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THE FEASIBILITY OF PRODUCING AND MARKETING FRESH VEGETABLES IN CENTRAL AND WESTERN NEW YORK

BY

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ABSTRACT

The potential for growers in Western New York to grow, pack, and market 10 fresh vegetable crops was investigated. Terminal market price data for 1984-1988 were collected and analyzed for each crop. The cost of central packing, marketing, and transportation to terminal markets was estimated. The resulting net returns to growers and the costs of production using recommended cultural practices were calculated.

Results, which depend very heavily on particular assumptions used in the study, indicated that tomatoes and green beans were profitable in an average season, giving positive returns to above total costs of production and marketing. Three crops (green peppers, broccoli, and cucumbers) had positive returns above variable costs, indicating that some returns would accrue to fixed resources. Four other crops (sweet corn, zuchinni, winter squash, and cauliflower) had negative returns to variable costs, indicating that they were unprofitable to grow and market through a central packing facility. The tenth crop, cherry tomatoes, could not be analyzed because of incomplete data.

Market window analysis, which incorporated a risk factor, indicated that six crops had market windows for at least one week in the season. These crops were snap beans, broccoli, cucumbers, peppers, tomatoes, and zuchinni. The market windows identified were, however, typically very early or very late in the season when few observations of prices were available and production risk is substantial.

These results show some opportunities for expanded production of tomatoes, green beans, peppers, broccoli, and cucumbers for growers who are willing and financially able to incur substantial risk.

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THE FEASIBILITY OF PRODUCING AND MARKETING FRESH VEGETABLES IN CENTRAL AND WESTERN NEW YORK

by Raymond Barnes and Gerald B. White*

I. INTRODUCTION

Despite a reduction in the scale of vegetable production, New York has maintained a significant share of the total U.S. production of certain vegetable items. In 1988, New York ranked third in the production of green beans for processing, second in the production of fresh market sweet corn, and fourth in the production of fresh market cauliflower (Table 1.1). New York is also high ranking in the production of cabbage. Central and Western New York counties comprise over 70 percent of all reported vegetable acreage in the State (Tables 1.2 and 1.3), making the vegetable industry an important part of the region's economy.

Table 1.1 New York's rank in U.S. fresh and processed vegetables, selected vegetables, 1988

Processed	Rank	Fresh	Rank
Green Beans	3	Cauliflower	4
Sweet Corn	7	Sweet Corn	2
Tomatoes	6	Tomatoes	9

Source: New York Agricultural Statistics, 1988.

Table 1.2 Vegetable production and acreage in New York State, 1950-1987*

	1950	1960	1970	1980	1987
			(tons)		
Production:					
Processed	486,500	412,750	384,800	226,880	312,180
Fresh	852,000	668,600	585,150	413,400	358,600
Total	1,338,500	1,081,350	969,950	640,280	670,780
Acreage:					
Processed	115,000	91,300	80,490	70,700	76,880
Fresh	111,750	86,300	63,190	47,910	54,010
Total	226,750	177,600	143,680	118,610	130,890

*Preliminary.
Source: USDA Agricultural Statistics, 1950-1988.

*Raymond Barnes, an M.B.A. Candidate at the State University of New York at Binghamton, was formerly Research Support Specialist in the Department of Agricultural Economics at Cornell. Gerald B. White is Associate Professor.

Table 1.3 Number of vegetable farms and acres of vegetables harvested for sale, Central and Western New York Region*, 1954-1987

	1954	1964	1974	1987
Number of farms	5,782	2,645	1,623	1,123
Acres	101,580	111,494	96,140	95,074

*Includes the counties of Cayuga, Erie, Genesee, Monroe, Niagara, Oneida, Onondaga, Ontario, Orleans, Oswego, Wayne, and Yates.

Source: USDA Census of Agriculture, 1954-1987.

Background and Problem Statement

Since the end of World War II, the processing vegetable industry in New York State has been in a relative state of decline (Becker 1990; Wysong et al. 1984). Growing conditions, especially soils and climate in Central New York, are not as favorable for vegetable production as in some areas of Western New York. Urban pressure in New York and increased production and transportation efficiencies in other parts of the country have contributed to a steady movement of processing vegetable plant capacity further west in the State or out of the State completely. For similar reasons, fresh vegetable production has also declined in the region.

In recent years the processing vegetable industry in New York has been further altered by changing consumer preferences and consumption patterns (How 1991; Eastwood et al. 1987). U.S. consumers became more health conscious and attentive to their diets. This led to increased per capita consumption of fresh vegetables, perceived to be more healthful, and a diminished per capita consumption of canned processed vegetables (Table 1.4). The emergence of salad bars at fast food restaurants and the wider variety of vegetables offered at supermarkets also contributed to a significantly increased demand for fresh vegetable items like tomatoes and broccoli. The effect on returns for certain fresh vegetables has ranged from significant to spectacular over the last two decades, whereas processed vegetables have experienced stable or less dramatic price changes (Table 1.5).

Table 1.4 U.S. fresh and processed vegetable per capita utilization, 1970-1988

	1970	1980	1988
		(pounds per person)	
Fresh:			
Tomatoes	12.1	13.4	17.8
Broccoli	0.5	1.5	3.6
Cauliflower	0.7	1.3	2.7
Sweet Corn	7.9	7.0	7.3
All Fresh	70.5	80.5	100.3
Processed (canned):			
Tomatoes	62.1	63.6	61.0
Snap Beans	5.9	6.1	5.3
Sweet Corn	20.1	19.3	18.6
Peas	5.1	4.5	3.5
All Processed	104.7	105.0	99.8

*Preliminary.
Source: USDA; ERS.

Table 1.5 New York fresh and processed vegetable prices, 1970-1988, Market year weighted average price, selected vegetable items.

	1970	1980	1988
		($ per hundredweight)	
Fresh:			
Tomatoes	8.26	28.60	45.40
Snap Beans	10.80	29.60	55.00
Sweet Corn	3.71	9.51	14.30
		($ per ton)	
Processed:			
Tomatoes	43.60	68.30*	75.70*
Snap Beans	89.60	169.00	161.00
Sweet Corn	24.20*	48.90	55.70

*USDA Agricultural Statistics (no New York data available) combined price data for New York and other states.
Source: New York State Agricultural Statistics, 1970-1988.

In response to the changing demand for vegetables, many processing vegetable farmers in Central and Western New York are expressing an interest in the production of fresh vegetables as an alternative. Farmers who have experience growing fresh vegetables are also interested in the possibility of expanding acreage and varieties grown. The increased consumption and higher profit potential for fresh vegetables, however, has not gone unnoticed or unmet. Florida and California maintained or significantly increased fresh vegetable acreage and took full advantage of production and transportation efficiencies (Table 1.6). These states also offer the possibility of year-round supply which is very appealing to buyers. Neighboring states like New Jersey and Maine have been swift to move into the production of fresh vegetables, and have begun production of crops not previously considered popular for growing in these regions, such as broccoli in Maine (Table 1.7). Canada and Mexico have also become established suppliers to U.S. consumers of major fresh vegetable items such as tomatoes and carrots.

Table 1.6 California and Florida fresh vegetable production, 1950-1987 (tons production).

	1950	1960	1970	1980	1987*
California	2,677,600	3,614,450	4,231,850	4,895,150	5,425,700
Florida	1,161,800	1,433,050	1,424,650	1,213,400	1,400,450

*Preliminary.
Source: USDA Agricultural Statistics, 1950-1988.

Table 1.7 Acreage comparisons, New York with New Jersey fresh market tomatoes and Maine fresh market broccoli, 1974-1987* (acres production)

	1974	1982	1987
Tomatoes:			
New Jersey	6,700	6,500	6,100
New York	3,900	3,200	2,100
Broccoli:			
Maine	2	302	2,367
New York	219	358	1,262

*Preliminary.
Source: USDA Census of Agriculture, 1974-1987.

The interest of Central and Western New York farmers in fresh market vegetables as an alternative enterprise coupled with the significant competition offered by producers from other areas (including other parts of New York) suggests the need for a thorough assessment of the fresh vegetable market situation as well as production possibilities and potential costs and returns for Central and Western New York. Given the volatile and unpredictable nature of vegetable production, demand, prices, and the competitive environment, a feasibility study is an important first step in providing producers with information to help them make intelligent decisions when considering fresh vegetable production.

Objectives

The overall objective of this study was to determine the feasibility of fresh vegetable production in Central and Western New York. Potential opportunities, as well as limiting factors, were identified. There were four specific objectives:

1. To identify vegetable crops which have the most potential for production and marketing for the fresh market. We also investigated markets (locations and channels) to which the selected vegetable crops will be shipped and evaluated potential market prices, barriers to entry, and major competitors.

2. To estimate the cost of production for each of the selected fresh vegetable crops.

3. To estimate the costs of packing and shipping each of the vegetable crops and the cost of a central packing facility.

4. To compare the costs of production, packing, shipping, and marketing with expected returns for the selected crops, giving consideration to potential limiting factors in production, packing, and marketing. We evaluated the feasibility of production of each crop given the results of the comparison.

Methods

An advisory committee comprised of growers, packers, and Extension personnel was initially established to guide this research project. We used expert advice from the advisory committee to formulate a list of prospective crops to consider. Meetings between the researchers and the committee were held quarterly to receive guidance on research goals, design of a survey of growers, data collection, and feedback on results through progress reports.

Recent fresh vegetable unloads and prices were analyzed for major terminal markets in the Northeast U.S. In addition, a survey of independent buyers was carried out to discover potential prices, competitors, buyer perceptions, problems, and potential market barriers for New York fresh vegetables, and their competitive position in the marketplace.

To help estimate production costs, a survey was distributed by Extension agents to evaluate the resource base, production experience, and interest of potential vegetable growers in the study region in growing fresh vegetables. The survey was distributed to two groups: (1) current growers of primarily processing vegetables and field crops who were interested in growing vegetables for the fresh markets; and (2) growers who were currently growing fresh vegetables. These growers were not selected randomly, but rather from cooperators of Extension programs in vegetable production. The economic engineering approach was used to develop crop budgets. Fertilizer and pesticide costs were budgeted using recommended practices as specified by Cornell Recommends. Yields were specified from a number of sources, primarily Phelps and How, 1981 (New York); Fisher, et al., 1988 (Ontario); and Estes, 1988 (North Carolina). These yields were then adjusted according to the grower survey, where information was available, and interviews with growers. It should be recognized that yield estimates, though crucial to an estimate of profitability, are tenuous since experience is limited in the

study region for these particular crops. Therefore, breakeven yields and prices were computed to aid growers in making comparisons with their own situations.

Packing sheds in New York and Virginia were visited to observe operations, procedures, and equipment for packing fresh vegetables. Data on procedures, equipment and facilities, packaging materials, and labor requirements were collected. Equipment manufacturers and building contractors were also contacted to estimate potential costs. The economic engineering approach, assuming recommended equipment and structures and efficient packing lines, was used to estimate packing costs (Kirkpatrick, 1987; Runyan et al., 1986).

Data on potential crops, markets, costs and returns, and opportunities and limiting factors were summarized. The feasibility of growing each crop was evaluated by comparing the costs and returns of producing and selling each vegetable item, in addition to considering other factors such as production and marketing risks, competition, and buyer requirements.

Economic Model

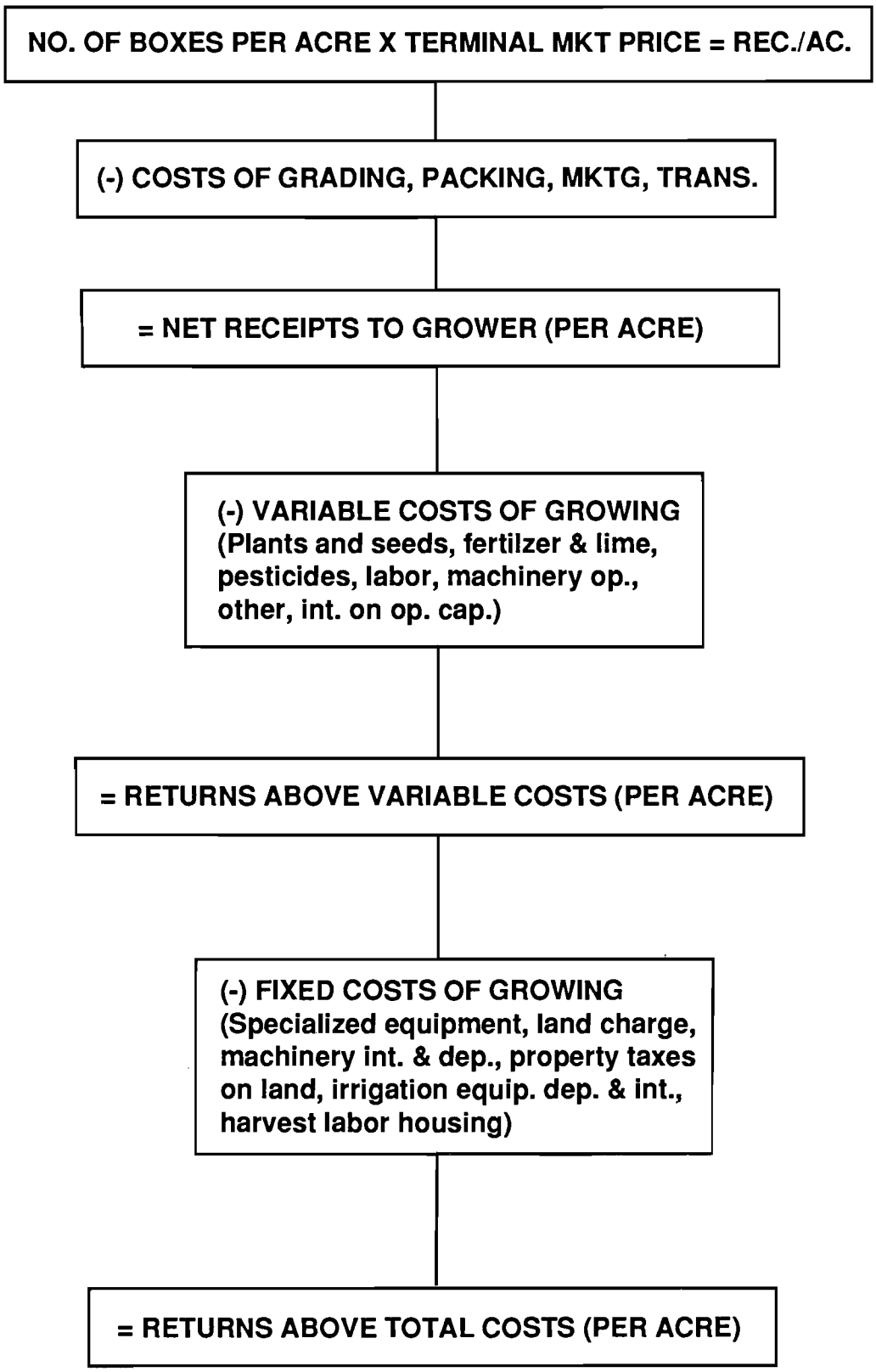
The economic model which was used to conduct this research is shown in Figure 1.1. Gross receipts per acre were calculated as the product of number of packed boxes per acre for each crop times the terminal market price per box. The costs of grading, packing, marketing, and transportation were deducted, yielding net receipts per acre to the grower. Variable costs of growing were deducted from net receipts, giving returns above variable costs per acre. Finally, fixed costs of growing were subtracted to give returns above total costs per acre.

All labor, including labor that the owner may provide, was deducted as a cash cost. An opportunity cost on all assets used in production was imputed. No charge for the grower's management was assessed, but a salary for hired management in the packing house was included in packing house costs.

Therefore, the resulting measure of profitability can be considered returns to the grower's management in a vertically integrated growing and packing organization.

Market window analyses were used to further assess the potential for production of the selected crops. Terminal market prices for New York grown crops, or proxies when data were unavailable for New York produce, were collected for all weeks of shipment to selected markets. These price data were collected for five years (1984-1988) where available. Market window analysis consisted of evaluating crops to determine those time periods during the marketing season when the average weekly price minus one standard deviation exceeded the variable costs of growing and marketing. Thus, the technique gives a measure of the relative riskiness of price fluctuations. It was not possible, given the current extent of growing the selected crops and data availability, to construct a measure of risk from fluctuations in yields as well as prices. A full explanation of the market window technique is given in Section VI.

Figure 1.1. Flow chart of economic model for estimating profitability



II. PRODUCTION AND MARKETING POTENTIAL

Crops Selection

The advisory committee proposed a list of fresh vegetable crops to be studied and evaluated. The preliminary list included the following crops:

Snap Beans	Green Peppers
Broccoli	Zucchini Squash
Cauliflower	Acorn & Butternut Squash
Cucumbers	Tomatoes
Sweet Corn	Cherry Tomatoes

These crops were selected due to their favorable prospects for growing and marketing from Central and Western New York. Sweet corn, cucumbers, and squash are the most widely grown crops in the region; fresh snap beans, broccoli, and cherry tomatoes are the least frequently grown crops. The advisory committee believed that broccoli, cauliflower, green peppers, and tomatoes have the greatest potential for marketing, but are the most difficult and risky vegetables to grow and pack. Cucumbers, sweet corn, and squash are generally less risky to grow, and the committee felt that including them in combination with riskier crops would balance the growing and marketing risks while increasing potential returns.

Marketing

The fresh vegetable market is complex and highly fragmented for certain crops (How, 1991; Wolfe et al., 1987), but it can be broken down into three basic channels:

1. Sales through terminal market wholesalers.

2. Direct sales to chain stores and institutions.

3. Direct farm sales to consumers (roadside stands, etc.).

Large wholesale terminal markets in major cities such as Boston and New York offer the opportunity for a large volume of sales to many buyers and wide distribution. Buyers such as chain stores and institutions can offer high returns and repeat business for consistent suppliers of high quality products. Though roadside farmstands offer high returns, the volume that can be sold is limited by the number of potential customers in the market area of the farmstand, access to major highways and important secondary roads, and the number of grower/seller competitors in the market area, among other factors. Furthermore, growers incur additional costs in selling so that the prices received are not comparable with the prices received in other channels. Therefore, it was decided to focus on the wholesale terminal markets and large independent buyers as potential markets for fresh vegetables in this study. These markets generally have larger volumes purchased and sold and a wider distribution of sales.

Sales through wholesale terminal markets have an additional advantage in that the USDA has kept consistent records of price and arrivals data from various terminal market locations across the country. These data are readily

accessible through published annual summaries. Prices and sales to independent buyers and at farmstands are either not available or not as consistent, reliable, and well organized as terminal market data. Therefore, only terminal market prices and unloads are reported in this study.

Market Locations

Due to time and cost constraints, not all terminal markets that could potentially be markets for New York produce could be examined. After scanning the recent annual arrivals of New York fresh vegetables at 22 eastern U.S. cities, it was decided that the three markets with the highest unloads from New York would be analyzed in detail with respect to prices and arrivals. These markets were the New York City, Boston, and Buffalo terminal markets. All are in relatively close proximity to Central and Western New York and, thus, offer the advantage of lower transportation costs, another reason for including these market locations for further study.

Wholesale Terminal Market Arrivals and Price Data

Arrivals

Table 2.1 indicates that sweet corn and cucumbers made up the greatest volume of fresh vegetables shipped from New York State in the past five years. Broccoli, cauliflower, peppers, and cherry tomatoes were each less than five percent of the total shipment of vegetables to the three markets, reflecting the relative extent to which these crops are grown in the State. Squash (zucchini, butternut, and acorn), tomatoes, and snap beans were each represented less than 10 percent of the total shipments.

Table 2.1 Average annual unloads, New York State selected fresh vegetable items, Boston, Buffalo, New York City Terminal Markets, for selected months, 1984-88, in 1,000 cwt.

Crop	Boston	Buffalo	New York City	Total	Percent
Beans (July-Sept.)	3.8	4.2	9.8	17.8	8.0
Broccoli (Aug.-Oct.)	1.1	1.4	0.4	2.9	1.3
Cauliflower (July-Sept.)	0.4	2.4	2.8	5.6	2.5
Sweet Corn (July-Oct.)	17.0	12.0	43.6	72.6	32.0
Cucumbers (July-Sept.)	41.3	14.4	22.8	78.5	35.1
Peppers (July-Sept.)	0.6	6.4	0.6	7.6	3.4
Acorn-Butternut Squash* (Sept.-Nov.)	5.9	2.3	2.3	10.4	4.7
Zucchini* (June-Aug.)	4.7	3.6	0.0	8.3	3.7
Tomatoes (July-Sept.)	13.0	5.0	1.2	19.2	8.6
Cherry Tomatoes (July-Sept.)	0.0	0.7	0.0	0.7	0.3
Total	86.8	52.7	84.0	223.5	100.0
Percent	38	24	37	100	

*Estimated

Source: USDA, Fresh Fruit and Vegetable Prices, Federal-State Market News Service.

The Boston and New York City terminal markets each received approximately equal portions of unloads, the remaining one-quarter going to Buffalo. The Boston market had the majority of cucumber, squash, and tomato shipments. New York City received more than half of all the New York State sweet corn delivered to the three markets. Buffalo received the majority of peppers from New York and is approximately equal to Boston in broccoli arrivals and with New York City in arrivals of cauliflower. Buffalo was also the only market of the three to receive any significant amount of cherry tomatoes from New York State.

Though not thoroughly examined and reported, the Atlanta, Baltimore/Washington, and Philadelphia terminal markets have in recent years received significant quantities of New York State sweet corn and cucumbers.

Major Competitors With New York in the Terminal Markets

New York held a relatively large share of sweet corn and cucumber unloads in all three markets considered (Tables 2.1 and 2.2). During the season for sweet corn (July-October) New York was the leading supplier in the Buffalo and New York City markets; Massachusetts leads New York in sweet corn deliveries in the Boston market. For cucumbers, New York usually led in arrivals to the Boston and Buffalo markets during the season (July-September), but New Jersey lead New York in cucumber shipments to the New York City market.

It should be noted that Florida was the leader in total annual shipments of both sweet corn and cucumbers to all three markets, though that state is usually out of production of these crops during New York's season. If New York were to try to extend its season in cucumbers or sweet corn, Florida would be a formidable competitor.

Table 2.2 New York's rank in arrivals of cucumbers and sweet corn, Boston, Buffalo, and New York City Terminal Markets during the New York season, 1984-1988.

New York City		Boston		Buffalo	
Sweet Corn	Cucumbers	Sweet Corn	Cucumbers	Sweet Corn	Cucumbers
N. York	N. Jersey	Mass.	N. Jersey	N. York	N. York
N. Jersey	N. York-LI	N. York	N. York	Florida	Florida
N. Carolina	N. York	N. Carolina	Virginia		N. Carolina
Florida	Virginia	Connecticut	Michigan		Canada
	Calif.	Virginia			
		Michigan			

The remainder of the crops evaluated in the study comprised a much smaller proportion of total unloads from New York; thus, New York was a relatively minor supplier of these crops to the terminal markets examined. In fresh market tomatoes, New York typically ranked in the lower 50 percent of total arrivals. California and Florida were by far the major tomato suppliers during the New York season (July-October). Nearby competitors such as New Jersey, Pennsylvania, Ohio, and Virginia, were usually ahead of New York in deliveries to each of the terminal markets. New York tomato arrivals

in New York City and Boston were generally quite variable from week to week during any one season.

New Jersey was the market leader in fresh snap bean arrivals in both the New York City and Boston markets during the season (July-September). New York was usually a close second with Connecticut and Virginia. New York led in snap bean arrivals in the Buffalo market, and Florida lead in total annual snap bean arrivals to all three markets, though the state was out of production during the New York season.

Florida was also the annual leader in squash deliveries to all the markets examined for both summer and winter squash. New York typically ranked fifth out of about 12 regular suppliers to the Boston market during the season (July-September for zucchini, August-December for acorn and butternut), usually trailing Massachusetts, New Jersey, Florida, and the Carolina's. Total squash deliveries to Buffalo and New York City were about half the amount delivered to Boston in an average year, and New York faces essentially the same competitors and rank in deliveries as in the Boston market.

California was by far the leading supplier of broccoli and cauliflower in all three markets. Arrivals occur year-round and typically without significant interruption. To a lesser extent, Arizona was a supplier to the New York City and Buffalo markets. Maine entered the broccoli market in force in the last decade and became the number two supplier behind California in the New York City and Boston markets. Broccoli arrivals from New York to all three markets were relatively small and very sporadic from year to year and during any one season. The cauliflower situation is similar to that of broccoli; however, New York had significantly higher and more regular unloads of this crop, particularly in Buffalo where New York ranked second in cauliflower deliveries and not far behind California. Similarly, in New York City and Boston, New York ranked second behind California in cauliflower deliveries, but in these markets California arrivals were much higher (sometimes as much as 10 times) than cauliflower arrivals from New York.

New York typically ranked towards the bottom of the list of suppliers of peppers to New York City and Boston; New Jersey and California were the major suppliers during the season (July-September). New York tends to show much variability in pepper deliveries from year to year, sometimes making no deliveries in certain years. In the Buffalo market, New York was a major supplier of peppers during the season, ahead of New Jersey and North Carolina, but far behind Florida in total annual deliveries.

Cherry tomatoes were the smallest portion of the total arrivals for the crops and markets considered. The Buffalo terminal market was the only market of the three examined to receive any shipments of New York cherry tomatoes in the years that data were collected (1984-1988). Deliveries were very sporadic and occurred usually in only one month (August or September). Mexico and California had the majority of cherry tomato deliveries to all three markets.

Terminal Market Prices

Weekly terminal market prices for each of the vegetables and markets studied were recorded from USDA Market News service publications for the years 1984-1988. Terminal market prices are prices applying to sales of less

than carlot quantities by wholesalers to jobbers or other buyers. The amount remitted to shippers is the published price less the terminal market wholesaler's commission and any other fees that may apply as conditions of the sale. Five year average seasonal, monthly, and weekly prices were calculated as were standard deviations on weekly prices to give a measure of relative variability.

