to \$399,000 in assets invested almost two times more than individual proprietorships with \$400,000 to \$700,000 in assets. It appears the partnerships and corporations are inherently more growth oriented than proprietorships.

**Table 49.** *Average 1985-86 Investment by Farm Asset Value According to Type of Owner Upstate New York Farms*

Jan. 1, 1985 Farm Asset Value (\$000)	Form of Ownership			All
	Individual Proprietor	Partnership	Corporation or Ltd. Partner	
---Average 1985-86 Investment (dollars)---				
Under 100	\$ 3,944	\$ a	\$ a	\$ 3,138
100 - 399	5,972	21,001	22,070	7,507
400 - 699	11,634	19,470	21,841	14,251
700 or more	32,328	55,310	56,619	44,969
All	\$ 9,134	\$21,395	\$38,071	\$13,352

<sup>a</sup> Too few farms to report.

Source: 1987 Farm Management and Energy Survey.

## Region

Upstate New York was divided into four regions. The Southeast region (region 1) includes Sullivan, Ulster, Green, Schoharie, Schenectady, Saratoga and Washington Counties and all counties southeast thereof down to Orange and Dutchess. The Northern region (region 4) includes Warren, Montgomery, Herkimer, Oneida and Oswego Counties and all counties north thereof. The Western Plain region (region 3) includes Onondaga, Madison, Cortland, Cayuga, Seneca, Yates, Ontario, Livingston, Wyoming and Erie counties and all counties northwest thereof. The Southern tier (region 2) includes Schuyler, Tompkins, Chenango, Otsego and Delaware counties and all counties west of Delaware that border on the state of Pennsylvania.

These regions were designed to represent contiguous areas with somewhat similar topography, soils, climate and economic environment. The western plain has the most uniformly good soils and climate and is sometimes referred to as the breadbasket of New York State. Field crops, such as corn, dry beans, wheat, barley and oats, and fruits are more prevalent in this region than other parts of the state. The Southeastern region includes a wide variety of soils from the Hudson River Valley to the Foothills of the Catskill Mountains. This region has economic influence from New York City, which increases land prices and nonfarm development potential, and has generally higher milk prices. Northern New York has large areas of marginal soils, a cooler climate, few nonfarm alternatives and a relatively low milk price. The Southern tier has a hill and valley terrain with large amounts of hill soils at the edge of the Allegheny Mountains.

Total investment in farm businesses varies considerably between regions. The Western plain, being the leading agricultural region, showed the highest average investment. The Southeastern region had the second largest investment, due at least in part to higher real estate values. The lowest investment accrued in the northern and southern tier region where soil resources are poorer.

Net cash income followed a pattern unlike that found for asset values (Table 50). The relatively modest income in the Western Plain region in light of the quality of resources in that region can probably be at least partially explained by the low prices received for grain crops, which are important only in this region, during 1986.

As expected, innovativeness was most prevalent in the Western Plain region where most of the soil has a long term future in agriculture. Management practices were also best in this region, likely indicating that good managers tend to gravitate towards the better soils.

Although incomes varied considerably by region, farmers expectations about the future course of their income levels was similar for all regions (Table 51). The only basically significant difference was that Southeastern farmers were a little more optimistic with 20 percent more of them expecting a significant (10 - 50 percent) increase in incomes rather than a continuation at current levels.

Table 50. *Relationship Between Region of New York State and Investment Related Variables*

Region	Value of Assets	Net Cash Income	Innov. Index <sup>a</sup>	Management Index <sup>b</sup>
Southeastern	666,132	27,316	0.48	2.07
Southern Tier	324,767	15,393	0.45	2.29
Western Plain	428,571	18,074	0.56	2.54
Northern	384,723	20,206	0.50	2.20

<sup>a</sup> Dairy farms only, indicates adoption of dairy technologies; automatic takeoffs, in-line cooler or precooler, heat recovery system or use of isoacid feed.

<sup>b</sup> Range of one to four with four indicating highest level of management.

Source: 1987 Farm Management and Energy Survey.