Seasonal and Monthly Average Prices

The season average prices shown in Table 2.3 are actually weighted average prices, calculated by weighting monthly average prices by the percentage of arrivals each month from New York at the particular market examined. For example, in July the five year average bean arrivals from New York to the New York City terminal market were 20 percent of the total average arrivals for the three months in the season (July-September), in August arrivals were 49 percent of the total, and in September 31 percent. The five year monthly average price of beans from New York to New York City was $22.75 per 30 pound crate for July, $14.67 for August, and $21.50 for September. These prices were multiplied by the percentage arrivals each month to get weighted monthly prices (0.20 x $20.13 = $4.03, 0.49 x $14.67 = $7.19, 0.31 x $21.50 = $6.67). The monthly weighted prices were then added to get a weighted season average price of $17.89 for beans from New York to New York City. Only the weighted season average prices are shown in Table 2.3. The monthly weights and calculation of the season prices can be seen in Appendix I.

Also note that for broccoli and cherry tomatoes, New York prices were not given and were therefore not used. Maine's broccoli price and California's cherry tomato price are used as a proxy for New York prices.

Table 2.3 Fresh vegetable season average prices, selected vegetables and terminal markets from New York State (except where noted), 1984-1988.

Crop	Unit	Market Location	Season Average Price ($)
Snap Beans	30 lb. crate	NYC	17.89
Broccoli (from Maine)	12 hd. box	Boston	9.03
Cauliflower (from Long Island)	50 lb. box	NYC	7.61
Cucumbers	1 1/9 bu.	Boston	8.93
Sweet Corn	5 dz. crate	NYC	6.29
Green Peppers	1 1/9 bu.	Buffalo	8.46
Acorn Squash	1 bu.	Boston	5.38
Butternut Squash	1 bu.	Boston	5.72
Tomatoes (extra-large)	25 lb. box	Boston	10.89
Cherry Tomatoes (from California)	12 pint flat	Boston	9.40
Zucchini	8 qt. baskets	Buffalo	2.78

Weekly Prices

Weekly average price data during the period 1984-1988 for New York fresh vegetables in selected terminal markets are plotted in Figures 2.1-2.11. As with monthly and seasonal price data, only prices from those markets with the highest five year average total unloads of each crop from New York are shown. Weekly average prices plus/minus one standard deviation were plotted to give an indication of the relative variability in weekly price from year to year. Note that for certain weeks and crops, no standard deviation is plotted, only the average price. This is because price data were available for only one of the five years considered, or in rare instances the exact same price in the same week for two or more years. The weekly price data as presented in USDA publications is normally given as a price range for each week. In these instances, the midpoint of each weekly price range was used as a single estimate for the weekly price.

Price behavior between the three terminal markets examined is similar for each crop considered, another reason for presenting data for only the market with the most arrivals from New York. The exception is tomatoes, where the Buffalo market prices follow a quite different pattern than prices in New York and Boston markets, which have very similar patterns.

Beans, broccoli, and tomatoes (including cherry) showed the highest price variability over the five years examined (Figures 2.1, 2.2, 2.9, 2.9a, and 2.10). Snap beans exhibited the widest fluctuations in price, particularly in the early part of the season. Broccoli had highly sporadic deliveries from New York, and price data is correspondingly sketchy. In the Buffalo market tomatoes had markedly higher prices in the early season, then prices declined and stabilized for the rest of the season. In the Boston market over the five year period, weekly tomato prices were more variable from year to year and generally increased from early to late season. It should be noted that tomato arrivals at Buffalo from New York were much more regular (though less in total hundredweight) than those at Boston or New York City.

Cauliflower, cucumbers, sweet corn, and peppers exhibited moderate variability in price from year to year (Figures 2.3-2.6). The only major shift in prices over the season was in cucumbers in the Boston market in late season, but arrivals, and hence observations for this period, are few and therefore not completely representative of a typical year. For the most part, these crops have shown fairly steady prices on the terminal markets examined throughout the season.

Acorn, butternut, and zucchini squash (Figures 2.9-2.11) showed little weekly price variability from year to year. The only major increase in price appeared early in the season for zucchini and in the latter part of the season for acorn and butternut squash.

It was concluded that prices for fresh vegetables not widely grown in New York, such as broccoli, fresh snap beans, and tomatoes, are generally higher and more variable both throughout the season and from year to year. The difficulties and risks of growing, harvesting, and packing these crops in New York are the most likely reasons for this type of price situation. Though other states like Florida, California, Maine, and New Jersey grow and supply major quantities of these crops, shipping costs and quality variation can affect prices significantly.

On the other hand, acorn, butternut, and zucchini squash exhibited lower but more stable and predictable prices in the terminal markets examined over the period. These crops are not generally considered to be as difficult or risky to grow and pack and not in as high demand as the other crops under study.

Cauliflower, cucumbers, peppers, and sweet corn fall somewhere in between. Cucumbers and sweet corn are widely grown in New York and other nearby states but have steady consumption and popularity with consumers. Cauliflower and peppers are also popular with consumers but more difficult to grow in New York; however, other states like New Jersey, Florida, and California are large growers and suppliers of these crops.

Studying the patterns of price changes over the course of a season and comparing weekly returns to cost estimates can be useful in discovering when it may be most profitable to enter the market. This is most effective if a regular price pattern can be discerned, and if there are more than one or two observations for a given week. It might be expected that prices will generally be higher in the early and late season, when production and supplies are lower. Certain crops and markets, such as peppers, acorn, butternut, and zucchini squash, and tomatoes in the Buffalo market, display this characteristic to some degree. The other crops have price patterns that are more difficult to generalize over the season, either because of few price observations or other factors. However, comparing recent price patterns over a number of seasons with expected costs is a way to begin analyzing the feasibility of production and can in some cases indicate when during the season profits may most likely be maximized.

Independent Buyers

Independent buyers were interviewed to discover their perceptions and experiences in dealing with New York fresh vegetables. Three chain store buyers in Central and Western New York were contacted and agreed to a personal interview using an open-ended questionnaire (see Appendix II). The interview results are summarized here in four parts:

I. Experience with New York fresh vegetables

All the buyers interviewed had experience with New York fresh vegetables. The crops under consideration in this study most often bought were cucumbers, sweet corn, tomatoes, squash, and peppers. Almost no broccoli or cauliflower were purchased from New York. The buyers declined to give specific information on volumes purchased and sold or prices paid.

II. Problems and barriers to market entry for New York produce and suggested improvements.

Four basic problems with New York fresh vegetables were outlined by the buyers:

1. A need for more standardized packs, grades, and sizes. New York suppliers often have shown much variability in regard to consistent packaging, grades, and sizes. Also, more pre-cooling of certain vegetable items is needed such as liquid icing of broccoli. One buyer commented that "New York is slightly behind in packing

(standard packs, pre-cooling, etc.)" when compared with suppliers from other regions.

2. Inconsistent deliveries. According to the buyers, in some years a supplier may deliver two truckloads of a product, the next year only 10 boxes. Buyers prefer as consistent supplies as possible. With shippers like California providing consistent supplies of vegetables year-round, this is an especially critical item for New York growers to bear in mind.

3. Poor communication. Buyers noted that many smaller New York suppliers do not always provide prior indications of harvest dates and what volumes and quality should be expected. Farmers have been known to arrive unannounced with produce at the buyer's loading docks and don't always attempt to coordinate deliveries with the buyer's requests. Given the variable nature of vegetable production and harvesting (due in a large part to uncontrollable factors such as weather), predicting supplies and quality is not an easy task. However, the buyers indicated that any effort on the part of suppliers to do so is preferable to none. Buyers also appear to prefer dealing with fewer and larger suppliers than with many small suppliers. This facilitates communication and the coordination of supplies with buyers' requirements, according to the buyers interviewed.

4. A general failure to deliver product according to buyer specifications, due to improper growing and harvesting, packing, and communication -- a culmination of the problems listed previously. This can give the impression of unreliability for New York suppliers who are trying to enter the fresh vegetable market.

III. Positive Aspects of New York Fresh Vegetables

1. Consumer loyalty to New York produce within the State is quite strong according to the buyers. Producers should use every opportunity to exploit the New York grown name through packaging and advertising. However, this does not exclude New York suppliers from meeting every quality and standardization requirement that other suppliers are subject to. This loyalty does not, of course, extend to out of state consumers who will have to form the bulk of New York growers' markets if a significant fresh vegetable industry is developed in the State.

2. All buyers indicated a willingness to give New York fresh vegetables a chance and expressed a desire for more of some kinds of vegetables from New York, assuming the buyers' specifications can be met.

3. Two buyers said they have begun dealing with recently established centralized packers of vegetables from New York as regular suppliers. The buyers have been very pleased with the quality and delivery schedule of these suppliers.

Market Opportunities

During the interviews the buyers were asked to review the list of potential crops under consideration and evaluate the market potential of each item. According to the buyers, fresh market tomatoes, cherry tomatoes, broccoli, peppers, and cauliflower were the crops that they would most like to have in increased supply from New York. Tomatoes, cherry tomatoes, and peppers have an excellent opportunity for expansion if they are packed correctly, with consistent sizing and no culls thrown in to fill the box. All buyers said they would welcome more broccoli and cauliflower from New York if the broccoli was liquid iced before delivery. Sweet corn is in good supply from New York and other regions from August through September, but a substantial opportunity for high returns exists for those New York producers who can deliver earlier, even one week earlier, than the beginning of the peak season. Snap beans have the most promise if they are hand harvested, but machine harvested beans are acceptable if they are sorted and graded carefully. Both squash and cucumbers were described by the buyers as being in very good supply most years, and thus have the most limited opportunity for expanded supply and sales, particularly squash.