Table 51. *Percent Distribution of Farms According to Expected 1990 Net Cash Farm Income by Region of New York State*

Region	Expected 1990 Net Farm Income Compared to 1986 Income				
	+50% or more	+10-50%	±10%	-10-50%	-50% or more
	---Percent---				
Southeastern	3	65	21	10	1
Southern Tier	2	45	41	3	9
Western Plain	8	46	31	9	6
Northern	2	50	31	5	12

Source: 1987 Farm Management and Energy Survey.

There were large differences in investment by region. The highest level occurred in the Western Plain region (Table 52). This appears consistent with soil quality and the long run opportunities in the region. The lowest level of 1985-86 expansion investment occurred in the Northern region. Expansion during the 1980-86 period were most frequent in the Western Plain (Table 53). Expansions that did occur in the Northern region tended to be larger than those of other regions.



Table 52. *Relationship of 1985-86 Investment to Region of New York State Upstate New York*

Region	Average 1985-86 Investment <sup>a</sup>			1986 Rate of Expansion <sup>a</sup>
	Expansion	Replacement	Total	
				-Percent-
Southeastern	\$ 3,300	\$ 7,600	\$10,900	0.7
Southern Tier	2,900	8,200	11,100	0.6
Western Plain	4,900	13,100	18,000	2.2
Northern	1,500	8,800	10,300	0.9
All	\$ 3,400	\$10,100	\$13,500	1.2

<sup>a</sup> For all farms.

Source: 1987 Farm Management and Energy Survey.

Table 53. *Relationship of 1980-86 Expansion Investment to Region of New York State Upstate New York*

Region	Percent of All Farms	Farms Expanding		Average Investment per Expansion <sup>a</sup>
		Once or more	Twice or More	
				---Percent---
Southeastern	15	28	11	\$ 94,900
Southern Tier	27	39	11	55,400
Western Plain	34	42	18	78,300
Northern	24	37	15	107,400
All	100	38	15	\$ 80,400

<sup>a</sup> For farms that expanded, most recent expansion only.

Source: 1987 Farm Management and Energy Survey.

### Farm Type

Farmers were classified into nine groups based primarily on the predominant types of products produced (see Kelleher and Bills for description of selection procedure). The greatest 1985-86 expansion investment was made by vegetable and potato businesses, followed by horticulture and tree fruit farms (Table 54). The lowest investment was

made on grape farms which were under severe product price pressure. Crop and dairy farms were also experiencing decreased prices during the 1985-86 period which may have contributed to the lower investment levels observed.

**Table 54.** *Relationship of 1985-86 Investment to Farm Type  
Upstate New York*

Farm Type	Average 1985-86 Investment <sup>a</sup>			1986 Rate of Expansion <sup>a</sup>
	Expansion	Replacement	Total	
				-Percent-
Egg Producer	\$ b	\$ 6,700	\$ 6,700	b
Veg. & Potato	6,800	12,800	19,600	1.2
Grape	700	2,500	3,200	c
Tree Fruit	6,000	11,200	17,200	3.2
Horticulture	10,100	9,200	19,300	1.8
Dairy	3,000	9,700	12,700	1.4
Other Lvstk.	4,400	12,700	17,100	0.5
Other Crops	1,200	9,200	10,400	0.7
Misc.	800	3,800	4,600	2.4
All	\$ 3,400	\$10,100	\$13,500	1.2

<sup>a</sup> For all farms.

<sup>b</sup> Too few observations to report.

<sup>c</sup> Less than 0.1 percent.

Source: 1987 Farm Management and Energy Survey.

Expansion during the 1980-86 period occurred most frequently on horticulture businesses and least frequently on egg farms (Table 55). Vegetable and potato and other crop farms expanded quite frequently and had the largest size investment when they did expand.

#### Distance to Nearest City

In theory, the closer land is to an expanding population center, the higher the likelihood that it will be sold for development within the next few years. In such situations, farmers may avoid major land and building investments that can not be moved and have a long repayment period. Also, returns to some investments may be reduced due to the higher costs of vandalism, regulation and higher tax levels.

However, the data from this survey provide conflicting evidence on the relationship between nearness to a city of 20,000 population or more and investment. Both replacement and expansion investment were lower in 1985-86 for farms within five miles of a city (Table 56). For those living more than five miles from a city, the distance from the city appeared to have no effect on investment. Further, the composition of investment

within five miles was not consistent with the theory. Most of the investment that was made was in buildings rather than machinery or livestock (Table 57). Several explanations for this result are possible; (1) the influence of a city extends less than five miles in most cases, (2) the number of farms within five miles (three percent, Table 58) is too small for generalizations, or (3) 1985-86 were sufficiently unprofitable for farm businesses that investment did not follow normal patterns.

Table 55. *Relationship of 1980-86 Expansion Investment to Farm Type Upstate New York*

Farm Type	Percent of All Farms	Farms Expanding		Average Investment per Expansion <sup>a</sup>
		Once or more	Twice or More	
---Percent---				
Egg Producer	1	10	b	\$ c
Veg. & Potato	7	43	30	102,700
Grape	2	35	5	62,900
Tree Fruit	2	40	30	41,700
Horticulture	1	80	70	57,600
Dairy	72	36	12	77,700
Other Lvstk.	9	41	24	52,100
Other Crops	5	56	12	126,000
Misc.	1	30	20	64,700
All	100	38	15	\$ 80,400

<sup>a</sup> For farms that expanded, most recent expansion only.

<sup>b</sup> Less than .5 percent.

<sup>c</sup> Too few observations to report average.

Source: 1987 Farm Management and Energy Survey.

The evidence for the 1980-86 period is also conflicting. The frequency with which expansions were made during that period was almost the same for the nearest farms as the frequency for all farms (Table 58). The average size of expansions of nearest farms was, however, considerably below the average for all farms and for all distance categories of greater than five miles. The most that can be said is that farms within five miles of a city may invest somewhat less than those more distant from the metropolitan areas.

### Financial Considerations

A number of different credit sources served as the primary lender to New York farmers in 1986 (Table 59). The predominant lenders were commercial banks and the Farm Credit System (Production Credit Association or Federal Land Banks). The Farmers Home Administration (FmHA) was also important. None of the other lenders served as many as two percent of farmers.

Table 56.

*Relationship of 1985-86 Investment  
to Distance to Nearest City  
Upstate New York*

Miles to Nearest City <sup>b</sup>	Average Investment <sup>a</sup>			1986 Rate of Expansion <sup>a</sup>
	Expansion	Replacement	Total	
				-Percent-
0 - 4.9	\$ 1,000	\$ 6,200	\$7,200	0.2
5 - 14.9	4,500	11,000	15,500	1.0
15 - 24.9	3,800	9,400	13,200	1.0
25 - 34.9	3,400	11,500	15,000	0.7
35 or more	2,500	8,800	11,200	2.0
All	\$ 3,400	\$10,000	\$13,300	1.2

<sup>a</sup> For all farms.

<sup>b</sup> With a population of 20,000 or more.

Source: 1987 Farm Management and Energy Survey.

Table 57.

*Composition of 1985-86 Expansion Investment and  
Distance to Nearest City  
Upstate New York*

Miles to Nearest City	Type of Expansion Investment				
	Buildings	Land & Improvements	Machinery	Livestock	Total
					---Dollars---
0 - 4.9	1,000	a	a	a	1,000
5 - 14.9	1,000	1,500	1,200	800	4,500
15 - 24.9	800	1,900	600	500	3,800
25 - 34.9	1,100	1,100	900	200	3,300
35 or more	1,000	1,000	200	300	2,500
All	1,000	1,300	700	400	3,400

<sup>a</sup> Too few observations to report.

Source: 1987 Farm Management and Energy Survey.

Over half of the farmers who did not borrow in 1986 would have used a commercial bank if borrowing had been necessary. Nonborrowers were less likely to use the Farm Credit System (FCS) or Farmers Home Administration than borrowers. This is not surprising for FmHA since many nonborrowers

likely would have little debt and would not qualify for funding from a last resort lender. The low potential use of the FCS is more difficult to explain. It may be that the recently (at the time of the survey) advertised financial problems of FCS and the inappropriate identification of FCS as a government credit source by the press resulted in a reluctance to claim Farm Credit as a primary lender. Alternately, those who do not use financing may be familiar with a bank from other financial transactions but be basically unfamiliar with the Farm Credit System. Almost half of Upstate New York farmers consider a commercial bank to be their primary lender while only about one-third claimed FCS.