FIGURE 2.1 SNAP BEANS

NYC 1984-1988

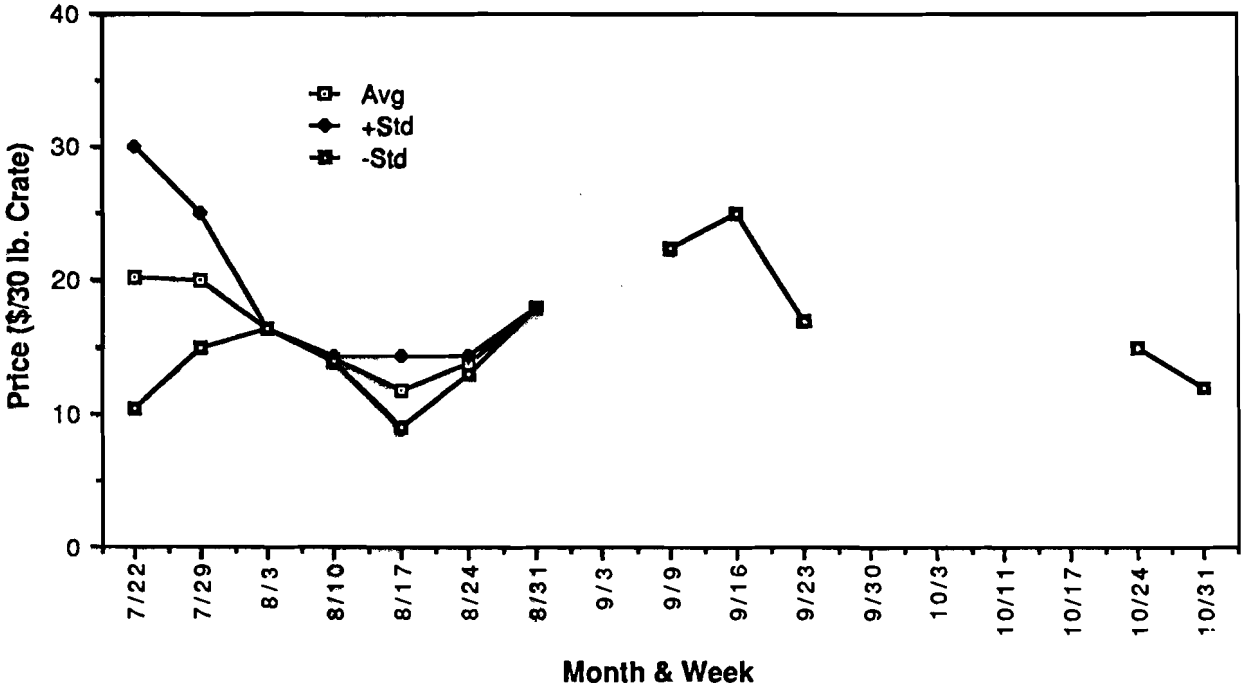


FIGURE 2.2 BROCCOLI

NYC 1984-1988

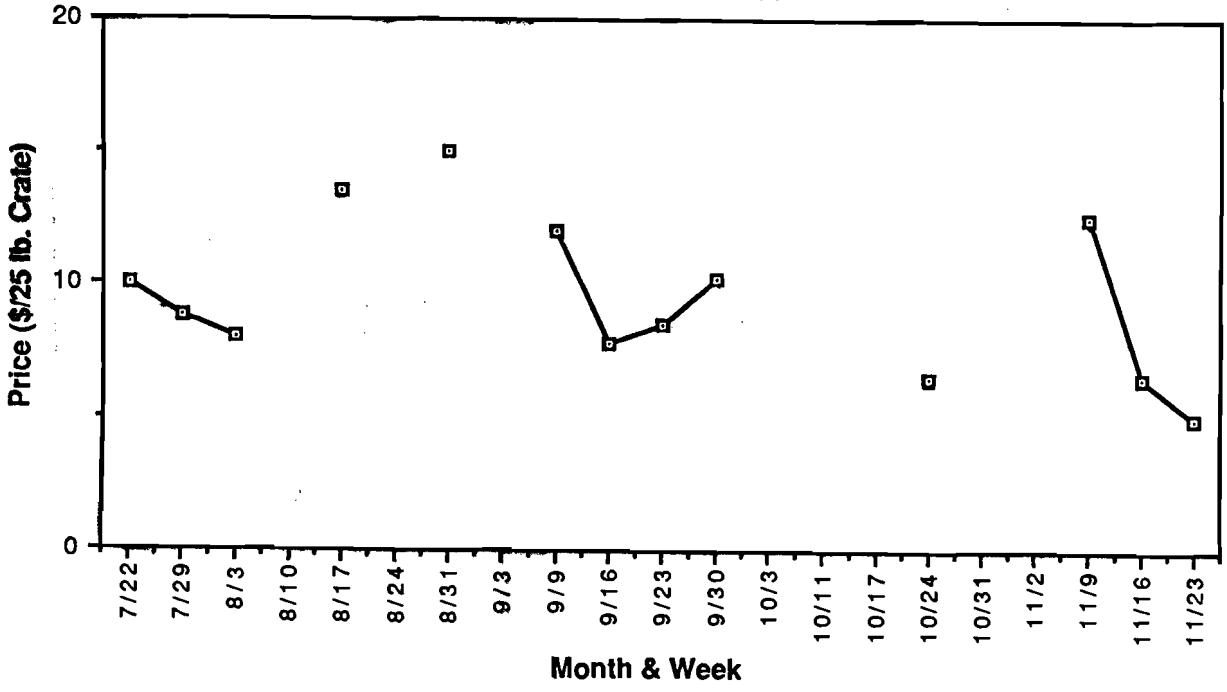


FIGURE 2.3 CAULIFLOWER

NYC, From L.I. 1984-1988

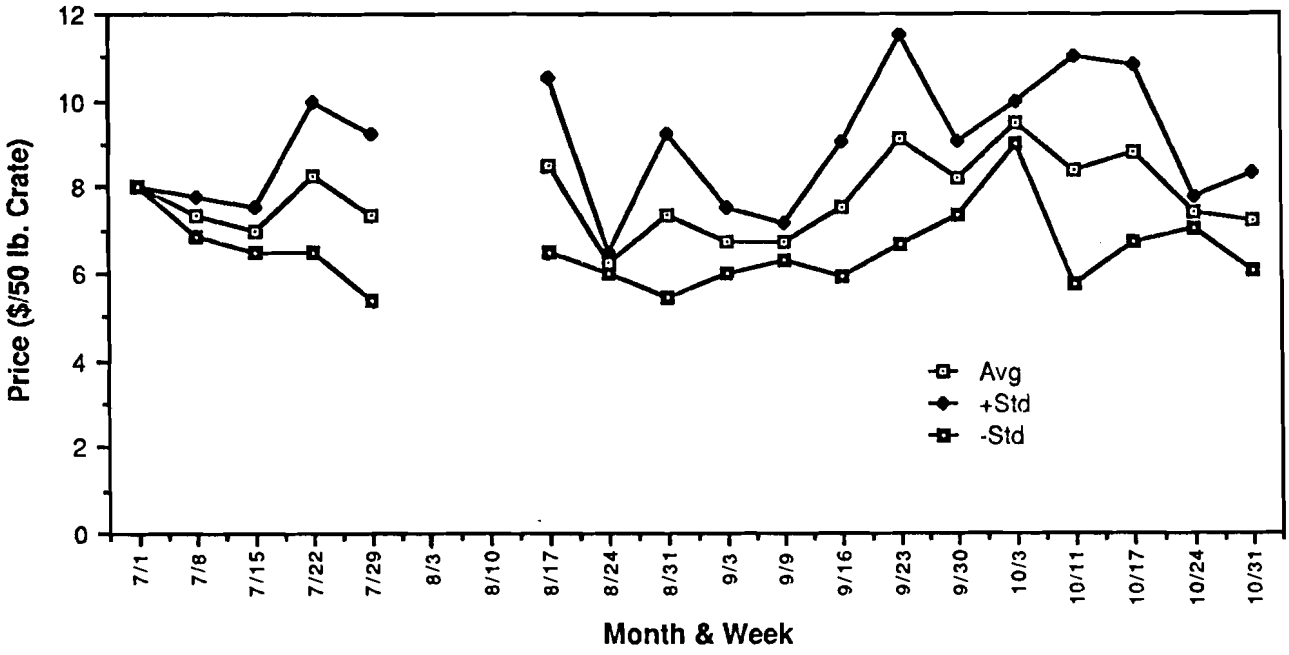


FIGURE 2.4 CUCUMBERS

BOSTON, 1984-1988

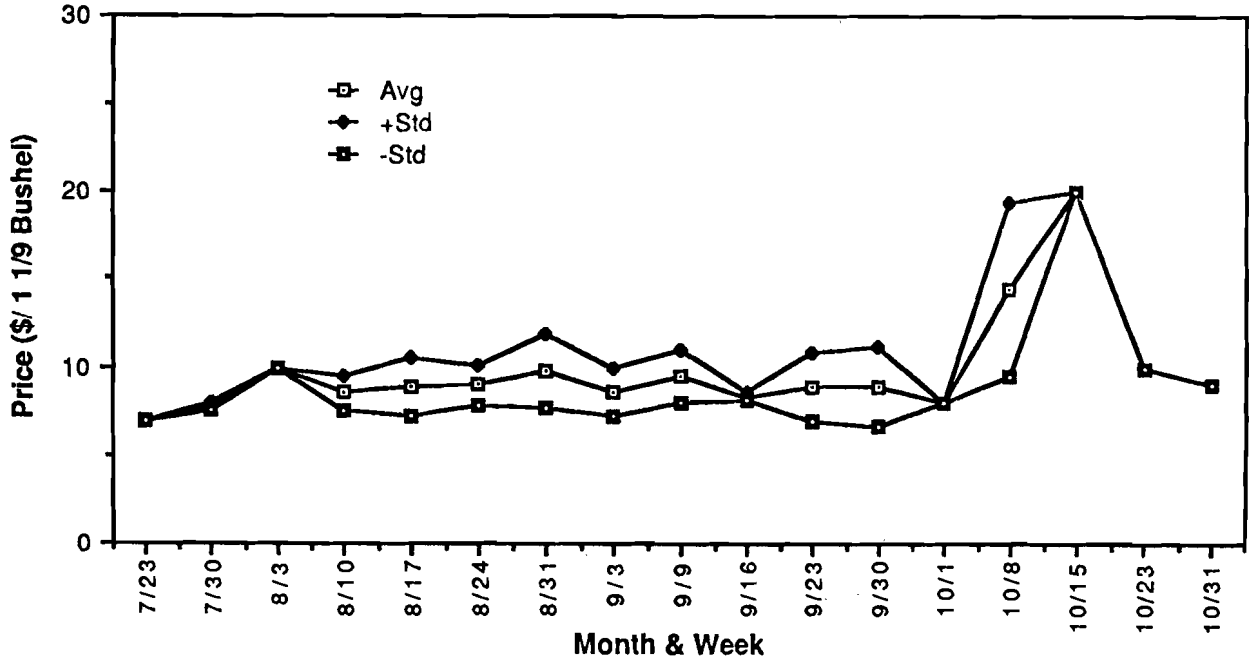


FIGURE 2.5 SWEET CORN

NYC 1984-1988

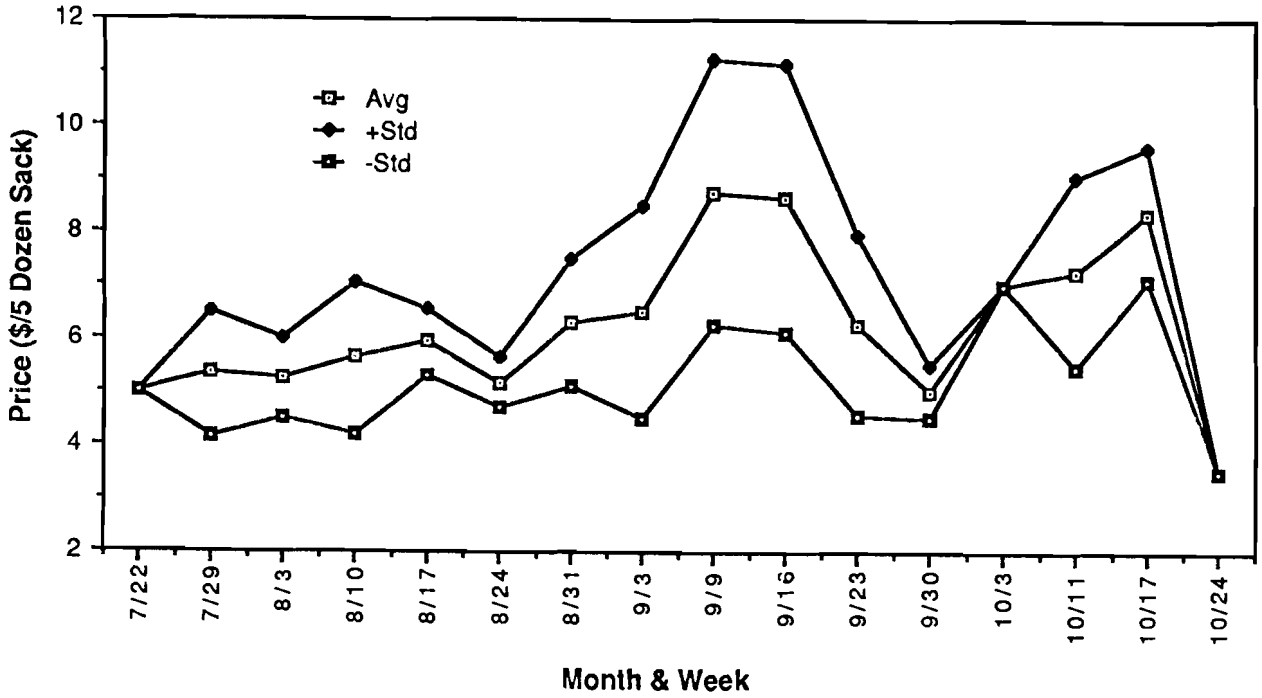


FIGURE 2.6 PEPPERS

BUFFALO, 1984-1988

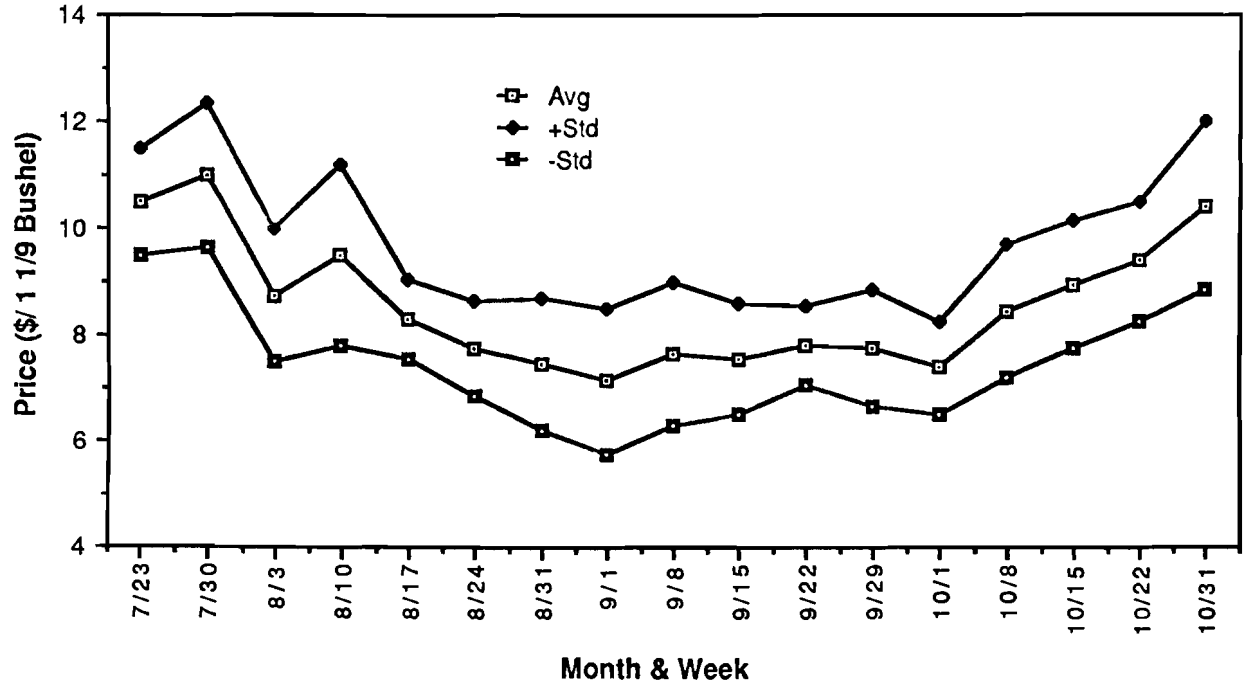


FIGURE 2.7 ACORN SQUASH

BOSTON, 1984-1988

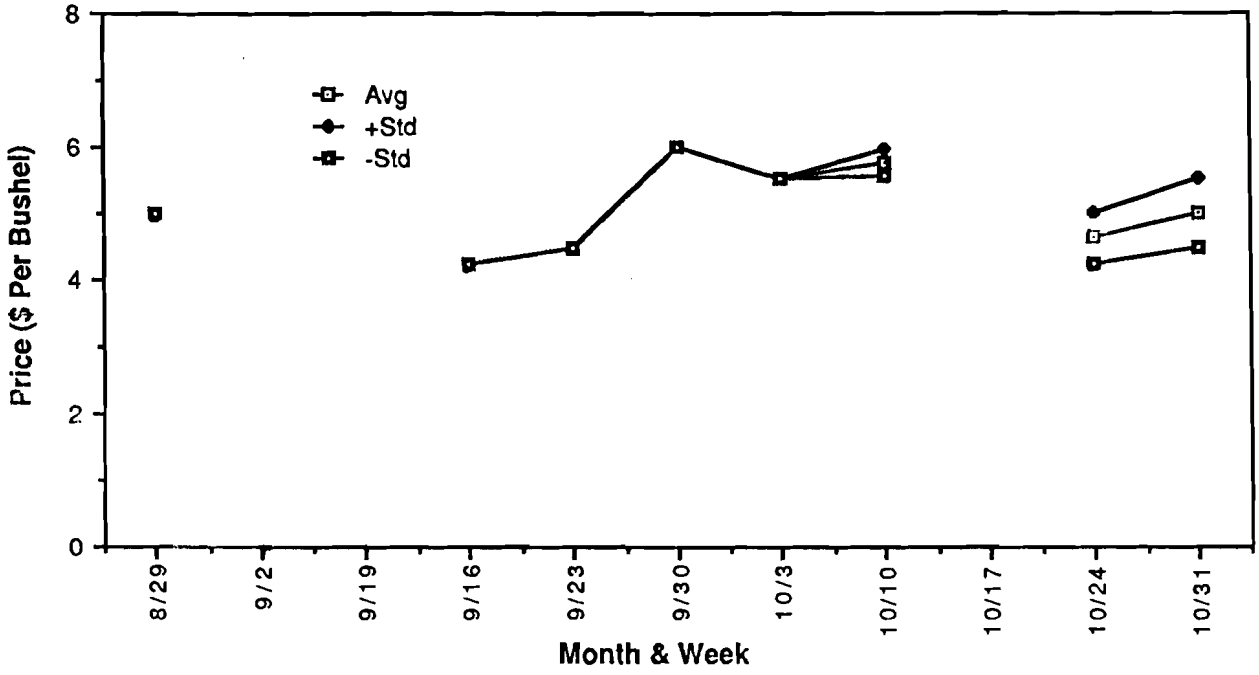


FIGURE 2.8 BUTTERNUT SQUASH

BOSTON, 1984-88

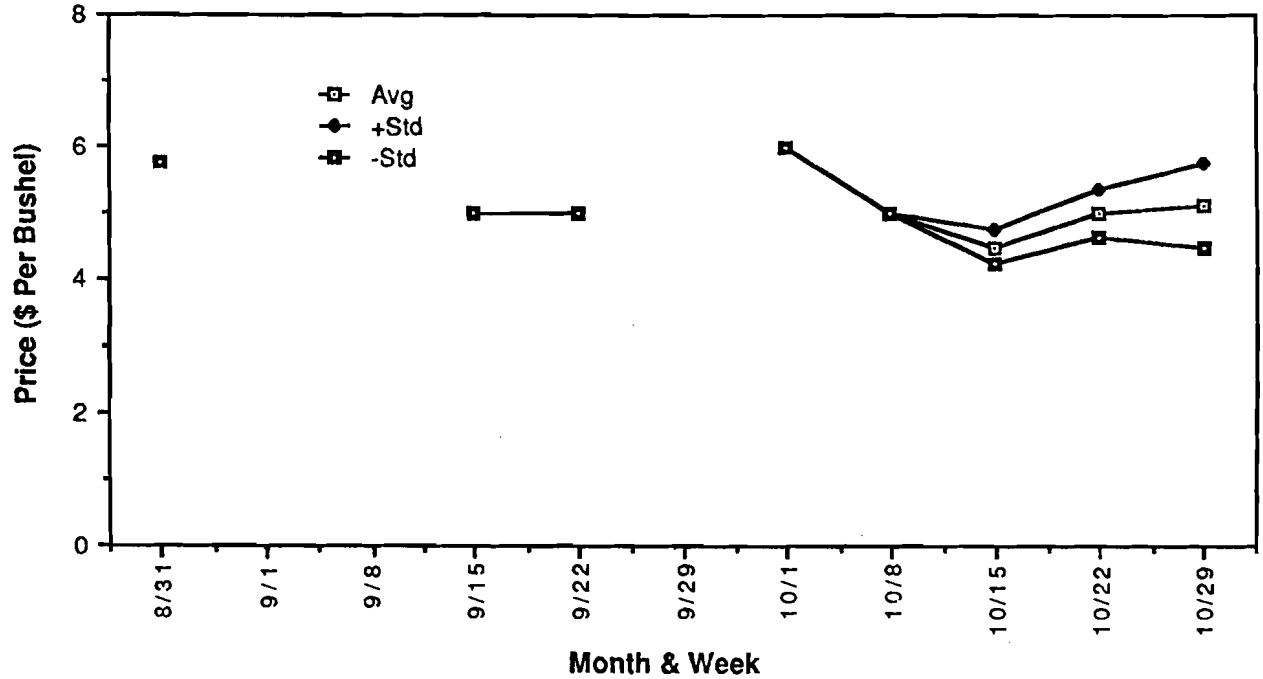


FIGURE 2.9 TOMATOES

BOSTON, EXTRA-LARGE, 1984-1988

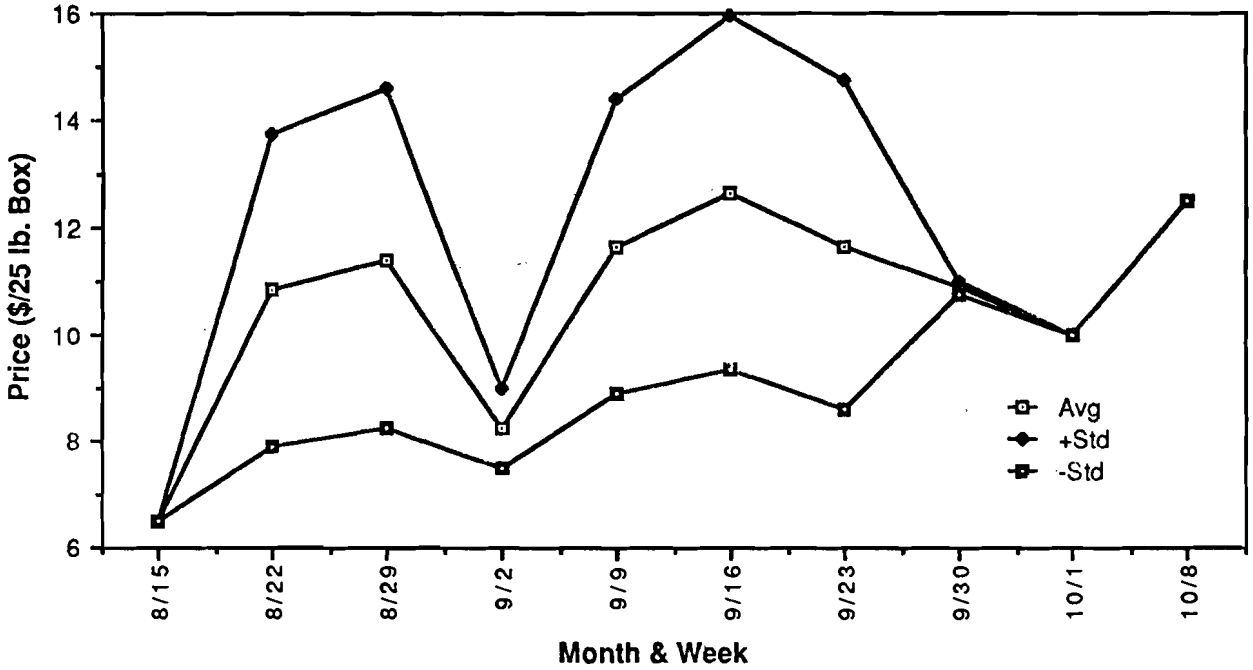


FIGURE 2.10 CHERRY TOMATOES

BOSTON, FROM CALIFORNIA, 1984-1988

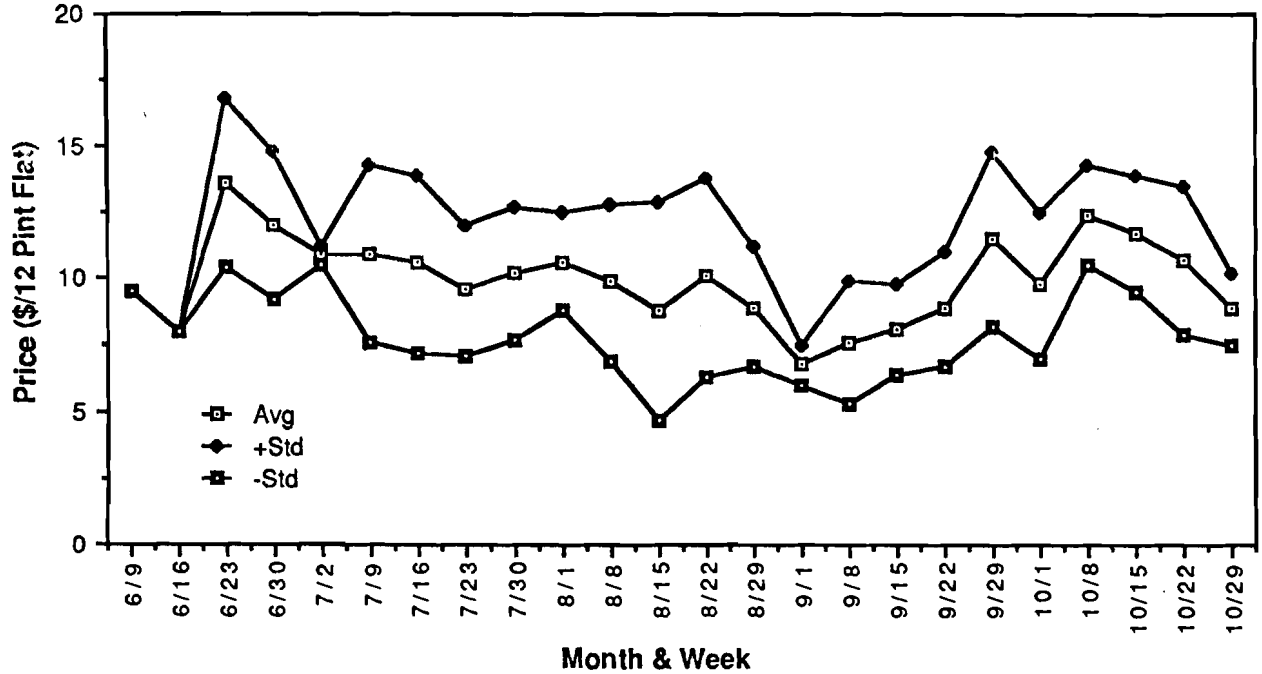


FIGURE 2.11 ZUCCHINI

BUFFALO, 1984-1988

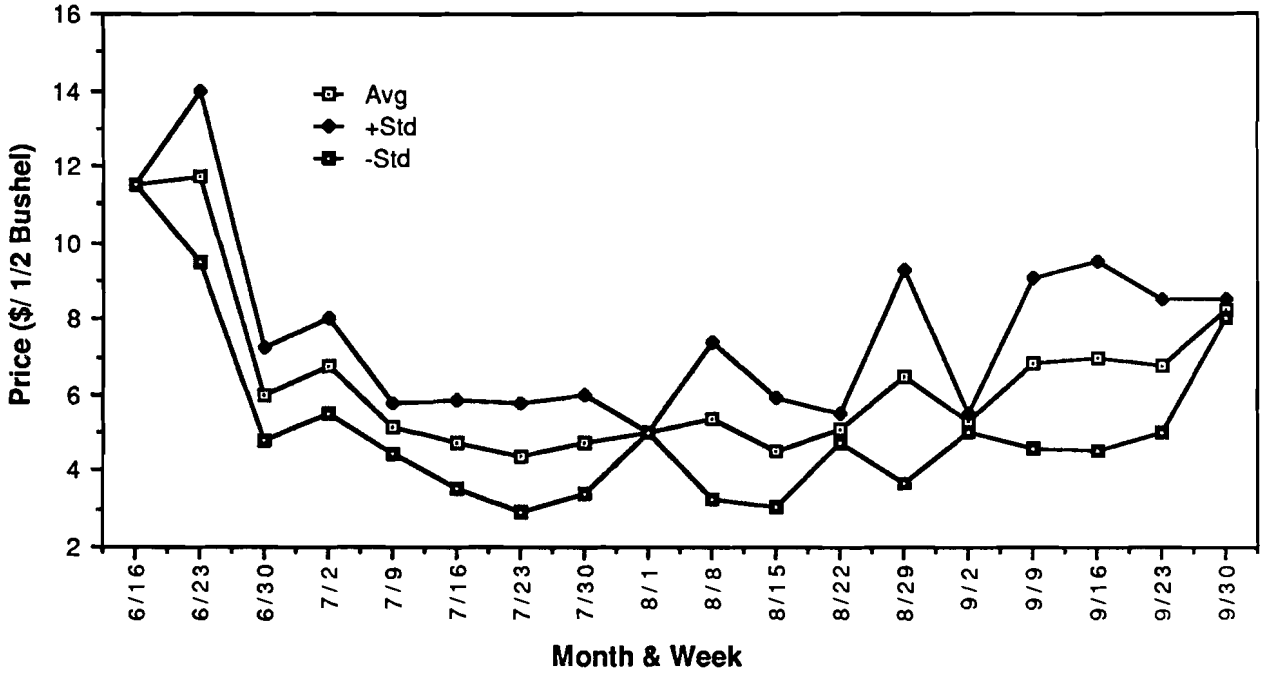


FIGURE 2.9 TOMATOES

BOSTON, EXTRA-LARGE, 1984-1988

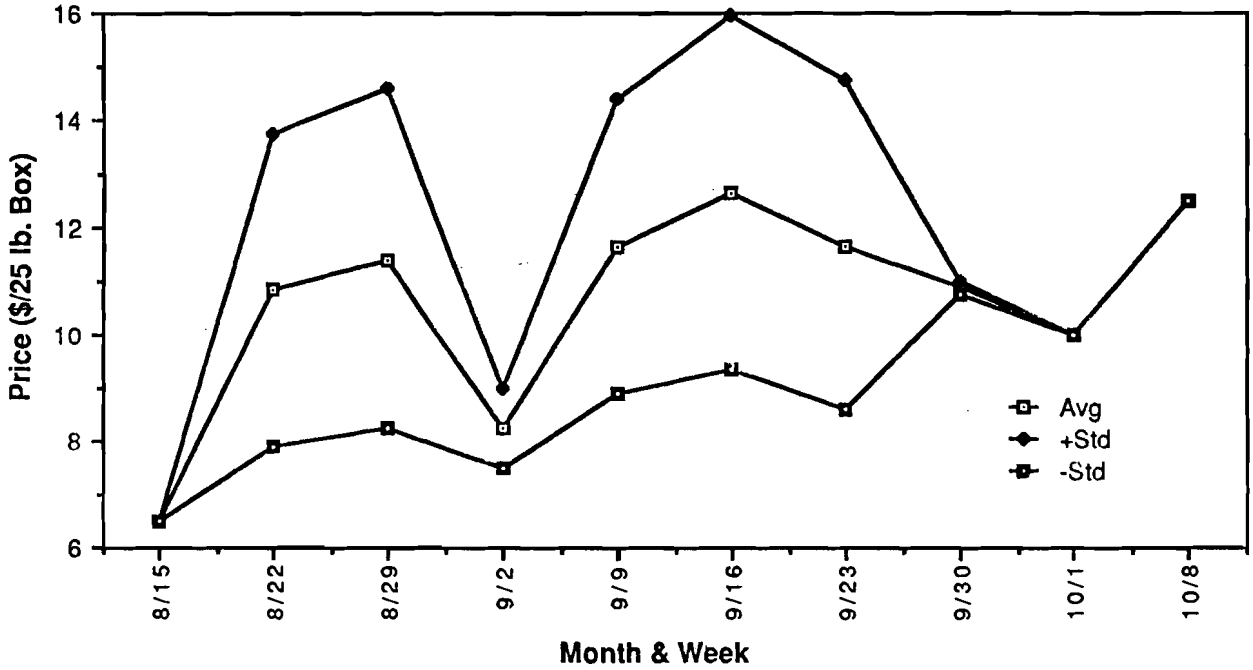


FIGURE 2.10 CHERRY TOMATOES

BOSTON, FROM CALIFORNIA, 1984-1988

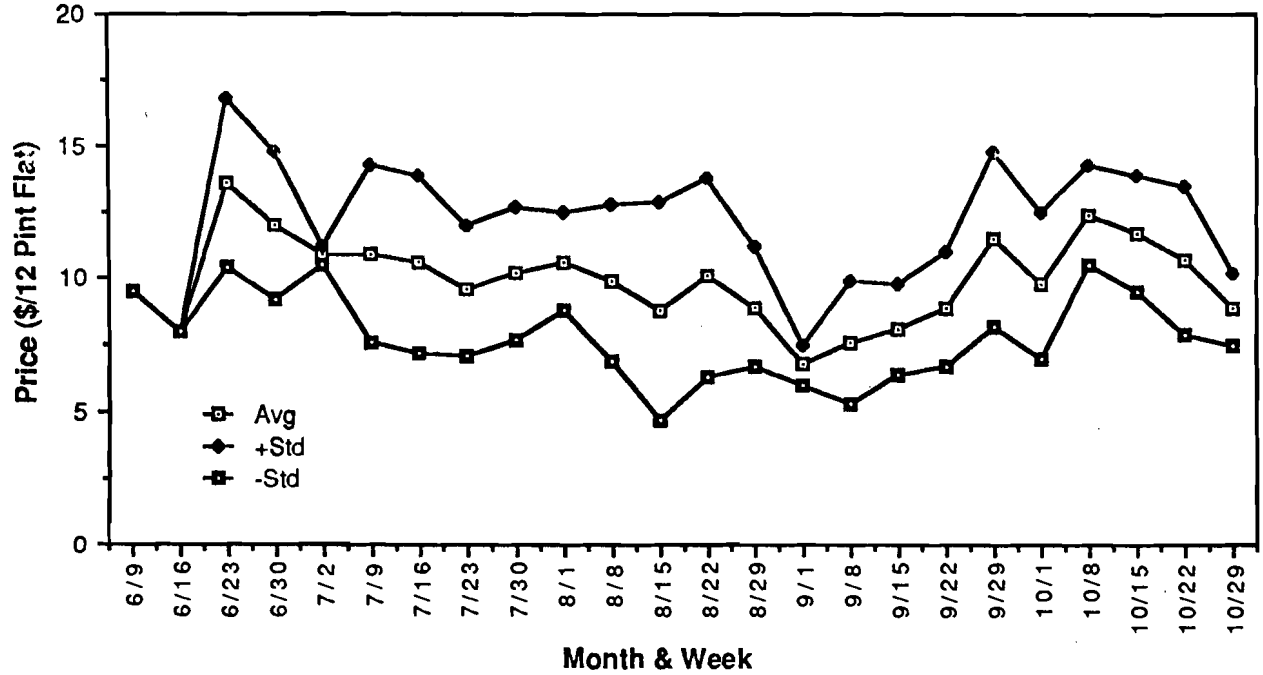
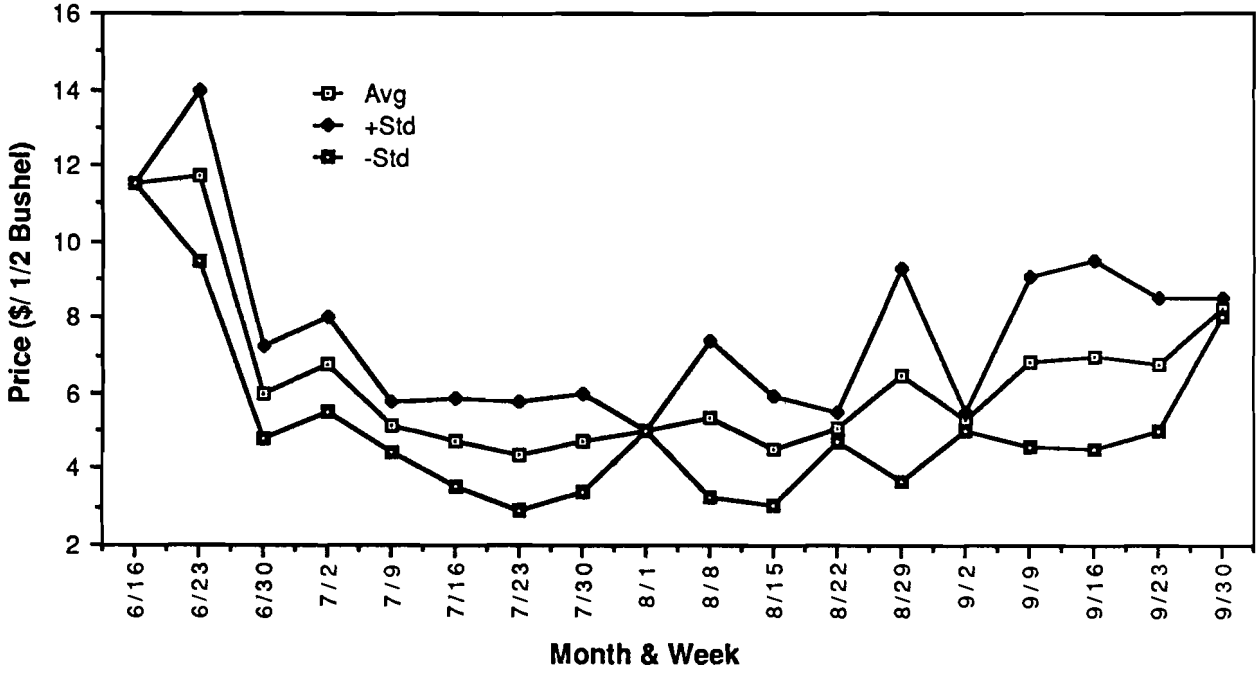


FIGURE 2.11 ZUCCHINI

BUFFALO, 1984-1988



III. RESULTS OF THE GROWER SURVEY

In order to evaluate the resource base, production experience and interest of growers in producing fresh vegetables, a questionnaire was distributed by Extension agents to vegetable farmers in the nine Central and Western New York counties being studied (see Appendix III). Thirty-two usable responses were returned. The 32 responses are not considered to be random nor are the results assumed to be statistically significant or representative of all Central and Western New York vegetable farmers. Rather they are meant to give an insight into the resources, experiences, potentials, and interests of vegetable farmers who are Extension cooperators in the region for growing fresh vegetables.

The questions were divided into five sections: crops grown, acreage, and yields; equipment for planting, harvesting, packing, and cooling; irrigation water source and equipment; land values and rental rates; labor hired and costs; and, finally, acreage to be devoted to fresh vegetables. Highlights of the questionnaire responses are presented here.

The total number of farms and corresponding acreage responding to the survey are shown in Table 3.1. About one-third of the farms had predominant acreage in fresh vegetables.

Table 3.1 Crop acres and number of farms, 32 farms, Western New York, 1990.

Crop Type	Acres (All Farms)	Number of Farms*
Field crops	7,128	9
Fruit	854	2
Processed vegetables	6,964	10
Fresh vegetables	1,611	11
TOTAL	16,958	32

*Represents the number of farms that had the majority of acreage in this crop type.

Machinery and equipment on the survey farms are described in Tables 3.2 and 3.3. Nearly all farms had some sort of planter, and packing and cold storage equipment were present on about one-half of the farms surveyed.

Table 3.2 Machinery complement, 32 farms, Western New York, 1990.

Item	Farms With Various Equipment
Vegetable Seeder	22
Corn Planter	31
Transplanter	26
Air Sprayer	11
High Pressure Spray	19
Harvestaid	11
Plastic Mulch Equipment	14
Raised Bedding Equipment	3
Packing Equipment	16
Cooling Facility	14

Table 3.3 Tractors, number and horsepower, 32 farms, Western New York, 1990.

Item	Response
Average number of tractors per farm	11
Average horsepower of smallest tractor	24.4
Average horsepower of largest tractor	178.8

Average land values and rental rates per acre are shown in Table 3.4. Land values per acre were as high as $3,000 and rental rates as high as $350 per acre. The average land value for all farms was $1,154, and the rental rate was $78.

Table 3.4 Land values and rental rates per acre, 32 farms, Western New York, 1990.

Item	All Farms	Fresh	Others
Average Land Value ($ per acre)	1,154	1,386	940
Average Rental Rate ($ per acre)	78	58	86
Range of Land Values	400-3,000	650-3,000	400-2,000
Range of Rental Rates	20-350	20-150	35-350

The number of farms with water availability and equipment for irrigation are described in Tables 3.5 and 3.6. Though more than half of the farms surveyed had irrigation, less than 10 percent of the total acreage in the survey (1,287 out of 16,958 acres) was irrigated. Portable pipe is the most common type of irrigation equipment used by the farms in the survey. All 11 farms which were predominantly fresh vegetable farms had irrigation capability. Irrigation will be required for the successful growing and marketing of fresh vegetables.

Table 3.5 Irrigation and water supply, 32 farms, Western New York, 1990.

Item	Total	Fresh	Other
Growers Who:			
Have Irrigation	20	11	9
Have Water Supply	26	11	15
Total Acres Irrigated	1,287	320	967

Table 3.6 Farms having irrigation equipment, 32 farms, Western New York, 1990.

Item	Fresh	Other	Total
Equipment:			
Port-Pipe	6	4	10
Sprinkler with Reel		2	2
Trickle		1	1
Port-Pipe & Sprinkler with Reel	5	2	7
TOTAL	11	9	20

Wages and housing for four categories of employees are shown in Table 3.7. Migrant employment figures as a significant item, with an average of 28 migrant employees per farm for all farms. One large farm employed 200 migrant laborers. Twenty of the farms surveyed provide housing for employees (Tables 3.8 and 3.9); average housing capacity per farm for employees was 12 persons. In order to develop a fresh vegetable industry in Central and Western New York, the use of migrant labor will be required.