Table 58. *Relationship of 1980-86 Expansion Investment to Distance to Nearest City Upstate New York*

Miles to Nearest City <sup>a</sup>	All Farms	Farms Expanding		Average Expansion <sup>b</sup>
		Once or more	Twice or More	
---Percent---				
0 - 4.9	3	37	14	\$ 37,200
5 - 14.9	17	39	15	91,000
15 - 24.9	22	42	17	62,000
25 - 34.9	26	38	15	81,200
35 or more	32	35	12	92,200
All	100	38	14	\$ 80,400

<sup>a</sup> With a population of 20,000 or more.

<sup>b</sup> For farms that expanded, most recent expansion only.

Source: 1987 Farm Management and Energy Survey.

The average interest rate paid by farms expanding in 1986 varied considerably. There was more variability in the rates paid by farmers within each lender type than there was between types. Rates paid in 1986 to commercial banks were higher than those paid to the Farm Credit System or other lenders even after correcting Farm Credit rates for a representative stock requirement (Table 60). Sufficient data were not collected to conduct a comprehensive analysis of the relationship between interest rate and investment.

The interest rate paid was not related to the size of expansion undertaken in 1986 (Table 61). Large expansions were made by individuals paying a wide variety of rates. This may result from a lack of correspondence between profitability of expansions and the size of expansion. The distribution of expanding farms by interest rate appears to relate more to the likely distribution of rates available to farmers than to any effect of interest rate on the motive to invest.

Table 59.

*Primary Lender in 1986  
Upstate New York*

Declared Primary Lender	Farms that Borrowed in 1986	If had Borrowed in 1986	Total
---Percent of Farms---			
Farmers Home Admin.	6	3	9
Commercial Bank	23	28	51
Production Credit Assoc.	17	9	26
Federal Land Bank	a	3	3
Insurance Company	a	a	a
Dealer	a	a	a
Manufacturer	a	a	a
Relatives	a	a	a
Other	a	a	a
Never Borrowed	--	3	3
Total	51	49	100

<sup>a</sup> Less than two percent.

Source: 1987 Farm Management and Energy Survey.

Table 60.

*Average Interest Rate by Source of Credit  
for 1986 Expansion Investment  
Upstate New York Farms*

Source <sup>a</sup>	Percent of Expanding Farms <sup>b</sup>	Average Interest Rate
-Percent-		
Commercial Banks	49	11.7
Farm Credit System	29	10.5 <sup>c</sup>
Other	22	10.4
All	100	11.1

<sup>a</sup> According to declared primary source of credit.

<sup>b</sup> Percent of farms with indicated primary lender.

<sup>c</sup> Adjusted for stock ownership of eight percent.

Source: 1987 Farm Management and Energy Survey.

Table 61.

*Relationship of 1986 Expansion Investment  
to 1986 Interest Rate Category  
Upstate New York Farms*

Interest Rate Category (%)	Percent of Expanding Farms	Average Expansion Investment	Rate of Expansion <sup>a</sup>
			-Percent-
Less than 7.9	8	\$34,800	9.6
8 - 8.9	3	65,200	7.6
9 - 9.9	12	82,300	11.0
10 - 10.9	21	33,500	8.6
11 - 11.9	33	23,600	15.4
12 - 12.9	11	67,700	14.0
13 - 13.9	3	96,700	13.5
14 - 14.9	9	28,300	9.0
All	100	\$42,500	11.9

<sup>a</sup> For farms expanding in 1986.

Source: 1987 Farm Management and Energy Survey.

### The Decision Making Process

Survey respondents were asked a series of questions designed to reveal the characteristics of the investment decision process they use. Those who had expanded were asked about their decision process relative to their most recent expansion. Those who had purchased a silo, tractor, self propelled harvester, self propelled windrower or air blast sprayer during 1985 or 1986 were asked about their decision process for these larger investments. Farmers who had purchased a manure spreader, silo unloader, weed sprayer, cultivator, chisel plow or blower during 1985 or 1986 provided information on their decision process for these small investments. The questions focused on six areas: (1) sources of information, (2) use of financing, (3) tax calculations, (4) degree of written analysis, (5) types of calculations made, and (6) person carrying out the calculation.

#### Sources of Information

Farmers were asked to indicate the most important sources of information used in deciding to make the investment. Seven different sources of information were coded. A high proportion of the respondents believed that they were their own most important source of information for all three investment decisions. Since "self" was not separately coded, it is included in the "other" category (Tables 62, 63, 64).

For expansion investments, other producers was the most important of the external sources of information (Table 62). All the other sources were

the most important for only a few producers. For those indicating a second source of information, lender ranked highest.

Table 62. *Sources of Information for Expansion Investment Decisions  
Upstate New York Farms*

Source of Information	Most Important Source	Second Ranked Source	Third Ranked Source
	---Percent---		
Salesperson/Literature	4	6	5
Newspaper/Magazine	2	3	3
Cooperative Extension	5	4	4
Lender	5	10	4
Consultant	4	5	2
Other Producers	9	6	2
Advertisements	1	2	2
Other	70	5	3
Not Answered <sup>a</sup>	0	59	75
Total	100	100	100

<sup>a</sup> Percent of 336 farmers providing data on information sources.

For large investments, the salesperson or manufacturer was the most important source of information (Table 63). All other sources were used to a modest degree.

For small investment decisions, the salesperson or manufacturer was also the most used external information source (Table 64). Other producers were also used relatively frequently. The remaining sources were infrequently used.

The general implication of these data (assuming the survey procedure worked correctly) is that farmers do not make much use of external sources of information in making investment decisions.

### Use of Financing

For each specific investment, farmers were asked if they used financing. If not, they were asked if they would have made the investment had financing been necessary.

Use of financing was reported by approximately 70 percent of respondents who undertook an enterprise expansion. Others relied on their own finances. Among the latter, half would have expanded had financing been necessary.



Table 63.

*Sources of Information for  
Large Equipment Investment Decisions  
Upstate New York Farms, 1985 and 1986*

Source of Information	Most Important Source	Second Ranked Source	Third Ranked Source
	---Percent---		
Salesperson/Literature	22	14	4
Newspaper/Magazine	a	4	2
Cooperative Extension	a	3	1
Lender	3	5	2
Consultant	1	2	2
Other Producers	7	5	6
Advertisements	5	5	5
Other	61	6	2
Not Answered <sup>a</sup>	0	56	76
Total <sup>b</sup>	100	100	100

<sup>a</sup> Less than 0.5 percent.

<sup>b</sup> Percent of 218 farmers providing data on information sources.

Source: 1987 Farm Management and Energy Survey.

Table 64.

*Sources of Information for  
Small Equipment Investment Decisions  
Upstate New York Farms, 1985 and 1986*

Source of Information	Most Important Source	Second Ranked Source	Third Ranked Source
	---Percent---		
Salesperson/Literature	22	15	6
Newspaper/Magazine	2	5	3
Cooperative Extension	a	2	a
Lender	1	2	1
Consultant	1	2	1
Other Producers	8	6	5
Advertisements	3	6	4
Other	63	5	2
Not Answered <sup>a</sup>	0	57	78
Total <sup>b</sup>	100	100	100

<sup>a</sup> Less than 0.5 percent.

<sup>b</sup> Percent of 249 farmers providing data on information sources.

Source: 1987 Farm Management and Energy Survey.

Sixty-one percent of large equipment purchasers obtained financing, while 39 percent used their own funds. For small equipment, 38 percent of the purchases were financed, while 62 percent were not. Among the large equipment purchasers who used their own funds, 53 percent would have obtained financing if it had been necessary, whereas for small purchases, 59 percent would have sought financing.

The frequency of use of the various sources of credit (excluding own financing) was nearly the same for expansion investment and large and small purchases. The Farm Credit System and commercial banks ranked either first or second in each case.

### Tax Considerations

Farmers were asked if tax calculations were made in deciding to make the investment. Thirty-five percent of those making expansion investments indicated that tax calculations were made. Twenty-seven percent made tax calculations for large investments and 21 percent for small. Clearly a high proportion of farmers do not make tax calculations. However, as the size of investment being considered gets larger, more farmers do calculate the tax consequence.