Table 3.7 Employees, wages, housing - number of employees per farm by farm and employee type, survey of 32 farms, Western New York, 1990.

Item	Average All Farms	Low	High	Average Fresh	Average Others
Full-Time	5	1	12	6	4
Migrant	28	3	200	12	36
Local	7	1	25	7	6
Part-Time	5	1	20	2	7

Half of the respondents indicated they could either hire more migrant labor or would begin hiring migrant labor if not presently doing so in order to grow fresh vegetables (Table 3.9). Half of the farms also indicated that a labor procurement service (through the state or other sources) was available to them.

Table 3.8 Employee housing (number of farms with housing), 32 farms, Western New York, 1990.

Item	All Farms	Fresh	Other
Full-Time	14	1	13
Migrant	6	2	4
TOTAL	20	3	17

Table 3.9 Migrant labor and labor availability, 32 farms, Western New York, 1990.

Item	All Farms	Fresh	Others
Average Migrant Housing Capacity (number of persons per farm)	12	7	14
Would Hire Migrants? (number of farms)	16	5	11
Labor procurement Available? (number of farms)	16	4	12

Hourly wages are given for each type of employee in Table 3.10. The results shown were intended to represent the total hourly wage expense per employee, including taxes and fringe benefits. However, after reviewing the figures with the advisory committee and other growers, it was decided that these figures were too low. The $7.51 for full-time and $5.38 for migrant labor were thought to represent the hourly base wage, not including taxes and fringe benefits. In other words, it is suspected that the farmer respondents reported only hourly base wage rates instead of the total wage expense. A figure of $9.75 per hour for full-time and $7.00 per hour for migrant employees was recommended by the Advisory Committee as a more realistic estimate of the total wage expense. This is the wage rate used in the crop budgets.

Table 3.10 Hourly wages ($ per hour), survey of 32 farms, Western New York, 1990.

Item	Average All Farms	Low	High
Full-Time	7.51	4.50	12.00
Migrant	5.38	3.85	10.00
Local	4.68	3.35	7.00
Part-Time	5.14	3.35	7.00

Finally, commitment to fresh vegetable production is addressed in Table 3.11. Twenty farms surveyed indicated a willingness to commit 1,615 acres to a new fresh vegetable packing house. It was estimated that it would require at least 500 to 600 acres to support a proposed packing house, assuming an annual packout of 200,000 containers. Approximately 1,500 of these proposed acres would be from farms which presently have most of their production in field or processed vegetable crops rather than fresh vegetables. Growers indicated that they had sufficient acres of suitable land for vegetable production. Considering required rotations, an average of 259 acres of land per farm could be planted annually.

Table 3.11 Acres of fresh vegetables committed to packing house, survey of 32 farms, Western New York, 1990.

Item	All Farms	Fresh	Other
Total Fresh Vegetable Acreage Willing to Devote to Shed	1,615	105	1,510
Average Acres Suitable for Fresh Vegetable Production Per Farm	451	112	612
Average Acres Per Farm That Could be Planted in One Season	259	81	358

IV. PACKING

The 11 crops on the proposed list were divided into three basic groups with regard to packing: crops which are hand harvested and packed in the shed (broccoli, cucumbers, peppers, squash, tomatoes, and cherry tomatoes); crops which are hand harvested and packed in the field (cauliflower and sweet corn); and crops mechanically harvested and packed in the shed (snap beans). For certain crops there is more than one way to harvest and pack. Snap beans and sweet corn can be manually or mechanically harvested for fresh market. Broccoli can be field packed, and cauliflower can be harvested into large bins and shipped directly from the field. Which method is best can vary between farm operations depending on the yield and total volume harvested, equipment and labor availability, and buyer requirements, among other things. For the purposes of this research, one method was chosen for each crop, based on suggestions from the Advisory Committee. However, growers who are considering new fresh vegetable enterprises should be aware that there are alternative methods of harvesting and packing.

A summary of harvesting and packing methods and model packing line layouts are described on the following pages. Harvest and packing procedures are briefly outlined for field and shed packed crops in Table 4.1. Three basic types of packing line equipment layouts are illustrated. Table 4.2 gives a description and estimated cost of each item of equipment. These cost estimates were obtained from researchers at Virginia Polytechnic Institute and from manufacturers. The prices are for new equipment.

Table 4.1 Summary of harvesting and packing methods used in analysis.

Location	Hand Harvest Shed Pack	Hand Harvest Field Pack	Mechanical Harvest Shed Pack
CROPS	Broccoli, cucumbers, peppers, squash, tomatoes, cherry tomatoes	Cauliflower, sweet corn	Snap beans
FIELD OPERATIONS	Pick in buckets, baskets, bins. Stack on truck/ wagon. Broccoli: Cut, put on conveyor (Harvestaid) load on wagon.	Cauliflower: Cut, trim, put into crates, stack on pallets on wagon. Sweet Corn: Pick into wagon, unload into crates at end of field. Load on pallets on truck or wagon.	Mechanically harvest into truck/ wagon.
SHED OPERATIONS	Unload on belt or water dump. Presort, wash, wax (except zucchini) convey to sizing (hand or machine), grading, box-fill (hand or machine), box close and staple. Stack on pallets and store cold. Broccoli: Unload wagon on belt, trim, bunch, put in box. Slurry-ice, stack on pallets and store cold.	Unload pallets, store cold. Sweet Corn: hydro-cool or slurry-ice and store cold.	Unload on belt to tumbler and shaker belts for pin and broken bean removal. Hand sort and grade. Box-fill by hand or machine stack on pallets and hydro-cool, store cold.

Table 4.2 Packing line equipment and cost estimates, model packing house, Western New York, 1990.

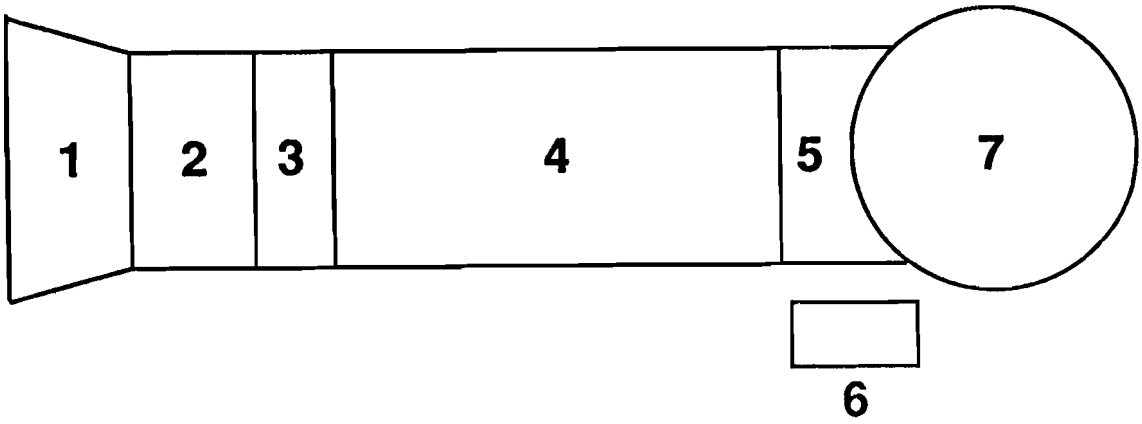
	Description	Cost ($)	
1. Equipment for tomatoes, cherry tomatoes, and squash 48 in. line 600 bushels/hour	Hydro-dump	7,500	
	Elevator	5,000	
	Wash/wax/dry	12,000	
	Sort table	6,500	
	Weight sizer	107,000	
	Pack bins	5,000	
	Pack stands	5,000	
	Power conveyor	15,000	
	Cull conveyor	11,000	
	Carton chutes	3,000	
	Forklift (2)	16,000	
	Pallets (100 @ $10)	1,000	
	Box stapler	8,000	
	Subtotal		202,000
Kerian sizer for cucumbers, peppers	Kerian roller sizer	15,000	
	Subtotal		15,000
2. Line for sweet corn, broccoli, cauliflower	Receiving belt	4,500	
	Conveyors (3)	45,000	
	Bunching machine (4) (for broccoli)	4,000	
	Subtotal		53,500
3. Line for snap beans 500 bushels/hour	Feeder chute		
	Eliminator		
	Shaker belts (3)	39,000	
	Hydro-cooler	33,000	
	Subtotal		72,000
TOTAL EQUIPMENT			342,500

SOURCE: T. Kazmierczak, Virginia Polytech.; and manufacturers.

Model Packing Line Layouts

1. Basic Line for Cucumbers, Peppers, Tomatoes, Cherry Tomatoes, and Squash

   a. Mechanical Sizing



1-Receiving (chute, belt, water dump)

2-Brush washer/absorber

3-Waxer

4-Conveyor

5-Sizer (chain, belt, bar, weight, drop/roll)

6-Packing stands

7-Rotary table (optional)

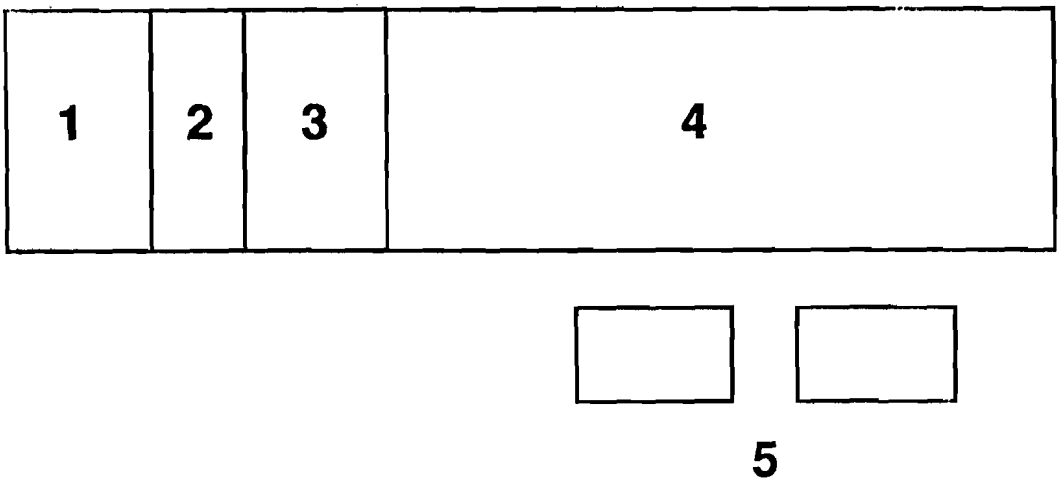
Description:

Produce arrives at shed in bulk bins/containers, then it is dumped onto belt or water dump with conveyor (to prevent bruising). Conveyed to washer/water absorber (may have a mechanical "eliminator" here to sort out undersized produce). Produce then moves to waxer (optional, depending on buyers' needs), then conveyed to a mechanical sizer. From the sizer the product is rolled or conveyed to packing stands for boxing. The larger sizes move to a rotary table or a conveyor for hand sorting and packing.

Special Considerations:

Sizers -- The best sizer for a line depends on the type of product, volume, labor available, number of grades, and initial capital investment desired. Peppers and tomatoes cannot be sized by the same units generally due to their differing shapes, density, and bruising. Chain sizers are suitable for peppers but not recommended for tomatoes. Belt, bar, and weight sizers are most often recommended for tomatoes. For specific recommendations, a machinery dealer should be consulted.

b. Alternative Line for Tomatoes/Peppers, Squash "Straight Line"



1-Receiving

2-Washer/absorber

3-Waxer

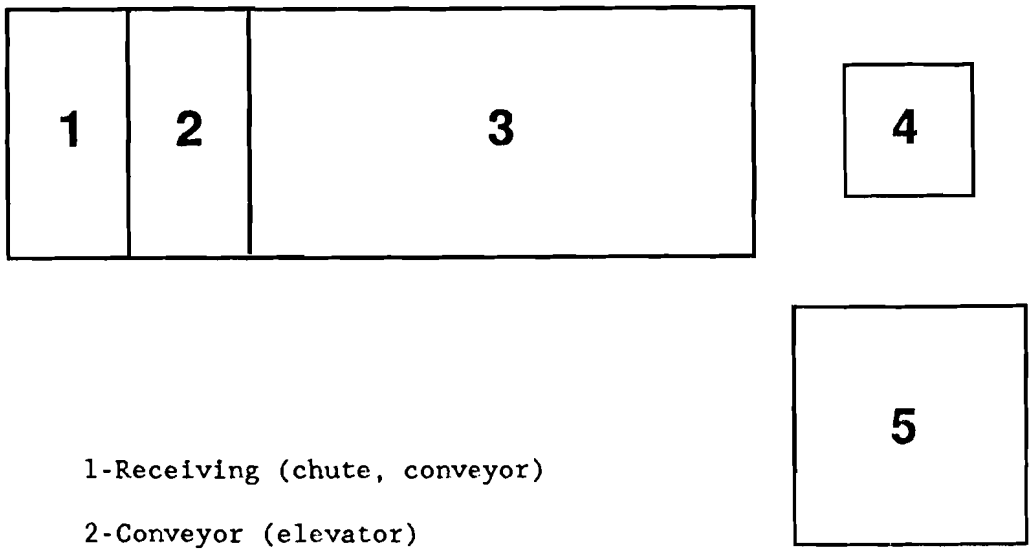
4-Long conveyor

5-Packing stands

Description:

This line removes the mechanical sizer(s), substituting labor for grading and sorting. It has the advantage of flexibility in handling a variety of vegetables (including squash), and lower initial cost and maintenance. However, more labor is generally required and may be a problem in regions where the labor supply is tight. Also, grading consistency may be poorer when done by hand rather than machine.

2. Basic Line for Broccoli, Sweet Corn



1-Receiving (chute, conveyor)

2-Conveyor (elevator)

3-Long conveyor

4-Bunching machine (broccoli)

5-Precooler

Description:

Product arrives at shed packed in crates, boxes, etc. It is then inspected and broccoli is cut, trimmed, bunched, and placed in box. The product is then precooled either by hydrocooling or ice/slurry ice. It is stored at relatively cooler temperatures (35-45 degrees F).

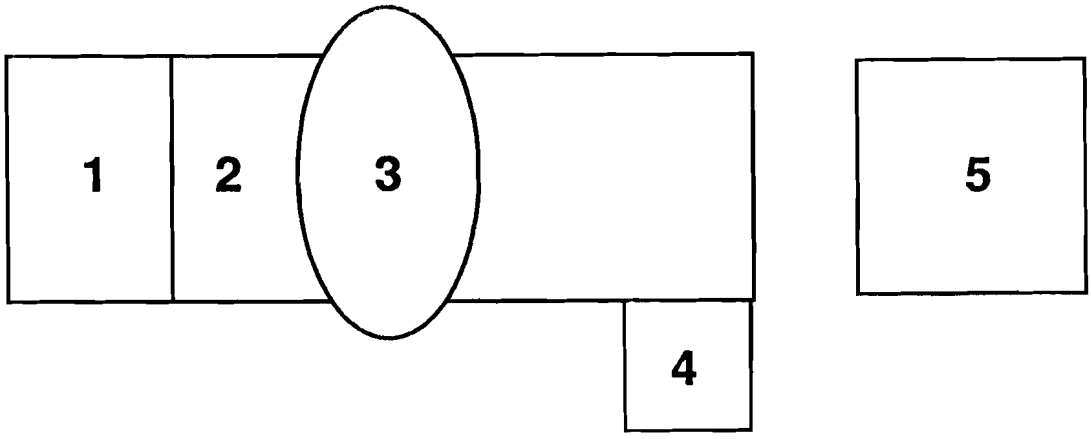
Ice: Can make/store ice or buy ice.

a. Ice plant, makes and stores, crushes and delivers as a slurry. For 15 tons per day, 1,000+ boxes per hour, the cost is approximately $125,000.

b. Ice crushing and delivery system (must buy ice) that uses 4,000 pounds of ice per day, has a capacity of 400 boxes per hour, and costs $30,000.

c. Can also buy ice, break-up and put in boxes manually.

3. Basic Line for Mechanically Harvested Snap Beans



1-Receiving (belt/chute)

2-Conveyor

3-Tumbler - pin and broken bean eliminator

4-Shaker belts

5-Box-filler (manual or machine)

6-Hydrocooler

Description:

Beans are unloaded in bulk onto conveyor for inspection and cluster/trash removal. Then they are moved to tumbler which spins out undersized and broken beans and further breaks up clusters. Shaker belts distribute beans for further inspection and grading. They are then crated by hand or mechanical crate filler and stored (may be hydrocooled).

Special Considerations:

Pin and broken bean eliminator (tumbler) is highly recommended, since sorting by hand requires a large amount of labor. Shaker belts not required but helpful in distributing beans for inspection.

Packing Line Layout Summary: Options and Considerations

1. Line Capacities:

Capacity of a packing line can vary with the size of the belt or conveyors (width), number of grades desired and quality of the product. Generally speaking, line capacities can be outlined as follows based on belt/conveyor width:

Width	Capacity
24 in. belt	100-200 bushels/hour
36 in.	300+ bushels/hour
48 in.	600-800+ bushels/hour
60-72 in.	900+ bushels/hour

2. If a straight line is used, it may be possible to pack all vegetables on one line by substituting pieces of equipment. However, this may not be practical if different vegetables are packed at the same time of year.

3. Tomatoes, peppers, and squash could all be packed on a straight line, but this would generally require more labor than a line with mechanical sizers. Potential problems with the "human factor" in grading and sizing must also be considered compared to mechanical sizing.

4. For broccoli, sweet corn, and snap beans, the precooler is the largest expense item. For broccoli, slurry icing appears to be desired by buyers. Precoolers can be leased or rented to reduce initial investment (cost $2,600 per month for 4,000 pounds, 400 box per hour ice machine).

5. If snap beans are harvested mechanically, tumbler and shaker belts will be needed.

6. In summary, it is suggested that an operation start small, with simpler lines and equipment initially. Capacity can be built up gradually as production and markets stabilize. "High tech", high cost equipment (such as laser sizers) should be avoided. Maintain as much flexibility in the line as possible to allow for expansion given labor and initial capital constraints.

Packing Cost Estimates

Estimates of packing labor, materials, transportation and marketing, and facility costs are summarized in Tables 4.3-4.7. Hourly labor costs and persons needed for packing were estimated for each vegetable. The number of persons needed for each line (Table 4.3) includes packing labor only, not management, and was estimated by consulting packers on the advisory committee and existing published data (see Pearson and Brooker, 1970 and Kirkpatrick and Bell, 1987). A detailed description of jobs and calculations of hourly packing line wage costs can be found in Appendix IV.

Table 4.3 Packing labor costs summary, model packing house, Western New York, 1990.

Crop	Number of Persons	Total Wage Cost/Hour	Cost/Box @ 100% Output*	Cost/Box @ 75/50% Output*
Beans	37	$383	$0.64	$0.85
Broccoli	21	217	0.27	0.54
Cauliflower	11	114	0.14	0.29
Cucumbers	31	321	0.54	0.71
Peppers	33	342	0.57	0.76
Winter squash	27	280	0.47	0.62
Summer squash	27	280	0.47	0.62
Sweet corn	17	176	0.22	0.44
Tomatoes	33	342	0.57	0.76
Cherry tomatoes	33	342	0.57	0.76

*Beans, cucumbers, peppers, squash, tomatoes, and cherry tomatoes @ 600 boxes per hour 100 percent output, 450 boxes per hour at 75 percent output.

Broccoli, cauliflower, sweet corn @ 800 boxes per hour 100 percent output 400 boxes per hour at 50 percent output.

The transportation costs per box in Table 4.4 were estimated at $0.02 per pound of product shipped, assuming a maximum 500 mile shipping radius from Central and Western New York.

Table 4.4 Costs of packing materials and transportation per box, model packing house, Western New York, 1990.

Crop	Box Size & Weight	Box Cost ($)	Wax ($)	Ice* ($)	Transport** ($)	Total Costs Per Box ($)
Tomatoes	11/9 bu. 25 lb.	0.80	0.02		0.50	1.32
Peppers	1 1/9 bu. 30 lb.	0.80	0.02		0.60	1.42
Cucumbers	1 1/9 bu. 55 lb.	0.80	0.02		1.10	1.92
Winter squash	1 bu. 50 lb.	0.80	0.02		1.00	1.82
Zucchini	5/9 bu. 23 lb.	0.53			0.46	0.99
Broccoli	12 hd. 22 lb.	1.25		0.30	0.50	2.05
Cauliflower	12 hd. 50 lb.	1.25			1.00	2.25
Corn	4.5 dz. 45 lb.	1.25		0.30	0.90	2.45
Beans	1 bu. 30 lb.	1.40			0.60	2.00
Cherry tomatoes	12 pt. 12 lb.	1.35	0.02		0.24	1.61

*Ice costs $0.02 per pound, 15 pounds per box.
**Transportation costs assumed to be $0.02 per pound for 46,000 pound load, 500 miles.

Initial investments in land, buildings, and equipment for a model centralized packing shed are summarized in Table 4.5, assuming all vegetables considered will be packed and a maximum total packout of 200,000 boxes annually. Equipment costs are based on combinations of crops that can be packed together. Cost figures are obtained from previous calculations in Table 4.4. A detailed description of the building and cost calculations can be seen in Appendix V. The building costs include the shell, electric and plumbing fixtures, concrete, paving and grading, and cold storage installation, including insulation and refrigeration equipment.

Annual costs of operation of a model packing house are given in Table 4.6. Costs per box are estimated at full capacity (200,000 boxes) and at 75 percent capacity (150,000 boxes).

Table 4.5 Initial investment costs and depreciation model centralized packing shed, model packing house, Western New York, 1990.

	Description	Initial Cost ($)	Estimated Life (years)	Annual Deprec. ($)
Building	Main: 100'x150' Cold: 50'x50'	325,580	20	16,369
Land	3 acres	30,000		
TOTAL BUILDING		357,580		16,379
Packing Equipment:				
Basic Line (tomatoes, squash, cherry tomatoes)		202,000	8	25,250
Cucumber & peppers (roller sizer)		15,000	8	1,875
Sweet corn, broccoli, cauliflower		53,500	8	6,688
Snap beans		72,000	8	9,000
Box stapler		8,000	8	1,000
TOTAL EQUIPMENT		350,500		43,813
TOTAL INITIAL INVESTMENT		708,080		60,192
Total Per Box:				
@ 200,000 boxes		3.54		0.30
@ 150,000 boxes		4.72		0.40

Table 4.6 Annual costs, model packing house, Western New York, 1990.

Taxes (1% of total initial costs)	$ 7,081
Insurance (1.5%)	10,621
Interest (10%)	70,808
Depreciation	60,192
Subtotal	$148,702
UTILITIES:	
Electric	7,500
Water & sewer (600,000 gallons, $2.70/1,000)	1,620
Telephone	5,000
Subtotal	$ 14,120
ADMINISTRATIVE:	
Manager's salary	40,000
Benefits (25% of salary)	10,000
Office supplies	3,000
Subtotal	$ 53,000
MACHINE RENTAL:	
Slurry ice, $3,000 per month, minimum three months	9,000
MAINTENANCE (3% of equipment costs)	10,515
TOTAL ANNUAL COSTS	$235,337
Per Box @ 200,000 boxes	$1.18
@ 150,000 boxes	$1.57

Finally, total costs per box of packing, shipping, and marketing each of the fresh vegetables considered are summarized in Table 4.7. Marketing fees per box were estimated at 15 percent of the five year season average price as calculated previously in Section II. Annual costs per box are calculated at the 75 percent capacity level, or 150,000 boxes output annually, from Table 4.6. It was felt that this would be a more realistic assumption for costs of a packing shed in the early years of operation. Costs ranged from $3.60 per box for zucchini to $7.18 per box for snap beans.

Table 4.7 Packing, marketing, and shipping costs for 11 fresh vegetables, packed in model packing house, Western New York, 1990, dollars per box.

Crop	Labor	Box	Wax/Ice	Annual Costs	Total Packing	Market*	Trans.	Total Cost
Beans	0.85	1.40		1.57	3.82	2.76	0.60	7.18
Broccoli	0.54	1.25	0.30	1.57	3.66	1.35	0.50	5.51
Cauliflower	0.28	1.25		1.57	3.10	1.14	1.00	5.24
Cucumbers	0.71	0.80	0.02	1.57	3.10	1.34	1.10	5.54
Corn	0.44	1.50	0.30	1.57	3.81	0.94	0.90	5.65
Peppers	0.76	0.80	0.02	1.57	3.15	1.27	0.60	5.02
Acorn squash	0.62	0.80	0.02	1.57	3.01	0.86	1.00	4.87
Butternut squash	0.62	0.80	0.02	1.57	3.01	0.81	1.00	4.82
Zucchini	0.62	0.53		1.57	2.72	0.42	0.46	3.60
Tomatoes	0.76	0.80	0.02	1.57	3.15	1.63	0.50	5.28
Cherry tomatoes	0.76	1.35	0.02	1.57	3.70	1.41	0.24	5.35

*Marketing charge per box: estimated at 15 percent of five year season average prices.

In summary, the results show that an initial investment of approximately $360,000 for land and buildings and up to $350,500 for equipment, for a total investment of approximately $700,000, would be needed for the model packing shed. This assumes a 200,000 container per year output capacity and packing all 11 crops considered.

It is unreasonable to expect that all 11 crops would be packed in one shed. Therefore, the initial investment in equipment will likely be less than the estimate presented, perhaps by as much as $70,000 to $100,000, depending on what crops are ultimately determined to be feasible for production and marketing. Other alternatives to be considered are the purchase of used equipment and the rental or leasing of land, buildings, and equipment. There are many different options and cost scenarios involved with these alternatives, and the analysis is too specific in nature to be done completely and accurately without specifying an exact crop mix. However, used equipment and facility and equipment rentals should be investigated since the cost savings and risk reduction can be substantial in the early years of operation.

After the packing shed has been in operation for a number of years, it is reasonable to expect that per unit overhead costs will decrease, assuming the shed becomes more efficient in its operations and packout is increased to full capacity. It is impossible at this time to determine how much per unit costs would decrease. For now we are assuming that in the first years of operation the packing efficiency will be only 75 percent of capacity, but later it may reach 90 percent. In reality, fresh vegetable packers should realize that packing efficiency can vary widely depending on product quality and yields, as well as the efficiency of the packing shed operations, and that packing efficiency can be even less than 75 percent in some years.