Those who did make tax calculations had higher 1986 accrual incomes than those who expanded without making the calculation (Table 65). Both groups had higher incomes than those who did not expand (\$17,000). Similar results were found for large and small equipment investments; those who made tax calculations generally had higher incomes. This difference in income does not necessarily indicate the difference in taxes paid. It indicates the character of individuals who made tax calculations. Those who make tax calculations likely also carefully consider each investment possibility in detail.

Table 65. *Relationship of Investment Tax Calculations to Net Income Upstate New York Farms, 1986*

Type of Investment	Tax Calculations Performed for Investment	
	Yes	No
	---Average Net Farm Income---	
Expansion	\$ 35,700	\$ 27,100
Large Equipment	46,600	34,100
Small Equipment	31,300	27,100

Source: 1987 Farm Management and Energy Survey.

Making tax calculations does not have any clear cut relationship to the amount invested. Those who made tax calculations undertook smaller expansions than those who did not (Table 66). Those who made tax

calculations for single small and large investments appear to invest more. However, this appears to result from the increased likelihood of making tax calculations for larger investments within each category (Table 67).

**Table 66.** *Relationship of Investment Tax Calculations to Average Amount Invested Upstate New York Farms, 1986*

Type of Investment	Tax Calculations Performed for Investment	
	Yes	No
---Average Amount Invested---		
Expansion	\$ 77,300	\$ 82,500
Large Equipment	27,200	20,300
Small Equipment	31,300	27,100

Source: 1987 Farm Management and Energy Survey.

**Table 67.** *Frequency with which Tax Calculations are made by Size and Type of Investment Upstate New York Farms*

Size of Investment <sup>a</sup>	Investments with Tax Calculations		
	Expansion	Equipment Purchase	
		Large	Small
---Percent---			
Small	34	23	14
Medium	32	27	19
Large	39	35	33
All	35	27	21

<sup>a</sup> Small corresponds to the one-third of observations with smallest amounts of investment, medium is the one-third of observations with approximately average amounts of investment, large is the upper one-third of observations.

Source: 1987 Farm Management and Energy Survey.

#### Use of Written Calculations

For each of the three investment types, farmers indicated whether the decision to invest was based on written calculations, mental calculations

or experience (no calculations). A low proportion of investment decisions are based on written calculations. Even for expansions for which the average investment was \$80,000, only 31 percent of the farms used written calculations in their decision process (Table 68). As might be expected, the proportion performing written calculations for individual investments was even lower; only 20 percent for large investments and 12 percent for small investments.

**Table 68.** *Relationship Between Degree of Analysis and Type of Investment Upstate New York Farms, 1980-86*

Type of Investment	Written Calculations	Mental Calculations	By Experience
---Percent of Farms---			
Expansion	31	40	29
Large Equipment	20	55	25
Small Equipment	12	48	40

Source: 1987 Farm Management and Energy Survey.

The most popular method of analysis for all types of investments was use of mental calculations. Nearly 30 percent of expansion and large equipment investments were made without any calculation of any kind as to the profitability or cash flow implication of the investment.

There is also a greater likelihood that written calculations will be used for larger expansions than for small ones (Table 69). However, the degree of analysis used by those who do not make written calculations is not closely related to size.

**Table 69.** *Effect of Expansion Size on Degree of Analysis Upstate New York Farms, 1980-86*

Expansion Size	Written Calculations	Mental Calculations	By Experience
---Percent of Farms---			
Small	26	44	30
Medium	41	14	45
Large	43	32	25

Source: 1987 Farm Management and Energy Survey.

### Types of Calculations

For those situations where written calculations were made, farmers indicated the type of analysis conducted. The most popular type of calculation was a cash flow analysis (Table 70). This would logically follow from the need for many businesses to plan for debt service on funds borrowed to make the investment. However, some farmers may equate positive cash flow and positive profit and, thus, use cash flow analysis to determine the desirability of investments.