V. GROWING COSTS AND RETURNS

Estimating costs and returns is a dilemma in regions where fresh vegetables are not widely grown. Data on fresh market yields and harvest labor are not readily available, and yet, these are crucial factors in estimating profitability. Final yield estimates and harvest labor requirements were based on the following data: 1) yields from other studies from New York or similar growing areas, mainly Phelps and How, 1981, (New York); Warner, 1985 (Long Island, New York); and Fisher et al., 1988 (Ontario); 2) the experience of cooperating extension agents; and 3) results from the survey of growers, supplemented by additional interviews with growers who had experience with fresh vegetables. Yield estimates are shown in Table 5.1. Season average prices, developed in Section 2 and reported in Table 2.3, are also shown in Table 5.1. The price for snap beans was modified as shown in the footnote to Table 5.1.

Table 5.1 Per acre yields, container description, and season average prices (1984-1988) for fresh vegetables, Western New York.

Crop	Container Description	Weight (pounds)	Marketable Yield Per Acre	Season Average Price
Tomatoes	Carton (loose pack)	25	715	$10.89
Green peppers	Crate, 1-1 1/9 bushel	30	750	8.46
Cauliflower	"Long-Island" type	50	375	7.61
Broccoli	Crate, 14-18 bunches	22	350	9.03
Cucumbers	Box/crate, 1 1/9 bushel	55	400	8.93
Sweet corn	Wire-bound crate	45	190	6.29
Green beans	Wire-bound crate	30	200	12.67*
Winter squash	Box/crate, 1 bushel	45	500	5.55
Zucchini	Carton/crate, 5/9 bushel	23	950	5.56
Cherry tomatoes	Flat, 12 pints	12	425	9.40

*The season average price from the analysis of terminal markets was $17.89. This average was very much affected by a few observations very early and very late in the season. Therefore, the Advisory Committee recommended using the August average price ($14.67) less a $2.00 discount for mechanically harvested beans as used in the crop budgets.

Crop Inputs

Estimated crop expenses for fertilizer, lime, and pesticides were developed from Cornell Recommends for vegetable crops, in consultation with cooperators David Wolfe (Department of Fruit and Vegetable Science, Cornell University) and Carol MacNeil and Laura Pedersen (Cornell Cooperative Extension, Ontario County).

Machinery, Equipment, and Buildings

Machinery and Equipment Complement and Fixed Costs

As indicated in Section 4, results from the survey indicated that farms which are considering fresh vegetables as cropping alternatives are primarily large farms now growing field crops and processed vegetable crops. Survey farms on average cropped 742 acres. These farms have most of the machinery and equipment necessary for growing fresh vegetable crops except specialized equipment such as a harvest aide, pallets, and bins. The basic machinery for the farm was taken from Snyder. The items of equipment are shown in Table 5.2 under "Base" machinery.

Other machinery necessary for vegetable production included a transplanter, fertilizer applicator, an air blast sprayer, and a precision vegetable seeder. These general items of equipment which would each be used over several crops are listed in Table 5.2 as "Added Vegetable Machinery". The machinery in the "Base" list was allocated over 750 acres to derive annual costs (depreciation, interest, insurance, and storage). "Added Vegetable Machinery" annual costs were allocated assuming 10 acres of each crop on which a particular item of machinery was used and a maximum of 80 acres of fresh vegetables.

The Advisory Committee believed that irrigation would be essential for Central New York fresh vegetables to be competitive with other producing regions. Therefore, a sprinkler with reel irrigation system was budgeted. Such a system has a flow rate of 300 gallons per minute, sprinkler pressure of 70 p.s.i., a system inlet pressure of 113 p.s.i., irrigates a width of 245 feet, a length of 1,173 feet, and can deliver one acre-inch of water in five days to approximately 80 acres. It was assumed for fixed cost allocation that the farm would irrigate 80 acres of vegetables. Investment costs were estimated at $25,000 for the sprinkler with reel systems with another $5,700 invested in 1,500 feet of portable pipe.

In addition, each farm going into fresh vegetable production would need to buy harvesting equipment such as picking baskets and bushels, wooden baskets, pallets, and bins. Farms which grow green beans would need a bean harvester while broccoli and cucumbers require a harvest aide. These items are shown under "Harvesting Equipment". Allocation of fixed costs of haresting equipment was also based on the assumption of each crop being grown on 10 acres.

Table 5.2 Machinery, equipment, and building complement and annual costs.

Machinery Complement	Purchase Price	Salvage Value	Capital Cost	Insur-ance	Storage	Annual Cost
Base						
4WD Pickup	$11,245	$1,125	$1,647	$ 56	$169	$1,872
Large Farm Truck (used)	6,204	620	908	31	93	1,033
Large Farm Truck (used)	6,204	620	908	31	93	1,033
120 HP Tractor	34,511	3,451	5,053	173	518	5,744
80 HP Tractor	24,158	2,416	3,537	121	362	4,021
60 HP Tractor	16,674	1,667	2,442	83	250	2,775
40 HP Tractor	12,990	1,299	1,902	65	195	2,162
5-18 Plow	7,910	791	1,158	40	119	1,316
14' Disc	5,235	524	767	26	79	871
16' Drag	1,474	147	216	7	22	245
8R Planter	13,417	1,342	1,965	67	201	2,233
8R Cultivator	3,490	349	511	17	52	581
Drill	5,312	531	778	27	80	884
28' Boom Sprayer	2,520	252	369	13	38	419
14' Cultipacker	1,435	144	210	7	22	239
2 Wagons	4,653	465	681	23	70	774
Added Vegetable Machinery						
2R Transplanter	1,850	185	271	9	28	308
Fertilizer Applicator	2,900	0	472	15	44	530
Air Blast Sprayer	3,500	350	513	18	53	583
Prec. Vegetable Seeder	4,000	400	586	20	60	666
Mulch Hayer & Roller	2,045	205	299	10	31	340
Irrigation System						
Sprinkler with Reel	25,000	2,500	3,661	125	375	4,161
1,500" Port Pipe	5,700	570	835	29	86	949
Harvesting Equipment						
1R Bean Harvester	12,500	1,250	1,830	63	188	2,080
Forklift (used)	11,050	1,105	1,618	55	166	1,839
Harvest Aid	11,500	1,150	1,684	58	173	1,914
250 Plastic Buckets (2/3 bu.)	1,200	0	317	6	18	341
500 Wooden Baskets (1 bu.)	250	0	66	1	4	71
400 8 qt. Baskets	160	0	42	1	2	45
30 Pallets	300	0	79	2	5	85
60 Bins	1,800	0	475	9	27	511
Housing (Cap=12)	84,000	8,400	9,870	420	800	11,090

Sources: Snyder
Various equipment manufacturers and sales offices.

Finally, the Advisory Committee believed that, given the need for skilled and knowledgeable harvest labor, a relatively tight labor supply situation, and the high demand for hand labor for harvesting the fresh vegetable crops considered in this study, the use of migrant workers would be essential. Therefore, costs were developed for migrant labor housing. The farm would need housing for 12 persons with an investment of $84,000. The annual cost for utilities and repairs was estimated at $800. Again, these costs were allocated to 80 acres. Allocation to specific crops was done on the basis of proportional uses of harvest labor; thus, a crop which used twice as much harvest labor per acre as another crop would have two times as much annual cost per acre for housing.

Thus, the profile of the typical farm which would grow fresh vegetables is a 750 acre farm growing predominantly field and grain crops and processing vegetables. The farm, in order to go into fresh vegetable production, would need to invest in irrigation capacity for 80 acres and housing for 12 additional workers. The farm would grow 80 acres of fresh vegetables. While no attempt was made to specify a cropping mix, each farm would include 10 acres of eight different fresh vegetable crops, with the remaining acres (670 acres) planted to field crops, grains, and processing vegetables. These assumptions were necessary in order to allocate fixed costs.

Variable Costs for Machinery and Equipment

Variable costs for machinery and equipment were taken from other sources such as Snyder, 1990 and Estes et al., 1988. These estimates are based on the economic engineering approach. Labor hours to operate machinery were obtained by multiplying by a factor of 1.35 to account for time going to and from the field, unproductive time, and other labor overhead. The labor estimates derived by this method should result in an approximation of the full-time and part-time labor supply of the typical grain and processing vegetable farm, excluding harvest labor, as profiled in this study.

Variable costs per operation for fuel, repairs, and labor (hours only) are shown in Table 5.3.

Table 5.3 Machinery variable costs by operation.

Machine	Trac. HP	Hours/ Acre	Impl. Repairs & Maint. ($/hr)	Trac. Repairs & Maint. ($/hr)	Trac. Fuel ($/hr)	Vari- able Costs ($/hr)	Vari- able Costs ($/ac)	Labor Hours
Plow 5-18	120	0.34	4.53	2.41	6.35	13.29	4.52	0.46
Disc 14'	120	0.16	2.40	2.41	6.35	11.16	1.79	0.22
Drag 16'	120	0.12	0.61	2.41	4.78	7.80	0.94	0.16
Plow 5-18	80	0.34	4.53	1.69	4.24	10.46	3.56	0.46
Disc 13'	80	0.16	2.40	1.69	4.24	8.33	1.33	0.22
Drag 16'	80	0.12	0.61	1.69	3.19	5.49	0.66	0.16
Planter 8R	80	0.13	14.67	1.46	3.19	19.32	2.51	0.18
Cultivator 8R	80	0.11	1.68	1.46	2.13	5.27	0.58	0.15
Drill	60	0.18	4.33	1.21	3.48	9.02	1.62	0.24
Sprayer 28'	60	0.11	0.85	1.21	2.33	4.39	0.48	0.15
Culti-packer 14'	40	0.12	0.42	0.72	2.32	3.46	0.42	0.16
Wagons	40	0.33	0.70	0.48	1.55	2.73	0.90	0.45
Trans-planter 2R	40	1.41	0.98	0.72	2.32	4.02	5.67	1.90
Fertilizer Applicator	60	0.16	1.63	1.21	3.48	6.32	1.01	0.22
Irrigate	120	0.80	4.69	2.41	6.35	13.45	10.76	0.30
Bean Harv.	120	2.00	5.00	2.41	6.35	13.76	27.52	2.70
Harv. Aide	120	2.50	5.00	2.41	6.35	13.76	34.40	3.38
Lay Plastic	80	1.00	1.00	1.69	3.19	5.88	5.88	2.70
Remove Plastic	40	0.33	0.70	0.48	1.55	2.73	0.90	0.45
Trucks								
Pickup			4.39		2.92	7.31	0.00	0.00
Large Farm Truck			2.89		4.20	7.09	0.00	0.00
Large Farm Truck			2.89		4.20	7.09	0.00	0.00

Sources: Snyder, 1990.
Estes, Sanders, and Rogers, 1988.
Geohring, 1990.

Land Costs

Other fixed costs for the typical farm were included in the crop budgets. These included a land charge of $78 per acre and property taxes of $27.50 per acre, both determined from the survey of growers.

Crop Budgets

The crop budgets resulting from these procedures are shown in Tables 5.4 through 5.13. Each crop has three tables. The first Table, e.g. Table 5.4a, shows the costs and returns for tomatoes. Total receipts are net of packing house transportation and marketing charges. Returns above variable costs and returns above total costs were estimated at $1,290 and $728, respectively. The break-even price is expressed in terms of a terminal market price. Thus, a terminal market price of $9.09 would be required to break even on variable growing costs and $9.87 would be necessary to cover all fixed growing costs. As shown in Table 5.4a, a seasonal average price of $10.89 was used (see Table 5.1).

Breakeven yield is also indicated in Table 5.14. Meaningful estimates could not be calculated for cauliflower, winter squash, zucchini, and sweet corn since the price net of packing, marketing, and transporting was low relative to harvesting costs. Breakeven yield was computed allowing harvesting costs to adjust in a direct relationship with yields.

Table 5.4b shows estimates of machinery costs and labor requirements for tomatoes as developed from Table 5.3. The operations were specified in consultation with Extension Agents Carol MacNeil and Laura Pedersen.

Fixed costs of specialized harvesting equipment, as developed in Table 5.2, are shown in Table 5.3c for tomatoes based on the assumption of growing 10 acres.

A summary by crop is shown in Table 5.14. Cherry tomato estimates are not shown because estimated costs were incomplete.

Table 5.4a Costs and returns, tomatoes (marketed fresh), Western New York, 1990.

Item	Unit	Price	Per Acre Quantity	Per Acre Total
RECEIPTS:				
Breakers, extra large	25 lb. ctn.	$10.89	715	$7,786.35
Less grading, packing & marketing	ctn.	5.28	715	3,775.20
Net receipts to grower	25 lb. ctn.	5.61	715	4,011.15
EXPENSES:				
Plants	thousand	34.50	5	172.50
Fertilizer:				
Nitrogen	lb.	0.22	80	17.60
Phosphorus	lb.	0.20	100	20.00
Potassium	lb.	0.12	120	14.40
Sidedress N	lb.	0.22	50	11.00
Starter solution	lb.	2.40	12	28.80
Lime	ton	25.69	0.5	12.85
Pesticides:				
Herbicide				13.27
Insecticide				12.91
Fungicide				75.98
Labor:				
Machine operation	hours	9.75	20.3	197.63
Hand (other than harvest)	hours	7.00	27.4	191.45
Harvest	hours	7.00	225.0	1,575.00
Machinery variable costs				83.31
Other variable costs:				
Plastic	roll	40.00	4.0	160.00
Interest on oper. capital	$	0.052	2,586.70	134.51
TOTAL VARIABLE COSTS				2,721.21
RETURNS OVER VARIABLE COSTS				1,289.94
Fixed Costs:				
Specialized equipment				100.45
Land charge				78.00
Machinery ownership				35.00
Property taxes				27.50
Irrigation equipment				64.00
Harvest labor housing				256.98
TOTAL FIXED COSTS				561.93
TOTAL COSTS				3,283.14
RETURNS OVER TOTAL COSTS				728.01
BREAKEVEN PRICE (VARIABLE COSTS)				9.09
BREAKEVEN PRICE (TOTAL COSTS)				9.87
BREAKEVEN YIELD				501.00
AVC-GROW				3.81
ATC-GROW				4.59

Table 5.4b Machinery variable costs and labor requirements, per acre, tomatoes, Western New York, 1990

Operation	Machinery Variable Cost ($ per acre)	Machinery Operation (hours)	Hand (hours)
Custom spread fertilizer	5.00		
Plow	4.52	0.46	
Disc (2X)	2.66	0.44	
Spray herbicide	0.48	0.15	
Transplant	5.67	0.90	
Lay plastic	5.88	1.35	1.35
Transplant	5.67	0.90	4.0
Cultivate (2X)	1.16	0.30	
Sidedress N	1.03	0.22	
Hoe & weed (2X)			12.0
Spray (7X)	3.36	1.05	
Irrigate (3X)	32.28	0.90	
Harvest & load	7.09	12.50	225.0
Haul (2X)	14.18	2.00	
Remove plastic	0.90	0.45	10.0
TOTALS	83.31	18.92	
TOTAL MACHINERY OPERATION HOURS	20.3		
TOTAL HAND LABOR HOURS	27.4		
HARVEST LABOR HOURS	225.0		

Table 5.4c Fixed costs of specialized equipment for tomatoes, cost per acre.

Item	Cost per Acre
Transplanter	$ 38.80
Fertilizer applicator	6.63
Air blast sprayer	7.29
Plastic buckets	11.36
Wooden baskets	2.37
Pallets	17.00
Mulch layer & roller	17.00
TOTAL	$100.45

Table 5.5a Costs and returns, green peppers (marketed fresh), Western New York, 1990.

Item	Unit	Price	Per Acre Quantity	Per Acre Total
RECEIPTS:				
Crates, 1 1/9 bushels	30 lb. crate	$8.46	750	$6,345.00
Less grading, packing & marketing	crate	5.02	750	3,765.00
NET RECEIPTS TO GROWER	30 lb. crate	3.44	750	2,580.00
EXPENSES:				
Plants	thousand	35.00	12.5	437.50
Fertilizer:				
Nitrogen	lb.	0.22	80	17.60
Phosphorus	lb.	0.20	100	20.00
Potassium	lb.	0.12	100	12.00
Sidedress N	lb.	0.27	60	16.20
Starter solution	lb.	2.40	18	43.20
Lime	tn.	25.69	0.50	12.85
Pesticides:				
Herbicide				16.12
Insecticide				23.30
Fungicide				9.00
Labor:				
Machine operation	hours	9.75	16.0	155.71
Hand (other than harvest)	hours	7.00	21.4	149.45
Harvest	hours	7.00	125.0	875.00
Machinery variable costs				99.94
Other variable costs				
Plastic	roll	40.00	4.0	160.00
Interest on oper. capital	$	0.052	2,047.86	106.49
TOTAL VARIABLE COSTS				2,154.35
RETURNS OVER VARIABLE COSTS				425.65
Fixed Costs:				
Specialized machinery & equipment				93.65
Land charge				78.00
Machinery ownership				35.00
Property taxes				27.50
Irrigation equipment				64.00
Harvest labor housing				142.77
TOTAL FIXED COSTS				440.92
TOTAL COSTS				2,595.27
RETURNS OVER TOTAL COSTS				-15.27
BREAKEVEN PRICE (VARIABLE COSTS)				7.89
BREAKEVEN PRICE (TOTAL COSTS)				8.48
BREAKEVEN YIELD				752
AVC-GROW				2.87
ATC GROW				3.46

Table 5.5b Machinery variable costs and labor requirements, per acre, green peppers, Western New York, 1990.

Operation	Machinery Variable Cost ($ per acre)	Machinery Operation (hours)	Hand (hours)
Custom spread fertilizer	5.00		
Plow	4.52	0.46	
Spray herbicide	0.48	0.15	
Disc (2X)	3.58	0.44	
Lay plastic	5.88	1.35	1.35
Transplant	5.67	0.90	4.0
Sidedress N	1.01	0.22	
Spray herbicide	0.48	0.15	
Spray (4X)	1.92	0.60	
Hoe & weed			6.0
Irrigate (4X)	43.04	1.20	
Harvest & load	7.09	7.50	125.0
Haul (3X)	21.27	3.00	
Remove plastic	0.90	0.45	10.0
TOTALS	99.94	15.97	
TOTAL MACHINERY OEPRATION HOURS	16.0		
TOTAL HAND LABOR HOURS	21.4		
TOTAL HARVEST HOURS-unskilled	125.0		

Table 5.5c Fixed costs of specialized equipment for green peppers, cost per acre.

Item	Cost per Acre
Transplanter	$38.80
Fertilizer applicator	6.63
Air blast sprayer	7.29
Plastic bushels	11.36
Wooden baskets	2.37
Bins	10.20
Mulch layer & roller	17.00
TOTAL	$93.65

Table 5.6a Costs and returns, cauliflower (marketed fresh), Western New York, 1990.

Item	Unit	Price	Per Acre Quantity	Per Acre Total
RECEIPTS:				
Packed cartons, Long Island type	50 lb. ctn.	$ 7.61	375	$2,853.75
Less grading, packing & marketing	ctn.	5.24	375	1,965.00
NET RECEIPTS TO GROWER	50 lb. ctn.	2.37	375	888.75
EXPENSES:				
Plants	thousand	17.00	10	170.00
Fertilizer:				
Nitrogen	lb.	0.22	110	24.20
Phosphorus	lb.	0.20	45	9.00
Potassium	lb.	0.12	70	8.40
Sidedress N	lb.	0.22	65	14.30
Starter solution	lb.	2.40	12	28.80
Lime	ton	25.69	1	25.69
Pesticides:				
Herbicide				5.75
Insecticide				23.27
Fungicide				20.93
Labor:				
Machine operation	hours	9.75	14.0	136.21
Hand (other than harvest)	hours	7.00	45.0	315.00
Harvest	hours	7.00	100.0	700.00
Machinery variable costs				68.47
Other variable costs				
Tying bands	thousand	6.00	9.00	54.00
Interest on operating capital	$	0.052	1,604.02	83.41
TOTAL VARIABLE COSTS				1,687.43
RETURNS OVER VARIABLE COSTS				-798.68
Fixed Costs:				
Specialized machinery & equipment				38.62
Land charge				78.00
Machinery ownership				35.00
Property taxes				27.50
Irrigation equipment				64.00
Harvest labor housing				114.21
TOTAL FIXED COSTS				357.33
TOTAL COSTS				2,044.76
RETURNS OVER TOTAL COSTS				-1,156.01
BREAKEVEN PRICE (VARIABLE COSTS)				9.74
BREAKEVEN PRICE (TOTAL COSTS)				10.69
BREAKEVEN YIELD				NA
AVC-GROW				4.50
ATC-GROW				5.45

Table 5.6b Machinery variable costs and labor requirements, per acre, cauliflower, Western New York, 1990.

Operation	Machinery Variable Cost ($ per acre)	Machinery Operation (hours)	Hand (hours)
Custom spread fertilizer	5.00		
Plow	4.52	0.46	
Spray herbicide	0.48	0.15	
Disc (2X)	3.58	0.44	
Transplant	5.67	0.90	4.0
Fertilize-sidedress	1.01	0.22	
Cultivate (2X)	1.16	0.30	
Hand hoe & weed (1X)			6.0
Irrigate (4X)	43.04	1.20	
Spray (4X)	1.92	0.60	
Tie			35.0
Harvest & load	7.09	8.70	100.0
Haul (1X)	7.09	1.00	
TOTALS	68.47	14.00	
TOTAL MACHINERY OPER. HOURS	14.0		
TOTAL HAND LABOR HOURS	45.0		
TOTAL HARVEST LABOR HOURS	100.0		

Table 5.6c Fixed costs of specialized equipment for cauliflower, cost per acre.

Item	Cost per Acre
Pallets	$17.00
Transplanter	7.70
Fertilizer applicator	6.63
Air blast sprayer	7.29
TOTAL	$38.62

Table 5.7a Costs and returns, broccoli (marketed fresh), Western New York, 1990.

Item	Unit	Price	Per Acre Quantity	Per Acre Total
RECEIPTS:				
Crate, 14-18 bunches	22 lb. crate	$ 9.03	350	$3,160.50
Less grading, packing & marketing	crate	5.51	350	1,928.50
NET RECEIPTS TO GROWER	22 lb. crate	3.52	350	1,232.00
EXPENSES:				
Seed	lb.	200.00	0.5	120.00
Fertilizer:				
Nitrogen	lb.	0.22	70	15.40
Phosphorus	lb.	0.20	45	9.00
Potassium	lb.	0.12	80	9.60
Sidedress N	lb.	0.22	65	14.30
Lime	ton	25.69	1	25.69
Pesticides:				
Herbicide				20.63
Insecticide				23.27
Fungicide				20.97
Labor:				
Machine operation	hours	9.75	8.2	79.95
Hand (other than harvest)	hours	7.00	6.0	42.00
Harvest	hours	7.00	60.0	420.00
Machinery variable costs				101.86
Other variable costs				
Interest on oper. capital	$	0.052	882.67	45.90
TOTAL VARIABLE COSTS				928.57
RETURNS OVER VARIABLE COSTS				303.43
Fixed Costs:				
Specialized equipment				94.17
Land charge				78.00
Machinery ownership				35.00
Property taxes				27.50
Irrigation equipment				64.00
Harvest labor housing				68.53
TOTAL FIXED COSTS				367.20
TOTAL COSTS				1,295.77
RETURNS OVER TOTAL COSTS				-63.77
BREAKEVEN PRICE (VARIABLE COSTS)				8.16
BREAKEVEN PRICE (TOTAL COSTS)				9.21
BREAKEVEN YIELD				378.00
AVC-GROW				2.65
ATC-GROW				3.70

Table 5.7b Machinery variable costs and labor requirements, per acre, broccoli, Western New York, 1990.

Operation	Machinery Variable Cost ($ per acre)	Machinery Operation (hours)	Hand (hours)
Custom pread fertilizer	5.00		
Plow	4.52	0.46	
Disc (2X)	2.66	0.44	
Plant	5.67	0.90	
Sidedress N	1.01	0.22	
Spray (4X)	1.92	0.60	
Cultivate (2X)	1.06	0.30	
Hoe & weed			6.0
Irrigate (3X)	32.38	0.90	
Harvest aide	40.65	3.38	
Harvest & load	2.73		60.0
Haul (1X)	7.09	1.00	
TOTALS	101.86	8.20	
TOTAL MACHINERY OPERATION HOURS	8.2		
TOTAL HAND LABOR HOURS	6.0		
TOTAL HARVEST HOURS-unskilled	60.0		

Table 5.7c Fixed costs of specialized equipment for broccoli, cost per acre.

Item	Cost per Acre
Precision seeder	$22.20
Fertilizer applicator	6.63
Air blast sprayer	7.29
Harvest aide	47.85
Bins	10.20
TOTAL	$94.17

Table 5.8a Costs and returns, cucumbers (marketed fresh), Western New York, 1990.

Item	Unit	Price	Per Acre Quantity	Per Acre Total
RECEIPTS:				
Crates, 1 1/9 bushels	50 lb. crate	$8.93	400	$3,572.00
Less grading, packing & marketing	crate	5.54	400	2,216.00
NET RECEIPTS TO GROWER	50 lb. crate	3.39	400	1,356.00
EXPENSES:				
Seeds	lb.	7.45	4	29.80
Fertilizer:				
Nitrogen	lb.	0.22	90	19.80
Phosphorus	lb.	0.20	45	9.00
Potassium	lb.	0.12	55	6.60
Sidedress N	lb.	0.22	50	11.00
Lime	ton	25.69	0.5	12.85
Pesticides:				
Herbicide				58.60
Insecticide				18.48
Fungicide				0.00
Labor:				
Machine operation	hours	9.75	8.1	79.17
Hand (other than harvest)	hours	7.00	6.0	42.00
Harvest	hours	7.00	100.0	700.00
Machinery variable costs				83.76
Other variable costs				0.00
Bee hive rental	each	30.00	1.0	30.00
Interest on oper. capital	$	0.052	1,101.06	57.25
TOTAL VARIABLE COSTS				1,158.31
RETURN OVER VARIABLE COSTS				197.69
Fixed Costs:				
Specialized machinery & equipment				71.97
Land charge				78.00
Machinery ownership				35.00
Property taxes				27.50
Irrigation equipment				64.00
Harvest labor housing				114.21
TOTAL FIXED COSTS				390.68
TOTAL COSTS				1,548.00
RETURNS OVER TOTAL COSTS				-192.99
BREAKEVEN PRICE (VARIABLE COSTS)				8.44
BREAKEVEN PRICE (TOTAL COSTS)				9.41
BREAKEVEN YIELD				518
AVC-GROW				2.90
ATC-GROW				3.87

Table 5.8b Machinery variable costs and labor requirements, per acre, cucumbers, Western New York, 1990.

Operation	Machinery Variable Cost ($ per acre)	Machinery Operation (hours)	Hand (hours)
Plow	4.52	0.46	
Disc (1X)	1.79	0.22	
Spray herbicide	0.48	0.15	
Drag harrow	0.94	0.16	
Plant	2.51	0.18	
Spray herbicide	0.48	0.15	
Sidedress	1.01	0.22	
Spray (3X)	1.44	0.45	
Cultivate (1X)	0.58	0.15	
Hoe & weed			6.0
Irrigate (2X)	21.52	0.60	
Harvest			100.0
Haul (2X)	14.09	2.00	
Harvest aide	34.40	3.38	
TOTALS	83.76	8.12	
TOTAL MACHINERY OPERATION HOURS	8.1		
TOTAL HAND LABOR HOURS	6.0		
TOTAL HARVEST HOURS	100.0		

Table 5.8c Fixed costs of specialized equipment for cucumbers, cost per acre.

Item	Cost per Acre
Fertilizer applicator	$ 6.63
Air blast sprayer	7.29
Harvest aide	47.85
Bins	10.20
TOTAL	$71.97

Table 5.9a Costs and returns, sweet corn (marketed fresh), Western New York, 1990.

Item	Unit	Price	Per Acre Quantity	Per Acre Total
RECEIPTS:				
Sacks each with 5 doz.	45 lb. sack	6.29	190	$1,191.30
Less grading, packing & marketing	sacks	5.65	190	1,073.50
NET RECEIPTS TO GROWER	45 lb. sack	0.64	190	121.60
EXPENSES:				
Seeds	lb.	4.00	10	40.00
Fertilizer:				
Nitrogen	lb.	0.22	90	19.80
Phosphorus	lb.	0.20	90	18.00
Potassium	lb.	0.12	80	9.60
Sidedress N	lb.	0.22	50	11.00
Lime	ton	25.69	0.50	12.85
Pesticides:				
Herbicide				18.13
Insecticide				28.27
Fungicide				0.00
Labor:				
Machine operation	hours	9.75	5.68	55.38
Hand (other than harvest)	hours	7.00	0.00	0.00
Harvest	hours	7.00	40.00	280.00
Machinery variable costs				64.47
Other variable costs				0.00
Interest on oper. capital	$	0.052	557.50	28.99
TOTAL VARIABLE COSTS				586.48
RETURNS OVER VARIABLE COSTS				-464.88
Fixed Costs:				
Specialized machinery & equipment				26.39
Land charge				78.00
Machinery ownership				35.00
Property taxes				27.50
Irrigation equipment				64.00
Harvest labor housing				45.68
TOTAL FIXED COSTS				276.57
TOTAL COSTS				863.05
RETURNS OVER TOTAL COSTS				-741.45
BREAKEVEN PRICE (VARIABLE COSTS)				8.74
BREAKEVEN PRICE (TOTAL COSTS)				10.19
BREAKEVEN YIELD				N.A.
AVC-GROW				3.09
ATC-GROW				4.54

Table 5.9b Machinery variable costs and labor requirements, per acre, sweet corn, Western New York, 1990.

Operation	Machinery Variable Cost ($ per acre)	Machinery Operation (hours)	Hand (hours)
Spread fertilizer	5.00	custom	
Plow	4.52	0.46	
Spray herbicide	0.48	0.15	
Disc (1X)	1.79	0.22	
Plant	2.51	0.18	
Sidedress	1.01	0.22	
Cultivate (1X)	0.58	0.15	
Spray - aerial application (4X)	28.00	custom	
Irrigate (1X)	10.76	0.30	
Harvest & load	2.73	3.00	40.0
Haul (1X)	7.09	1.00	
TOTALS	64.47	5.68	
TOTAL MACHINE OPERATION HOURS	5.7		
TOTAL HAND LABOR HOURS	0.0		
TOTAL HARVEST HOURS	40.0		

Table 5.9c Fixed costs of specialized equipment for sweet corn, cost per acre.

Item	Cost per Acre
Fertilizer applicator	$ 6.63
Air blast sprayer	7.19
Wooden baskets	2.37
Bins	10.20
TOTAL	$26.39

Table 5.10a Costs and returns, green beans (marketed fresh), Western New York, 1990.

Item	Unit	Price	Per Acre Quantity	Per Acre Total
RECEIPTS:				
Wire-bound crates, 1 bushel	30 lb. crate	12.67	200	2,534.00
Less grading, packing & marketing	crate	7.18	200	1,436.00
NET RECEIPTS TO GROWER	30 lb. crate	5.49	200	1,098.00
EXPENSES:				
Seeds	lb.	1.14	80	91.20
Fertilizer:				
Nitrogen	lb.	0.22	35	7.70
Phosphorus	lb.	0.20	60	12.00
Potassium	lb.	0.12	40	4.80
Sidedress N	lb.	0.22	0	0.00
Lime	ton	25.69	0.5	12.85
Pesticides:				
Herbicide				14.22
Insecticide				4.66
Fungicide				32.32
Labor:				
Machine operation	hours	9.75	10.78	105.11
Hand (other than harvest)	hours	7.00	0	0.00
Harvest	hours	7.00	0	0.00
Machinery variable costs				57.14
Other variable costs				0.00
Interest on oper. capital	$	0.05	341.99	17.78
TOTAL VARIABLE COSTS				359.77
RETURNS OVER VARIABLE COSTS				738.23
Fixed Costs:				
Specialized machinery & equipment				415.92
Land charge				78.00
Machinery ownership				35.00
Property taxes				27.50
Irrigation equipment				64.00
Harvest labor housing				0.00
TOTAL FIXED COSTS				620.42
TOTAL COSTS				980.19
RETURNS OVER TOTAL COSTS				117.81
BREAKEVEN PRICE (VARIABLE COSTS)				8.98
BREAKEVEN PRICE (TOTAL COSTS)				12.08
BREAKEVEN YIELD				179
AVC-GROW				1.80
ATC-GROW				4.90

Table 5.10b Machinery variable costs and labor requirements, per acre, green beans, Western New York, 1990.

Operation	Machinery Variable Cost ($ per acre)	Machinery Operation (hours)	Hand (hours)
Plow	4.52	0.46	
Spray herbicide	0.48	0.15	
Disc (2X)	3.58	0.44	
Plant	2.51	0.18	
Spray (2X)	0.48	0.15	
Cultivate (1X)	0.58	0.15	
Irrigate (0.5X)	5.38	0.15	
Harvest & load	27.52	5.40	
Harvest forklift	5.00	2.70	
Haul	7.09	1.00	
TOTALS	57.14	10.78	
TOTAL MACHINERY OPERATION HOURS	10.8		
TOTAL HAND LABOR HOURS	0.0		
HARVEST LABOR HOURS	0.0		

Table 5.10c Fixed costs of specialized equipment for green beans, cost per acre.

Item	Cost per Acre
Fertilizer applicator	$ 6.63
Air blast sprayer	7.19
1R bean harvester	208.00
Forklift	183.90
Bins	10.20
TOTAL	$415.92

Table 5.11a Costs and returns, winter squash (marketed fresh), Western New York, 1990.

Item	Unit	Price	Per Acre Quantity	Per Acre Total
RECEIPTS:				
Crates, 1 bushel	45 lb. crate	5.55	500	$2,775.00
Less grading, packing & marketing	crate	4.85	500	2,425.00
NET RECEIPTS TO GROWER	45 lb. crate	0.70	500	350.00
EXPENSES:				
Seeds	lb.	15.00	3	45.00
Fertilizer:				
Nitrogen	lb.	0.22	90	19.80
Phosphorus	lb.	0.20	90	18.00
Potassium	lb.	0.12	80	9.60
Sidedress N	lb.	0.22	60	13.20
Lime	ton	25.69	0.5	12.85
Pesticides:				
Herbicide				52.00
Insecticide				11.04
Fungicide				59.43
Labor:				
Machine operation	hours	9.75	12.2	118.46
Hand (other than harvest)	hours	7.00	0.0	0.00
Harvest	hours	7.00	83.0	581.00
Machinery variable costs				54.80
Other variable costs				0.00
Interest on oper. capital	$	0.05	995.18	51.75
TOTAL VARIABLE COSTS				1,046.93
RETURNS OVER VARIABLE COSTS				-696.93
Fixed Costs:				
Specialized machinery & equipment				35.48
Land charge				78.00
Machinery ownership				35.00
Property taxes				27.50
Irrigation equipment				64.00
Harvest labor housing				94.80
TOTAL FIXED COSTS				334.78
TOTAL COSTS				1,381.71
RETURNS OVER TOTAL COSTS				-1,031.71
BREAKEVEN PRICE (VARIABLE COSTS)				6.94
BREAKEVEN PRICE (TOTAL COSTS)				7.61
BREAKEVEN YIELD				N.A.
AVC-GROW				2.09
ATC-GROW				2.76

Table 5.11b Machinery variable costs and labor requirements, per acre, winter squash, Western New York, 1990.

Operation	Machinery Variable Cost ($ per acre)	Machinery Operation (hours)	Hand (hours)
Plow	4.52	0.46	
Spray herbicide	0.48	0.15	
Disc (1X)	1.79	0.22	
Drag harrow (1X)	1.33	0.22	
Plant	2.51	0.18	
Spray herbicide	0.48	0.15	
Sidedress N	1.01	0.22	
Spray (5X)	2.40	0.75	
Cultivate (2X)	1.16	0.30	
Irrigate (1X)	10.76	0.30	
Harvest	7.09	6.20	83.0
Haul (3X)	21.27	3.00	
TOTALS	54.80	12.15	
TOTAL MACHINE OPERATION HOURS	12.2		
TOTAL HAND LABOR HOURS	0.0		
TOTAL HARVEST HOURS	83.0		

Table 5.11c Fixed costs of specialized equipment for winter squash, cost per acre.

Item	Cost per Acre
Fertilizer applicator	$ 6.63
Air blast sprayer	7.29
Plastic buckets	11.36
Bins	10.20
TOTAL	$35.48

Table 5.12a Costs and returns, zucchini (marketed fresh), Western New York, 1990.

Item	Unit	Price	Per Acre Quantity	Per Acre Total
RECEIPTS:				
Crates, 1/2 bushel	23 lb. crates	5.56	950	$5,282.00
Less grading, packing & storing	crate	3.60	950	3,420.00
NET RECEIPTS TO GROWER	23 lb. crates			1,862.00
EXPENSES:				
Seeds	oz.	25.00	4	100.00
Fertilizer:				
Nitrogen	lb.	0.22	80	17.60
Phosphorus	lb.	0.20	90	18.00
Potassium	lb.	0.12	80	9.60
Sidedress N	lb.	0.22	50	11.00
Lime	ton	25.69	0.5	12.85
Pesticides:				
Herbicide				52.04
Insecticide				11.04
Fungicide				17.86
Labor:				
Machine operation	hours	9.75	8.89	86.68
Hand (other than harvest)	hours	7.00	6.00	42.00
Harvest	hours	7.00	238.00	1,666.00
Machinery variable costs				56.92
Other variable costs				0.00
Interest on oper. capital	$	0.05	2,101.59	109.28
TOTAL VARIABLE COSTS				2,210.88
RETURNS OVER VARIABLE COSTS				-348.88
Fixed Costs:				
Specialized machinery & equipment				44.65
Land charge				78.00
Machinery ownership				35.00
Property taxes				27.50
Irrigation equipment				64.00
Harvest labor housing				271.82
TOTAL FIXED COSTS				520.97
TOTAL COSTS				2,731.85
RETURNS OVER TOTAL COSTS				-869.85
BREAKEVEN PRICE (VARIABLE COSTS)				5.93
BREAKEVEN PRICE (TOTAL COSTS)				6.48
BREAKEVEN YIELD				NA
AVC-GROW				2.33
ATC-GROW				2.88

Table 5.12b Machinery variable costs and labor requirements, per acre, zuchini, Western New York, 1990.

Operation	Machinery Variable Cost ($ per acre)	Machinery Operation (hours)	Hand (hours)
Plow	4.52	0.46	
Disc (1X)	1.79	0.22	
Spray herbicide	0.48	0.15	
Drag harrow	0.94	0.16	
Plant	2.51	0.18	
Spray herbicide (2X)	0.96	0.30	
Sidedress N	1.01	0.22	
Hoe & weed (1X)			6.0
Spray (4X)	1.92	0.60	
Irrigate (2X)	21.52	0.60	
Harvest & load	7.09	4.00	238.0
Haul (2X)	14.18	2.00	
TOTALS	56.92	8.89	
TOTAL MACHINERY OPERATION HOURS	8.9		
TOTAL HAND LABOR HOURS	6.0		
TOTAL HARVEST LABOR HOURS	238.0		

Table 5.12c Fixed costs of specialized equipment for zucchini, cost per acre.

Item	Cost per Acre
Fertilizer applicator	$ 6.63
Air blast sprayer	7.29
Plastic buckets	11.36
Wooden baskets	2.37
Pallets	17.00
TOTAL	$44.65

Table 5.13a Costs and returns, cherry tomatoes (marketed fresh), Western New York, 1990 (incomplete data).

Item	Unit	Price	Per Acre Quantity	Per Acre Total
RECEIPTS:				
Flats, 12 pints	flat	9.40	425	3,995.00
Less grading, packing & storing	flat	5.35	425	2,112.25
NET RECEIPTS TO GROWER	flat	4.43	425	1,882.75
EXPENSES:				
Plants	thousand	34.50	5	172.50
Fertilizer:				
Nitrogen	lb.	0.22	80	17.60
Phosphorus	lb.	0.20	100	20.00
Potassium	lb.	0.12	120	14.40
Sidedress N	lb.	0.22	50	11.00
Starter solution	lb.	2.40	12	28.80
Lime	ton	25.69	0.5	12.85
Pesticides:				
Herbicide				13.27
Insecticide				12.91
Fungicide				76.77
Labor:				
Machine operation	hours	12.00	11.57	112.81
Hand (other than harvest)	hours	10.00	16	112.00
Harvest	hours	10.00	160	1,120.00
Machinery variable costs				78.81
Other variable costs				0.00
Interest on oper. capital	$	0.05	1,803.71	93.79
TOTAL VARIABLE COSTS				1,897.51
RETURNS OVER VARIABLE COSTS				-14.76
Fixed Costs:				
Specialized machinery & equipment				27.82
Land charge				78.00
Machinery ownership				35.00
Property taxes				27.50
Irrigation equipment				64.00
Harvest labor housing				0.00
TOTAL FIXED COSTS				232.32
TOTAL COSTS				2,129.83
RETURNS OVER TOTAL COSTS				NA
BREAKEVEN PRICE (VARIABLE COSTS)				NA
BREAKEVEN PRICE (TOTAL COSTS)				NA
BREAKEVEN YIELD				NA
AVC-GROW				NA
ATC-GROW				NA

Table 5.13b Machinery variable costs and labor requirements, per acre, cherry tomatoes, Western New York, 1990.

Operation	Machinery Variable Cost ($ per acre)	Machinery Operation (hours)	Hand (hours)
Spread fertilizer	5.00	custom	
Plow	4.52	0.46	
Spray herbicide	0.48	0.15	
Disc (2X)	3.58	0.44	
Transplant	5.67	0.90	4.0
Spray herbicide	0.48	0.15	
Sidedress N	1.01	0.22	
Cultivate (2X)	1.16	0.30	
Spray (7X)	3.36	1.05	
Hoe & weed (2X)			12.00
Irrigate (3X)	32.28	0.90	
Harvest & load	7.09	5.00	160.0
Haul (2X)	14.18	2.00	
TOTALS	78.81	11.6	
TOTAL MACHINERY OPERATION HOURS	11.6		
TOTAL HAND LABOR HOURS	16.0		
TOTAL HARVEST LABOR HOURS	160.0		

Table 5.13c Fixed costs of specialized equipment for cherry tomatoes, cost per acre.

Item	Cost per Acre
Transplanter	$ 7.70
Fertilizer applicator	6.63
Air blast sprayer	7.29
8-quart baskets	4.50
Pallets	1.70
TOTAL	$27.82

Table 5.14 Summary of per acre growing costs and returns, fresh vegetables, Western New York, 1990.

Crop	NR[1]	TVC[2]	Return Over VC[3]	FC[4]	TC[5]	Return Over TC[6]	Break-even YIELD[7]	Break-even VC[8]	Break-even TC[9]
	per acre						per box		
Beans	1,098	360	738	620	980	118	179	8.98	12.08
Broccoli	1,232	929	303	367	1,296	(64)	378	8.16	9.21
Caulifl.	889	1,687	(799)	357	2,045	(1,156)	NA*	9.74	10.69
Cucumbers	1,356	1,158	198	391	1,548	(193)	518	8.44	9.41
Peppers	2,580	2,154	426	441	2,595	(15)	752	7.89	8.48
W. Squash	350	1,047	(697)	335	1,382	(1,032)	NA*	6.94	7.61
Zucchini	1,862	2,211	(349)	521	2,732	(870)	NA*	5.93	6.48
Tomatoes	4,011	2,721	1,290	562	3,283	728	501	9.09	9.87
Sw. Corn	122	586	(465)	277	863	(741)	NA*	8.74	10.19

[1]Net returns per acre, or returns to grower net of packing charges, marketing charges, and transporting to terminal markets.

[2]Total variable costs per acre, or costs for plants and seeds, fertilizer and lime, pesticides, labor, machinery operating costs, interest on operating capital, and other operating expenses.

[3]Net returns over variable costs per acre.

[4]Fixed costs per acre, including depreciation and interest on machinery, specialized equipment, irrigation equipment, harvest labor housing, land charge and property taxes.

[5]Total costs per acre, or variable costs plus fixed costs.

[6]Net returns over total costs per acre.

[7]Breakeven yield per acre, or the yield required to cover all costs assuming the budgeted price per box.

[8]Breakeven variable costs per box, or the product price required to cover variable costs.

[9]Breakeven total costs per box, or the product price required to cover both variable and fixed costs.

*Net return to grower after deducting packing, marketing, and transportation charges was too low to calculate a meaningful breakeven yield.

VI. MARKET WINDOW ANALYSIS

To evaluate the feasibility of growing and marketing the crops under consideration, the market window method was used along with data concerning production, packing, and marketing opportunities and limitations. A summary of the crops considered is shown in Table 6.1 based on season average price.

Table 6.1 Summary of feasibility analysis, fresh vegetable crops, Central and Western New York, 1990.

Item	Returns Over Variable Costs ($/acre)	Returns Over Total Costs ($/acre)
Crops With Positive Profit		
Tomatoes	1,290	728
Green Beans	738	118
Crops With Positive Returns Over Variable Costs, Negative Profit		
Green Pepper	426	(15)
Broccoli	303	(64)
Cucumbers	198	(193)
Crops With Negative Returns Over Variable Costs, Negative Profit		
Sweet Corn	(465)	(741)
Zucchini	(349)	(870)
Winter Squash	(697)	(1,032)
Cauliflower	(799)	(2,156)

Tomatoes were the most profitable crop among those selected for the study, with returns above total costs of $728 per acre. Green beans gave returns above total costs of $118 per acre.

The second group of crops (peppers, broccoli, and cucumbers) had negative returns above total costs, but positive returns above variable costs, indicating that there were some returns to fixed resources.

The third group of crops (sweet corn, zuchinni, winter squash, and cauliflower) had negative returns above variable costs, indicating that growers would not plant these crops, even in the short-run. It should be noted that much of the sweet corn and cauliflower that is currently produced in New York is field packed. The results indicate that it would not pay to grow them for central packing, but it could be profitable for field packing. Terminal markets may not be a viable outlet for sweet corn given the extreme perishability of the crop. Most New York sweet corn is sold directly to chain stores or retail outlets. Sweet corn acreage and volume marketed has expanded in New York in recent years. Furthermore, even though a crop shows negative profit based on an average price for the season, there could be market windows in which the crop could be profitably marketed. In the following paragraphs, market window analysis is conducted for the respective crops.

Market Window Criterion

The market window method involves comparing historical prices of a given commodity with calculated costs of production and marketing over a particular time period (Bauer et al., 1987). Historical prices are used to project expected future returns. The prices used in our analysis are the five-year weekly average prices obtained from the wholesale terminal markets as discussed in Section II. The costs of production, packing, and marketing were estimated in Sections IV and V. By comparing historical prices with costs of growing and selling, market window analysis is intended to indicate what crops have potential for returns beyond costs, and during what time of the season profits may be minimized or maximized. A "market window" exists during a time period when expected returns exceed the costs of growing, transporting, and selling. In our analysis, it was assumed that production of a crop could be considered feasible if expected returns covered variable costs, and a "market window" exists.

Using historical prices as a proxy for expected returns can be misleading, particularly for vegetable crops which traditionally display volatile supply and price behavior from season to season. Some measure of the relative price variability can help identify those crops with greater risks of fluctuating returns. Variability in weekly average price over the five years studied was calculated as standard deviation, and following Bauer, et al. (1987), this is the measure of the relative riskiness of price fluctuation that we used as a criterion. If the average weekly price minus one standard deviation exceeds the variable costs of growing and selling, the potential for negative returns from producing a crop is considered low, and thus not risky. On the other hand, if variable costs exceed both average price and average price minus one standard deviation, the potential for negative returns is high, and production of the crop is considered risky. In using standard deviations from average prices as a measure of risk, we are assuming that the prices (and the markets they were obtained from) are representative of the typical scenario to be faced by the growers in the study region, and the prices and corresponding standard deviations were calculated from data from a representative (and normally distributed) sample of price observations. If these assumptions are accurate, then it would be reasonable to conclude, based on statistical theory, that the expected prices faced by Central and Western New York growers for the vegetables produced in an identified market window will be at least as great as the average price minus one standard deviation 83 percent of the time (Bauer, et al. 1987).

To carry out the market window analysis, the five-year weekly average prices gathered from the terminal markets and their corresponding standard deviations are plotted along with the costs of growing, packing, transporting, and selling in Figures 6.1 - 6.11. Costs are divided as break-even variable costs of production (BEVC) and break-even total costs of production (BETC), as calculated in Section V. Packing and shipping costs are included in both cost figures.

Results

Based on the criterion that average price minus one standard deviation must be greater than or equal to the variable costs of producing and marketing the crop, there appears to be very little opportunity for expanded fresh vegetable production for growers who are unwilling to incur substantial price risk. Six of the crops had market windows (Table 6.2); however, most were early or late in the season when production risk is very high; or, in the case of green beans, there were only limited data (one or two observations out of five years) available to assess the market windows. In these situations, one cannot attach a high level of confidence to the identified market windows. None of the market windows occurred in the middle of the season when five year's of price data were available. Results are further limited by the fact that the price data did not always distinguish between Long Island grown and Upstate grown produce; the early and late season price may be in some instances for Long Island which has a more moderate climate and, hence, a longer season.

Table 6.2 Market windows for fresh vegetable crops, Western New York, 1990.

Crop	Market Windows by Weeks	Comments
Snap beans	July 22 - August 31 September 9 - September 23 October 24 - October 31	Interpret with extreme caution because only one or two price observations per week were available.
Broccoli	July 22 - August 13 September 9 - September 16 September 23 - September 30 November 9 - November 16	Interpret with extreme caution because only one observation of price was available and Maine broccoli prices were used as a proxy.
Cucumbers	August 3 October 8 - October 31	Early and late season prices represented by only one observation.
Peppers	July 23 - July 30 October 22 - October 31	Early and late season prices represented by two to four observations.
Tomatoes	September 30 - October 8	Last two weeks represented by only one observation of price.
Zucchini	June 16 - June 23 September 30	Early and late season prices only represented by one or two observations.

These cautionary statements should be balanced, however, with the knowledge that terminal market price is probably a worst case scenario. Growers and packers may attain higher prices dealing directly with chain store buyers or brokers. Terminal market prices are probably also more variable than chain store prices. One difficulty is, however, that sufficient volume of produce to attract major buyers is often unavailable for a production region that first starts production. The opportunities to market to other than terminal markets may be assessed by reference to Table 6.3 which gives the breakeven total cost for each of the crops under study except for cherry tomatoes. This indicates the season average price that would be necessary to cover all production and marketing costs. Marketing costs may be different, however, when selling to different market channels. Therefore, the analysis of marketing and transportation costs in Table 4.7 should be modified to reflect these differences.

Table 6.3 Per acre yields, container description, and breakeven prices for fresh vegetables, Western New York, 1990.

Crop	Container Description	Weight (pounds)	Yield Per Acre	Break-even Price
Tomatoes	Carton (loose pack)	25	715	$ 9.87
Green Peppers	Crate, 1-1 1/9 bushel	30	750	8.48
Cauliflower	"Long Island" type	50	375	10.69
Broccoli	Crate, 14-18 bunches	22	350	9.21
Cucumbers	Box/crate, 1 1/9 bushel	55	400	9.41
Sweet Corn	Wire-bound crate	45	190	10.19
Green Beans	Wire-bound crate	30	200	12.08
Winter Squash	Box/crate, 1 bushel	45	500	7.61
Zucchini	Carton/crate, 5/9 bushel	23	950	6.48

Limitations of Market Window Analysis

One limitation of these results is that three of the crops with a favorable probability of positive returns; snap beans, peppers, and tomatoes, have not been a significant proportion of New York's total fresh vegetable shipments in recent years (see Table 2.1). Therefore, the assumption that the prices observed for these crops can be considered representative of a typical year may be unrealistic, particularly for snap beans and tomatoes, whose arrivals and prices have been highly variable from year to year in the markets studied.

Another limitation is the assumption that the markets we examined are the most likely markets to be used by New York growers. Prices in the terminal markets may be lower or higher than those offered by independent buyers, and the choice of market channel could change the results. Also, growers may ship to terminal markets other than those studied here. In fact, if substantial quantities of individual crops were produced and shipped out of the study area to the three terminal markets studied, the additional supply could have the effect of decreasing prices for New York producers. Prices and price behavior may vary between terminal markets in some cases, but they have tended to be consistent among the three locations we examined. Growers should bear in mind that prices for certain commodities may be higher in more distant markets, but the costs of shipping may outweigh the additional profit potential.