Table 70. *Type of Calculation Used to Analyze Investments  
Upstate New York Farms*

Source	Expansions	Large Equipment	Small Equipment	---Percent of Farms <sup>a</sup> ---			
Partial Budget	52	33	22				
Cash Flow Analysis	67	53	38				
Payback Period	54	33	31				
Net Present Value	32	15	2				
None of Above	15	16	31				
Number of Respondents	{123}	{55}	{45}				

<sup>a</sup> Multiple responses were permitted.

Source: 1987 Farm Management and Energy Survey.

Partial budget and payback period analyses were nearly tied for second place. Practically the same proportion of farmers used these methods for evaluating expansions and large equipment investments. Only about one-third of the farmers used net present value techniques for expansion investment evaluation. The complexity of making net present value calculations must more than off-set the conceptual superiority of net present value as an analysis technique.

### Source of Calculations

Farmers who relied on written calculations usually did at least part of those calculations themselves (Table 71). For expansions the most important external source was the lender. This is consistent with the fact that cash flow calculation was the most frequent type of analysis used. It, however, raises the question as to whether the large portion of the calculations were designed to address financial feasibility rather than investment profitability.

Table 71. *Source of Written Calculations for Investment Decisions  
Upstate New York Farms*

Source	Expansions	Large Equipment	Small Equipment
	---Percent of Respondents <sup>a</sup> ---		
Own Calculation	99	95	96
Extension Agent	22	2	2
Lender	37	7	16
Salesperson /Manufacturer	18	11	24
Hired Consultant	14	5	2
Other	10	2	4
Number of Respondents	{123}	{55}	{45}

<sup>a</sup> Multiple responses were permitted.

Source: 1987 Farm Management and Energy Survey.

Extension agents were used by about one-quarter of the farmers as expansion investment analysis, but were rarely used for consideration of individual investment items, whether large or small.

The salesperson/manufacturer was relatively important for all types of decisions and particularly so for small investments. Hired consultants were used for 14 percent of the expansions, but like extension agents (free consultants) were infrequently used for individual items.

### Reason for Purchase

Farmers were asked to indicate whether 1985-86 investments in a short list of large and small equipment items were purchased for:

- 1) Replacement - the new item replaces an existing item.
- 2) Expansion - the new item is designed to increase business size.
- 3) Efficiency - the new item is not a replacement but is purchased to improve operating efficiency rather than expansion.

Over half of the items purchased in 1985-86 were purchased to replace existing items (Table 72). Manure spreaders and air blast sprayers were most frequently purchased as replacements. Silos and chisel plows were most frequently purchased to improve efficiency but infrequently purchased as replacements.

Efficiency was a more important reason for purchase than expansion, particularly for small investments. This highlights a deficiency in much investment research (including that reported herein) in that investment is assumed to represent replacement of existing items or expansion. In cases

where replacement is estimated as a depreciation or decay function of the existing stock, the net investment that is calculated by subtracting replacement from total investment includes cost reducing efficiency investment as well as expansion investment. If the proportion of efficiency investment increases over time, say in response to rising energy prices or more stringent environmental regulations, the relationship between net investment and output will diminish.

Table 72. Reason for Purchase of Large and Small Equipment  
Upstate New York, 1985-86

Investment Item	Reason for Purchase			No. of Purchases <sup>a</sup>
	Replacement	Expansion	Efficiency	
---Percent---				
<u>Large</u>				
Silo	18	40	42	50
Tractor	60	20	20	155
Self Propelled Harvester	67	14	19	21
Self Propelled Windrower	56	22	22	9
Air Blast Sprayer	80	0	20	5
Total	51	24	25	240
<u>Small</u>				
Manure Spreader	78	8	14	134
Silo Unloader	52	13	25	55
Weed Sprayer	43	16	41	37
Cultivator	24	33	43	21
Chisel Plow	14	14	72	22
Blower	54	18	28	50
Total	57	15	28	319

<sup>a</sup> Respondents were asked to report only on one large and one small item.

Source: 1987 Farm Management and Energy Survey.