Opportunities for "market windows" identified usually occurred in the very early or late parts of the season for the crops studied. Yields at these times of the season cannot always be assumed to be "average", as was done when the cost of production figures were calculated. Much more variability in yields and quality of produce can be expected at these times of the season, making estimates of costs and returns less reliable. The average variable costs of growing and packing is probably higher during these parts of the season due to lower average yields and more variable quality.

FIGURE 6.1 SNAP BEANS

NYC 1984-1988

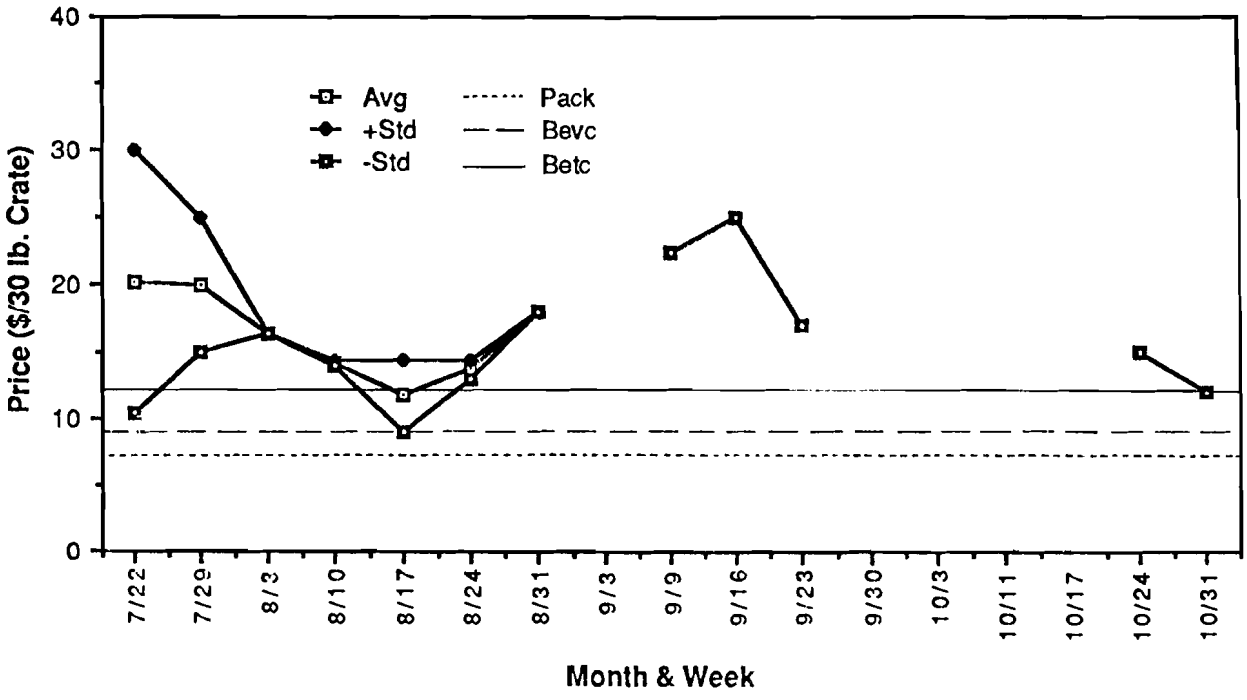


FIGURE 6.2 BROCCOLI

NYC 1984-1988

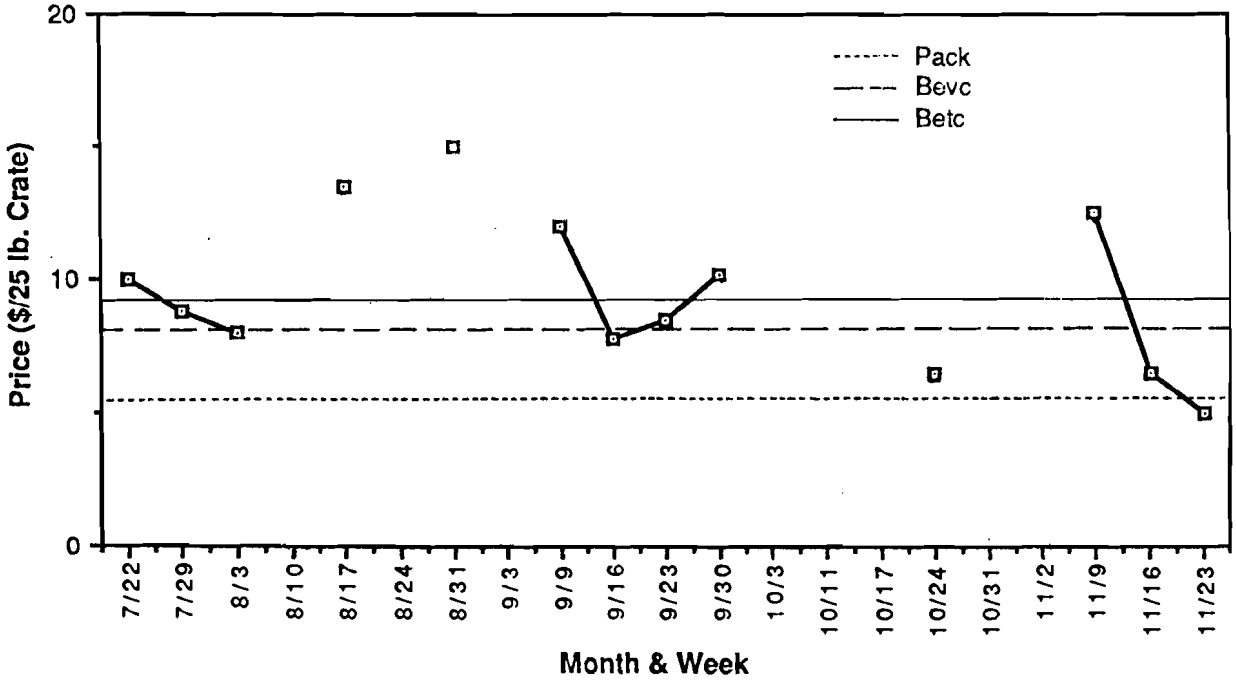


FIGURE 6.3 CAULIFLOWER

NYC, From L.I. 1984-1988

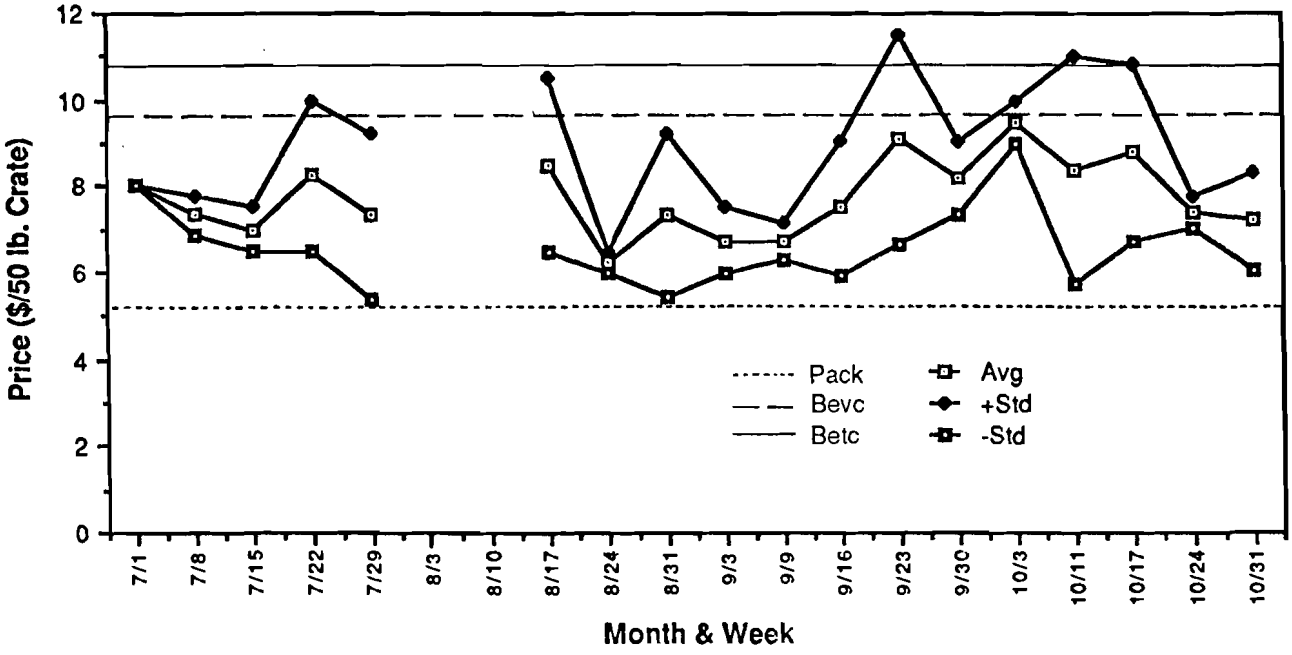


FIGURE 6.4 CUCUMBERS

BOSTON, 1984-1988

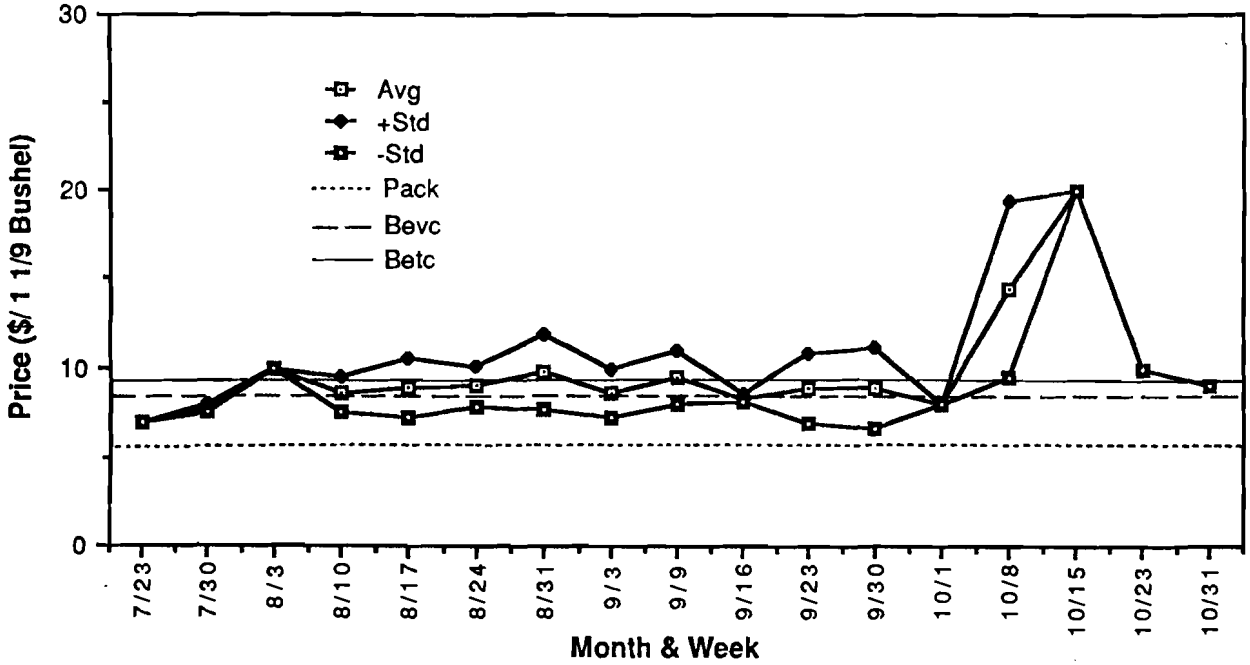


FIGURE 6.5 SWEET CORN

NYC 1984-1988

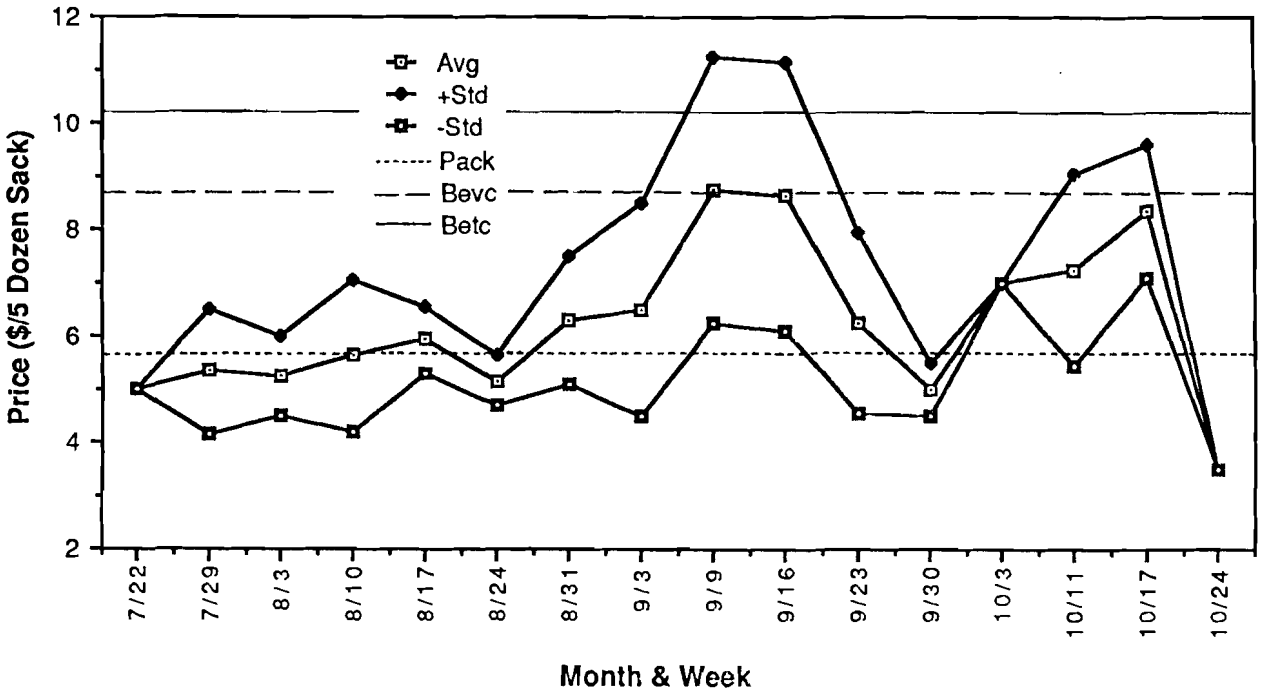


FIGURE 6.6 PEPPERS

BUFFALO, 1984-1988

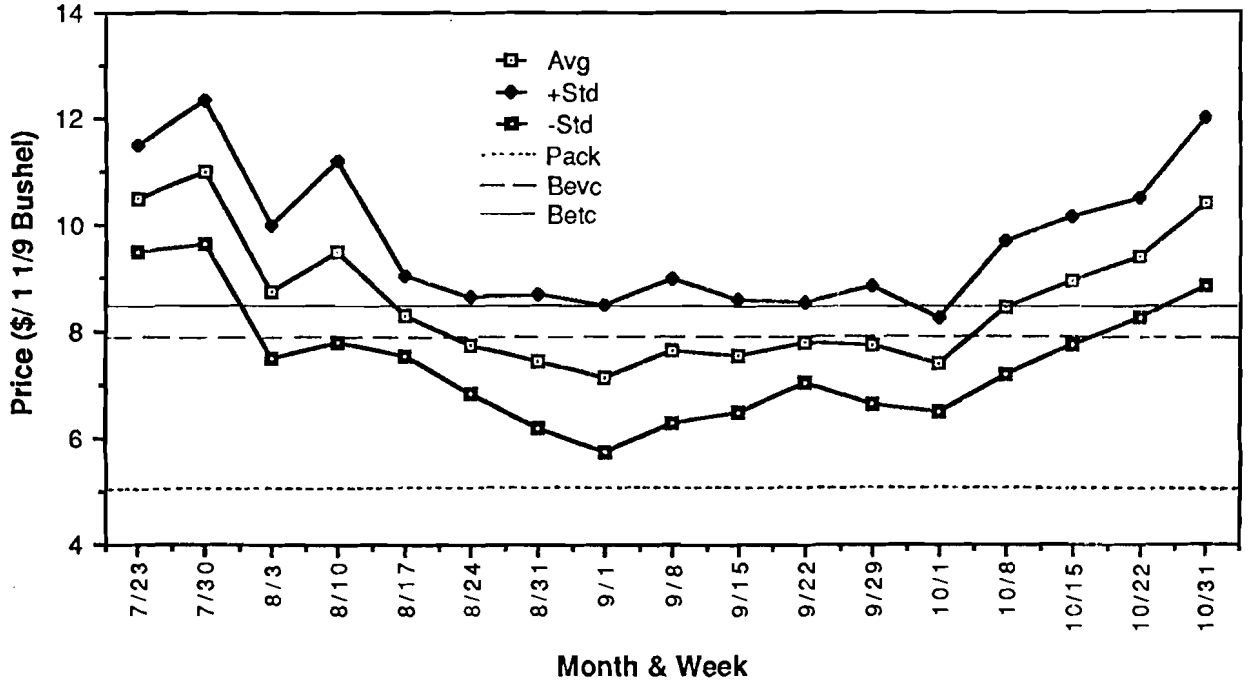


FIGURE 6.7 ACORN SQUASH

BOSTON, 1984-1988

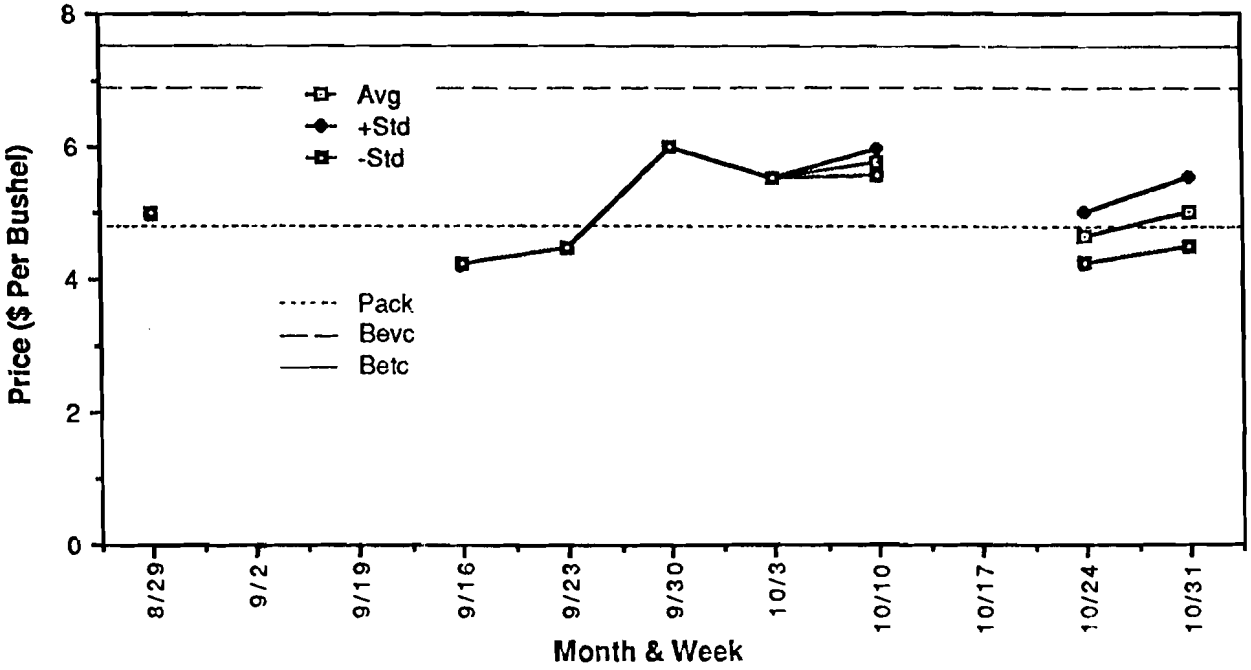


FIGURE 6.8 BUTTERNUT SQUASH

BOSTON, 1984-88

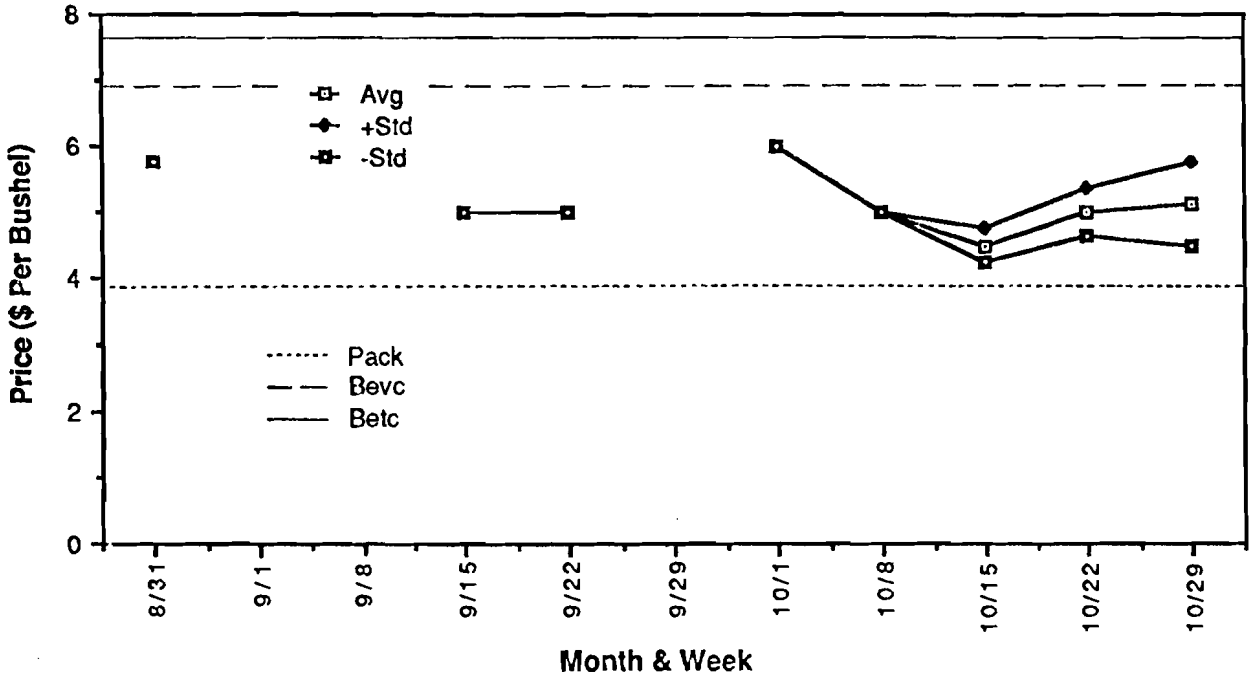


FIGURE 6.9 TOMATOES

BOSTON, EXTRA-LARGE, 1984-1988

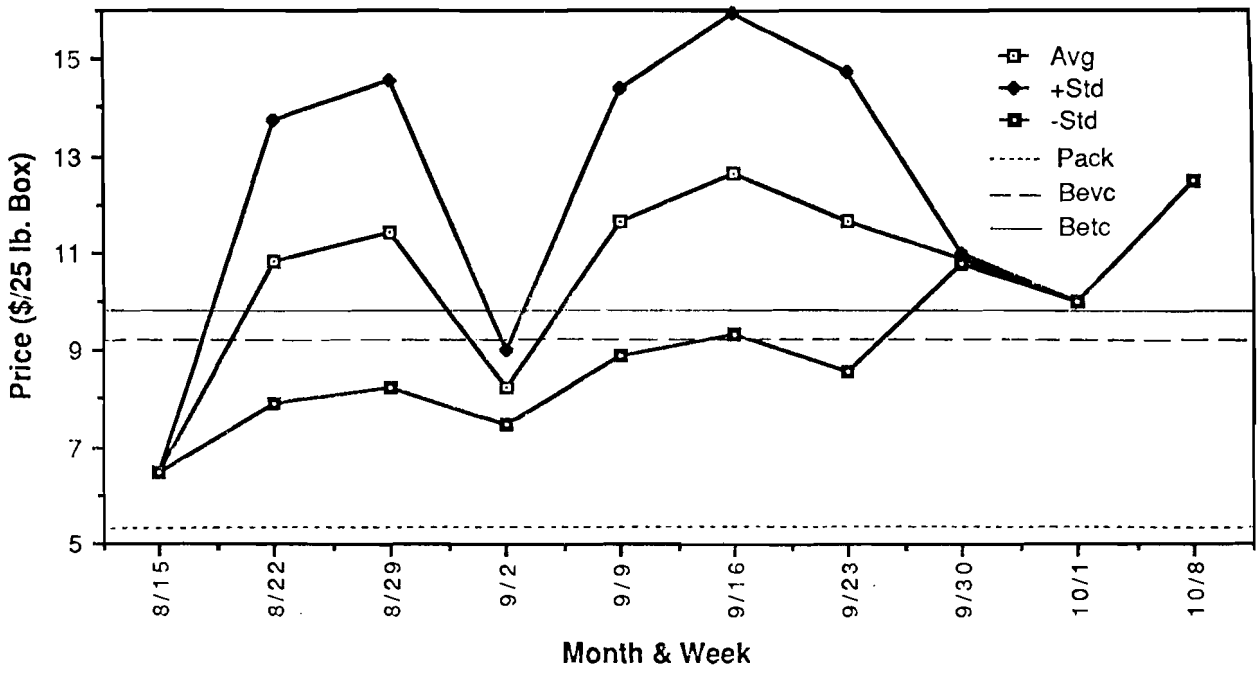


FIGURE 6.10 CHERRY TOMATOES

BOSTON, FROM CALIFORNIA, 1984-1988

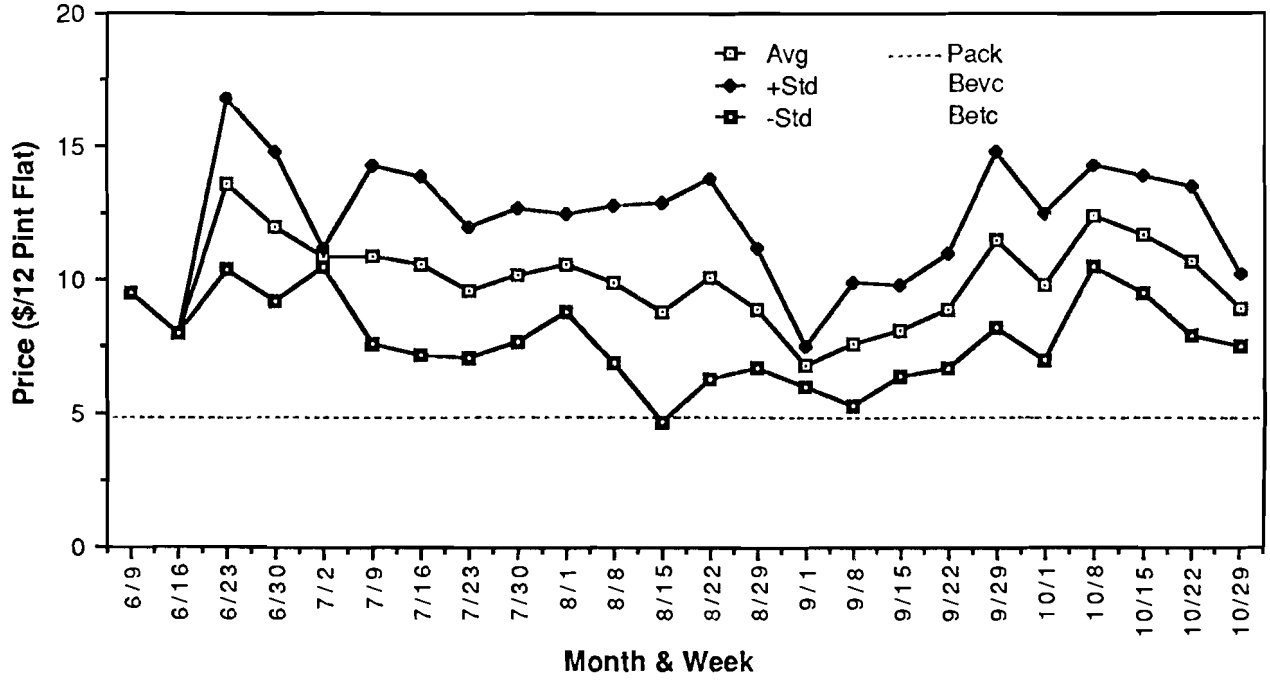
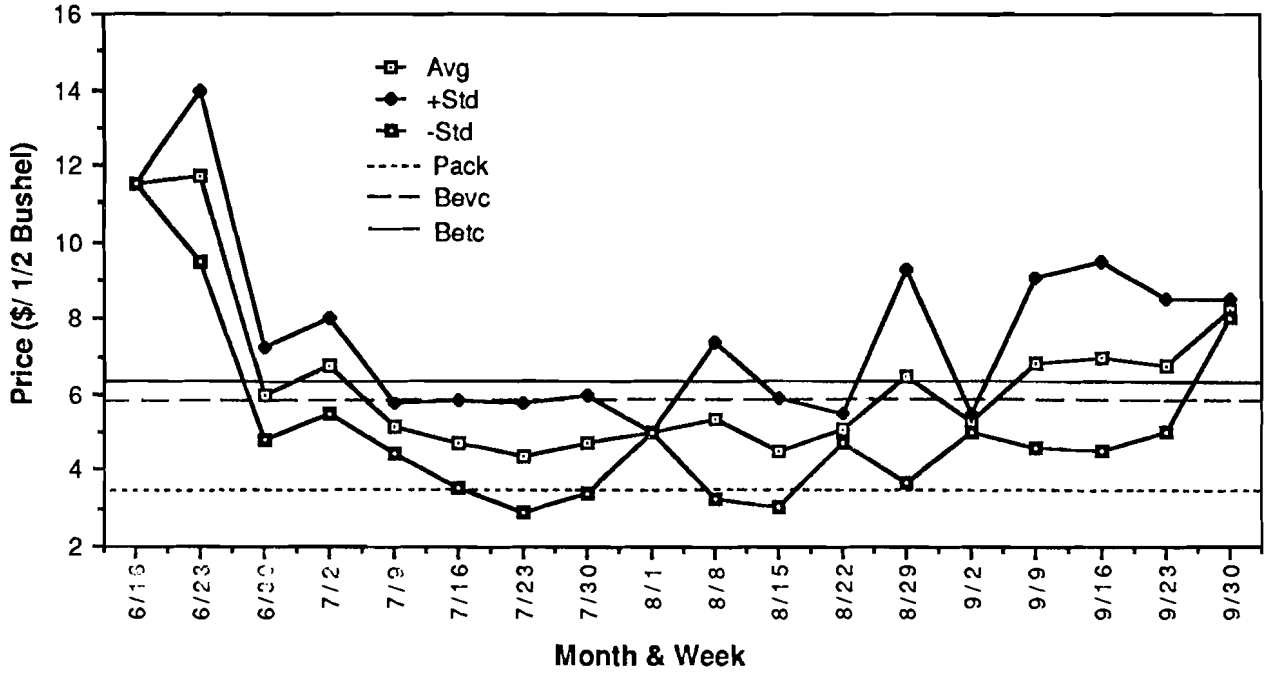


FIGURE 6.11 ZUCCHINI

BUFFALO, 1984-1988



VII. SUMMARY AND CONCLUSIONS

Summary of Results

The potential for expanded production of 10 vegetable crops was evaluated. The crops considered were snap beans, broccoli, cauliflower, cucumbers, sweet corn, green peppers, zucchini, winter squash, tomatoes, and cherry tomatoes. Results indicated that in an average season, tomatoes and green beans could be grown profitability; and that peppers, broccoli, and cucumbers would offer some compensation to fixed resources. To put these results in perspective, it should be realized that, even though total costs would not be covered, peppers, broccoli, and cucumbers may be more profitable on average than processing crops currently being grown.

Price risks in producing the selected vegetables were substantial, as indicated by market window analysis. Market windows were identified for the following six crops: tomatoes, green beans, peppers, broccoli, cucumbers, and zucchini. In general, the market windows identified occurred very early or very late in the season where few observations of prices were available and when production risks are substantial. Much more variability in yields and quality of produce can be expected at these times of the season, making estimates of costs and returns less reliable. Furthermore, the average variable costs of growing and packing is probably higher during these parts of the season due to lower average yields and more variable quality.

Critical Assumptions

Growers and packers who are considering production and marketing of these crops should modify the analysis to fit their particular situation. The results depend crucially on the assumptions used in this analysis. Four assumptions in particular had important impacts on the results. These key assumptions were as follows:

1) Prices can be adequately represented by five-year averages (1984-1988) of terminal market prices as reported by Federal-State Market News Service Reports. Many believe that these prices represent a worst case scenario, being somewhat lower and more variable than prices offered by chain store buyers.

2) Vegetables were assumed to be packed and marketed by a central packing facility. It was believed that this was necessary to insure adequate volume and consistent quality that is required in produce markets.

3) Harvesting was assumed to be done by migrant labor. Housing would be provided which results in significant fixed costs for labor intensive crops.

4) All crops were assumed to be irrigated. This assumption had implications for crop yields and variable and fixed costs. Management expertise, as well as significant capital investment, will be necessary to successfully grow fresh vegetables using irrigation. Not all growers have the necessary management expertise and capital to make the transition to fresh market vegetables.

Other Factors Affecting the Feasibility of Production

Labor Availability and Cost

Production of the fresh vegetables considered in this study, with the exception of green beans for which mechanical harvesting was assumed, is labor intensive because of the necessity for hand harvest. Producers in New York in recent years have experienced difficulty in obtaining the quantity and quality of labor required for many farming operations. Although migrant labor was budgeted in this analysis, to include housing, difficulties are often encountered in using this type of labor. State, and sometimes local, authorities have developed many rules and regulations for the protection of migrant workers. Many New York growers, citing the difficulties of personnel administration, have chosen not to consider hiring migrants. It is doubtful, however, that sufficient labor exists in the study area for a 200,000 box packing house and growing of the crops unless migrant labor is used, especially for harvesting. It is apparently somewhat less difficult to hire local labor for the packing house.

Climate, Soils, and Water Availability

The study area covers a wide geographic region, encompassing many different soils and microclimates. Not all farms in the region have soil types for efficiently growing the crops considered in this study. Only the best soils in the region should be considered for vegetable production.

Furthermore, as indicated, irrigation is believed to be essential for growing these crops competitively. Not all growers have a water source near enough to have irrigation capability. Once water has to be piped more than about one-half mile, the investment cost becomes prohibitive. Eighty percent of growers responding to the survey indicted that they had a water supply suitable for irrigation.

Buyer Requirements, Competition, Quality

This is probably the most difficult limiting factor to the expansion of New York produce. As quoted from one grower "The growing is the easy part, selling what you grow at a reasonable return is the hard part." It is very important to work with buyers to facilitate arrivals and have good communications.

It will be necessary to form some type of organization to facilitate dealing with buyers and to strengthen position of growers. As stated by buyers, they prefer to deal with a single, large supplier than many small ones.

We have assumed in this project that growers can meet quality standards of leading competitors. This must be accomplished in order to compete successfully. In fact, there are some producers of fresh tomatoes and broccoli in the State who are doing this.

Production Experience and Ease of Growing Recommended Crops

Of the most profitable crops, cucumbers is the only crop that is currently grown for fresh markets in the study region in any significant quantity. Many growers in the study area now grow vegetables for processing. Growing snap beans for processing has many similarities to growing beans for fresh market. There are approximately 28 thousand acres of snap beans grown annually in the state for processing. Making the change to alternative markets will, however, require more management ability. The requirement for packing fresh produce and growing to fresh market specifications will be a difficult step for many growers who have been growing vegetables for processing.

Cucumbers should be relatively easy to grow, but will face strong competition from local growers already in the market. The additional supply could depress market prices unless sales are made to more distant markets. Snap beans, peppers, and tomatoes are described as being more demanding of management skills than the other crops considered in this analysis.

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APPENDIX I. Seasonal Average Prices for Selected Fresh Vegetable Items Wholesale Terminal Markets for New York State (except where noted), Weighted by Arrivals Per Month for Markets with Highest Arrivals from New York State, 1984-1988

1. Beans (New York City)

	July	August	September	
Average Price	20.13	14.67	21.50	
Weight	0.20	0.49	0.31	
Weight Price	4.03	7.19	6.67	
Season Average Price				17.89

2. Broccoli (Boston, from Maine)

	August	September	October	
Average Price	9.33	8.55	9.11	
Weight	0.39	0.30	0.31	
Weight Price	3.64	2.57	2.82	
Season Average Price				9.03

3. Cauliflower (New York City, from Long Island)

	July	August	September	
Average Price	7.50	7.36	7.85	
Weight	0.25	0.33	0.42	
Weight Price	1.88	2.43	3.30	
Season Average Price				7.61

4. Cucumbers (Boston

	July	August	September	
Average Price	7.50	9.11	8.90	
Weight	0.06	0.54	0.40	
Weight Price	0.45	4.92	3.56	
Season Average Price				8.93

5. Sweet Corn (New York City)

	July	August	September	October	
Average Price	5.25	5.74	7.08	7.17	
Weight	0.08	0.49	0.34	0.09	
Weight Price	0.42	2.81	2.41	0.65	
Season Average Price					6.29

6. Peppers (Buffalo)

	July	August	September	
Average Price	10.86	8.30	7.63	
Weight	0.13	0.50	0.38	
Weight Price	1.41	4.15	2.90	
Season Average Price				8.46

7. Zucchini (Buffalo)

	June	July	August	
Average Price	4.42	2.46	2.72	
Weight	0.11	0.50	0.39	
Weight Price	0.49	1.23	1.06	
Season Average Price				2.78

8. Acorn Squash (Boston)

	September	October	November	
Average Price	4.38	5.25	5.94	
Weight	0.28	0.26	0.47	
Weight Price	1.23	1.37	2.79	
Season Average Price				5.38

9. Butternut Squash (Boston)

	September	October	November	
Average Price	5.33	5.03	6.22	
Weight	0.28	0.26	0.47	
Weight Price	1.49	1.31	2.92	
Season Average Price				5.72

10. Tomatoes (Extra Large, Boston)

	July	August	September	
Average Price	0.00	10.46	11.30	
Weight	0.00	0.49	0.51	
Weight Price	0.00	5.13	5.76	
Season Average Price				10.89

11. Cherry Tomatoes (Boston/Buffalo, California Prices*)

	July	August	September	
Average Price	0.00	9.98	8.81	
Weight	0.00	0.50	0.50	
Weight Price	0.00	4.99	4.41	
Season Average Price				9.40

*The weights used here are for Buffalo unloads, but the monthly average prices were taken from Boston market data (California cherry tomatoes) since Buffalo did not provide any price data.

APPENDIX II. Fresh Vegetable Buyer Questionnaire

QUESTIONS:

1. Have you received any New York State vegetables before? Have you had any experience with New York fresh vegetables? What are your experiences/perceptions of New York fresh produce?

   -- If you do not deal with New York fresh produce, why not? (availability, timing of harvest, quality).