### Summary and Conclusions

*Investment Patterns.* A survey of a random sample of commercial farm businesses (over \$10,000 in sales) in Upstate New York was used to determine the investment pattern, investment related characteristics and investment decision processes of farmers. Data were collected by personal interview. Reasonably complete investment related data were obtained for 756 farms. On an annual basis, commercial farms in New York spend more on machinery and equipment than any other type of investment. Both the

absolute level of investment and the rate of investment are highest for machinery and equipment. Real estate investment ranks second in absolute dollar investment but livestock investment ranks second in terms of the rate of investment. Replacement investment was clearly more important than expansion for most farms. Only 38 percent of surveyed farms expanded operation in the 1980-86 period. The proportion of farms expanding during that period was highest for horticulture businesses and lowest for egg producers. In 1986, expansion investment per farm was highest for horticulture, fruit and vegetable businesses. Except for manure spreaders, a large portion of the machinery on farms is older than the normal service life suggested by the IRS. Of the purchases by farmers in 1985-86, 41 percent of the large items and 27 percent of small items were purchased used. The age distribution of items replaced varied considerably among investment items. Replaced machinery items are most frequently over 10 years of age. Large farms tend to replace most items more frequently than small farms.

*Investment Related Characteristics.* Data were collected on all 1985-86 investments in the farm businesses and on the most recent expansion if an expansion occurred during 1980 and 1986 (inclusive). Investment was consistent with the life cycle theory of individual proprietorships. Young farmers expanded frequently but the amount of investment was limited. Maximum investment occurred at 35-44 years of age. Older operators tended to be less educated, less innovative, less risk tolerant and less inclined to use modern management practices, all of which lead to lower investment levels.

Operators with more education tended to be younger and more innovative with higher levels of management capacity and greater willingness to use debt. Thus, education was positively related to both the frequency and size of expansions. Experience has little independent relationship to investment. It appears that added years of experience primarily represent repetition rather than a cumulative learning activity.

Investment varies considerably depending upon the primary goal of the operator. Goals tend to shift from profits to improved living over time as the operator gets older, which undoubtedly contributes to the reduced investment observed for older operators. Risk tolerant farmers tended to invest considerably more than the more risk averse. The risk tolerant were generally younger, more innovative, better managers with larger farms and higher debt levels.

The income expectations of farmers did not confirm a naive expectation model. Only about one-third of the farmers expected their future incomes to approximately equal the current level or that the change in future income would be similar to the change experienced in the recent past. Current income levels are strongly related to replacement investment, but only weakly related to expansion investment indicating that income is primarily facilitative of replacement investment. Expected incomes were also weakly related to levels of expansion investment.

Better managers tended to have higher incomes, be more risk tolerant and make more use of debt. The management level was highly positively correlated with both the frequency and size of expansion investments.



Innovative farmers had higher incomes, greater management ability and more risk tolerance as well as larger businesses. Innovativeness had little impact on the frequency of expansion but generally resulted in larger investment when expansion occurred.

Larger businesses tend to expand more than smaller ones. This may be the result of either expanded investment opportunities or the basic behavioral character of the operator, or both. Partnerships and corporations are more growth oriented forms of organization than individual proprietorships. When farms of the same size are compared, corporations and partnerships invested more than proprietorships.

Expansions occurred more frequently and investment was larger for farms located in the western plain region where soils are better and the long run opportunities in agriculture are better. The management practices index was also higher for this region.

Contrary to theory, neither distance to nearest city of 20,000 population nor the interest rate paid were related to investment.

*The Decision Process.* The primary external source of information in making investment decisions were other producers and salesperson. Lenders were also used for expansion investment. Extension, consultants and other sources were little used.

Only about 15 percent of the farmers would refrain from expansion investment if financing were required. Another 15 percent used their own funds while 70 percent of the expansions involved financing.

Only about a quarter of farmers made tax calculations when considering individual (small or large) investments. Only 35 percent made tax calculations when making expansions. Those who made calculations generally had higher incomes.

Written calculations to evaluate the investment were made for only 12 percent of small investments, 20 percent of large investments and 31 percent of expansions. Although the probability of written calculations being made increase as investment size increases, a large number of investments of all sizes are made without performing calculations. About half of all investments are made based solely on mental calculations.

For those who did make written calculations, cash flow was the most frequently used type of analysis. Partial budget and payback period analyses were done much more frequently than net present value analysis. Most farmers making written calculations did at least part of them themselves. Lenders and salespersons were also frequently used.

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