2. How important do you think the New York State name is on fresh vegetable items? How do you think consumers feel?

3. How do you feel about the New York State Seal of Quality program?

4. What type of supplier do (or would) you see New York State fresh vegetable producers as being?

   -- Residual (only when needed, when sortages from regular suppliers occur).

   -- Regular (during the season, when harvest occurs).

5. What would New York producers have to do to induce you to carry their fresh vegetable products/become regular suppliers (if you are using as residual supplier now)?

   -- Would contributions towards advertising help, store displays, point of purchase information, special deals during season [lower price for advertising specials])?

6. List of potential vegetable items offered:

   tomatoes, cherry tomatoes
   peppers
   acorn and butternut squash
   sweet corn
   broccoli
   cauliflower
   snap beans

   From the list:

   -- Which crops do you feel you might purchase if available from New York producers?

   -- Which crops have the best market potential, why?

7. For the potential preferred crops:

   a) What are you currently accepting in regard to:

      -- Pack

      -- Size

      -- Volume

   b) what would you prefer in regard to pack, size, volume?

   c) Are mixed loads preferable? What type?

8. General (summary) questions:

   a) What are the most difficult or significant market barriers to New York State fresh vegetable producers?

   b) Would you consider contractural agreements or forward buying? -- i.e. for season will buy New York State fresh produce - advertised specials - producers give special lower price deal - incentive prices.

APPENDIX III. Grower Survey Form

County _____

Extension Agent's name _____

Name _____

Address _____

_____

Telephone No.: _____

SURVEY OF VEGETABLE GROWERS IN CENTRAL & WESTERN NEW YORK

(Overhead and Cost Data)

1. Acres of crops in 1989 and five-year average yields.

Crop	Acres Harvested (1989)	Yield Per Acre (average of last 5 years)
Field corn	_____	_____ bu/ac
Wheat	_____	_____ bu/ac
Oats	_____	_____ bu/ac
Rye	_____	_____ bu/ac
Soybeans	_____	_____ bu/ac
Dry beans	_____	_____ _____
Hay	_____	_____ _____
Other crops (name): _____	_____	_____ _____
_____	_____	_____ _____
Tree fruit	_____	_____ bu/ac
Small fruit	_____	_____ _____
Processed vegetables:		
Beets	_____	_____ tons/ac
Cabbage	_____	_____ tons/ac
Green peas	_____	_____ tons/ac
Green beans	_____	_____ tons/ac
Sweet corn	_____	_____ tons/ac
Other (name): _____	_____	_____ _____
_____	_____	_____ _____
Fresh vegetables:		(specify units)
Cucumbers	_____	_____ _____
Winter squash	_____	_____ _____
Zucchini	_____	_____ _____
Yellow squash	_____	_____ _____
Green beans	_____	_____ _____
Cabbage	_____	_____ _____
Peppers	_____	_____ _____
Eggplant	_____	_____ _____
Tomatoes	_____	_____ _____
Sweet corn	_____	_____ _____
Broccoli	_____	_____ _____
Brussel sprouts	_____	_____ _____
Cauliflower	_____	_____ _____
Other (name): _____	_____	_____ _____
_____	_____	_____ _____
_____	_____	_____ _____
Total Crop Acres in 1989:	_____	

2. Do you own <u>at least one</u> of the following types of machinery? Indicate size.

Vegetable seeders	yes___	no___	no. of rows	___ ___ ___ ___
Corn planters	yes___	no___	no. of rows	___ ___ ___ ___
Seedling transplanters	yes___	no___	no. of rows	___ ___ ___ ___
Airblast pesticide sprayers	yes___	no___	Boom width,	
High pressure sprayers	yes___	no___	ft.	___ ___ ___ ___
Harvest aid	yes___	no___		
Plastic mulch applicator	yes___	no___		
Raised bed equipment	yes___	no___		
Vegetable packing equipment	yes___	no___		

Cooling facility for harvested vegetables yes___ no___

Number of tractors owned? ____tractors with a range of horsepower from ____ to ____

PLEASE TURN PAGE →→

3. Does your farm business own irrigation equipment?
   ____ No (GO TO QUESTION 4)
   ____ Yes (GO TO QUESTION 5)

4. Is there a water source that would permit you to irrigate if equipment were available?

   ____ Yes
   ____ No

   If yes, source:
   ____ pond
   ____ stream or lake
   ____ other (list) _____

   GO TO QUESTION 7

5. Check type of equipment:

Acres	Presently Irrigated	Acres That Could be Irrigated with Present Water Source
____ Portable pipe moved by hand	_____ acres	_____ acres
____ Center pivot	_____ acres	_____ acres
____ On wheels for automatic movement across field	_____ acres	_____ acres
	_____ acres	_____ acres
____ Sprinkler gun with reel	_____ acres	_____ acres
____ Trickle irrigation	_____ acres	_____ acres
____ Other-specify type: _____	_____ acres	_____ acres

6. Water source: ____ Pond
   ____ Stream or lake
   ____ Other (list) _____

7. What are land values for land suitable for growing vegetables in your neighborhood? $_____ per acre

8. What are the cash rental rates for land suitable for growing vegetables in your neighborhood?
   $_____ per acre OR ____ none available (check)

9. Wage rates (include social security, workmen's compensation, fringe benefits) and present number of employees.

	Wage Rate	Housing Provided	Number Employed
Full-time	_____ $/hr.	___yes ___no	_____
Migrant	_____ $/hr.	___yes ___no	_____
Local seasonal	_____ $/hr.		_____
Part-time	_____ $/hr.		_____

10. Migrant housing now available: capacity _____ (no. of persons)

11. If not currently used, would you consider using migrant workers for manual operations and harvest? ___yes ___no

12. Would you consider building migrant housing? ___yes ___no

13. Is a labor procurement service available in your area? ___yes ___no

14. If a viable market and a central packing facility existed for fresh vegetables, how many acres of land would you likely devote to fresh vegetable production for this facility?
    _____ acres

15. How much land do you currently own or rent that is suitable for vegetable crops:
    a) Total acres that could be planted to vegetables: _____ acres
    b) Total acres <u>in a season</u> that could be devoted to vegetables considering that some or all of the land in a) needs to be rotated:
    _____ acres/year

APPENDIX IV. Packing Labor Costs Per Hour

Job	Number of Persons	Base Wage ($/hr.)	Tax (15%) ($/hr.)	Total Wage ($/hr.)	Adj. For Cleanup, Loading (1/2 of total wage)	Total Cost ($/hr.)	Cost Per Box @600/hr.
1. Tomatoes/Peppers/Cherry Tomatoes							
Receive	2	6	1.8	13.8	6.9	20.7	0.03
Pregarde	2	6	1.8	13.8	6.9	20.7	0.03
Grade	12	6	10.8	82.8	41.4	124.2	0.21
Cartonfil	4	6	3.6	27.6	13.8	41.4	0.07
Boxes	2	6	1.8	13.8	6.9	20.7	0.03
Closing	2	6	1.8	13.8	6.9	20.7	0.03
Stack	4	6	3.6	27.6	13.8	41.4	0.07
Forklift	1	6	0.9	6.9	3.45	10.35	0.02
Misc.	4	6	3.6	27.6	13.8	41.4	0.07
TOTAL	33			227.7	113.85	341.55	0.57
						Cost @450/hour	0.76
2. Cauliflower (field packed)							Cost/Box @800/hr.
Receive	2	6	1.8	13.8	6.9	20.7	0.03
Inspect	4	6	3.6	27.6	13.8	41.4	0.05
Stack	2	6	1.8	13.8	6.9	20.7	0.03
Forklift	1	6	0.9	6.9	3.45	10.35	0.01
Misc.	2	6	1.8	13.8	6.9	20.7	0.03
TOTAL	11			75.9	37.95	113.85	0.14
						Cost @400/hr.	0.28
3. Sweet Corn (field packed)							Cost/Box @800/hr.
Receive	2	6	1.8	13.8	6.9	20.7	0.03
Icing	4	6	3.6	27.6	13.8	41.4	0.05
Stack	6	6	5.4	41.4	20.7	62.1	0.08
Turn	2	6	1.8	13.8	6.9	20.7	0.03
Forklift	1	6	0.9	6.9	3.45	10.35	0.01
Misc.	2	6	1.8	13.8	6.9	20.7	0.03
TOTAL	17			117.3	58.65	175.95	0.22
						Cost @400/hr.	0.44

APPENDIX IV. (continued)

Job	Number of Persons	Base Wage ($/hr.)	Tax (15%) ($/hr.)	Total Wage ($/hr.)	Adj. For Cleanup, Loading (1/2 of total wage)	Total Cost ($/hr.)	Cost Per Box @600/hr.
4. Cucumbers							
Receive	2	6	1.8	13.8	6.9	20.7	0.03
Grade	12	6	10.8	82.8	41.4	124.2	0.21
Pack	4	6	3.6	27.6	13.8	41.4	0.07
Box	4	6	3.6	27.6	13.8	41.4	0.07
Stack	4	6	3.6	27.6	13.8	41.4	0.07
Forklift	1	6	0.9	6.9	3.45	10.35	0.02
Misc.	4	6	3.6	27.6	13.8	41.4	0.07
TOTAL	31			213.9	106.95	320.85	0.53
						Cost @450/hr.	0.71
5. Broccoli							
Receive	2	6	1.8	13.8	6.9	20.7	0.03
Inspect	2	6	1.8	13.8	6.9	20.7	0.03
Cut	3	6	2.7	20.7	10.35	31.05	0.04
Trim	3	6	2.7	20.7	10.35	31.05	0.04
Bunch	2	6	1.8	13.8	6.9	20.7	0.03
Box	2	6	1.8	13.8	6.9	20.7	0.03
Icing	2	6	1.8	13.8	6.9	20.7	0.03
Stack	2	6	1.8	13.8	6.9	20.7	0.03
Forklift	1	6	0.9	6.9	3.45	10.35	0.01
Misc.	2	6	1.8	13.8	6.9	20.7	0.03
TOTAL	21	60	18.9	144.9	72.45	217.35	0.27
						Cost @400/hr.	0.54
6. Beans							
Receive	2	6	1.8	13.8	6.9	20.7	0.03
Presort	6	6	5.4	41.4	20.7	62.1	0.08
Sort	12	6	10.8	82.8	41.4	124.2	0.16
Box	2	6	1.8	13.8	6.9	20.7	0.03
Boxfill	4	6	3.6	27.6	13.8	41.4	0.05
Stack	2	6	1.8	13.8	6.9	20.7	0.03
Precooler	4	6	3.6	27.6	13.8	41.4	0.05
Fork	1	6	0.9	6.9	3.45	10.35	0.01
Misc.	4	6	3.6	27.6	13.8	41.4	0.05
TOTAL	37			255.3	127.65	382.95	0.64
						Cost @450/hr.	0.85

APPENDIX IV. (continued)

Job	Number of Persons	Base Wage ($/hr.)	Tax (15%) ($/hr.)	Total Wage ($/hr.)	Adj. For Cleanup, Loading (1/2 of total wage)	Total Cost ($/hr.)	Cost Per Box @600/hr.
7. Summer/Winter Squash							
Receive	2	6	1.8	13.8	6.9	20.7	0.03
Grade	6	6	5.4	41.4	20.7	62.1	0.10
Pack	6	6	5.4	41.4	20.7	62.1	0.10
Box	4	6	3.6	27.6	13.8	41.4	0.07
Stack	4	6	3.6	27.6	13.8	41.4	0.07
Forklift	1	6	0.9	6.9	3.45	10.35	0.02
Misc.	4	6	3.6	27.6	13.8	41.4	0.07
TOTAL	27			186.3	93.15	279.45	0.47
						Cost @450/hr.	0.62

APPENDIX V. BUILDING COSTS

A. Assumptions

1. Dimensions:

   a) Main structure (packing line, receiving, shipping, office) -- 100' x 150' x 16'

   b) Cooler -- 50' x 50' x 16'

   Total Square Feet = 17,500

2. Cooling:

   a) Insulation: Foamed-in-place, 4 inch for a recommended R-value of 30, plus fire protectant (Zonolite).

   b) Refrigeration: Assume a peak of 180,000 pounds of produce to be cooled in one 12 hour period (10 hours x 600 boxes per hour = 6,000 boxes per day, x 30 pounds per box = 180,000 pounds per day).

   Approximately 564,000 BTU per hour would be needed to cool 180,000 pounds from 80 to 40 degrees F in 12 hours. THis is equivalent to approximately 30 to 50 tons of refrigeration. WE will assume that 30 tons of refrigeration will be used.

3. Costs:

   a) Structure (pole-type, metal sides, concrete floor, including plumbing and electricity)

   = $12.00 per square foot of floor area

   b) Insulation

   = $3.40 per square foot of cooler walls and ceiling for 4 inches (1 inch @ $1.00 per square foot under floor)

   = $1.00 per square foot of cooler walls and ceiling for fire protectant (none on floor)

   c) Refrigeration = $2,000 per ton

4. Landscaping, Utilities -- Assume $30,000 total cost

B. Cost Calculations

1. Structure (main and cooling) -- 17,500 x $12.00 = $210,000

2. Cooler Insulation and Fire Protectant --

5,700 square feet (walls and ceiling) x ($3.40 + $1.00) = $25,080

2,500 square feet of floor x $1.00 = $2,500

Total Cost = $27,580

3. Refrigeration -- 30 tons x $2,000 per ton = $60,000

4. Landscaping, Utilities -- $30,000

C. Building Costs Summary

1. Structure -- $210,000

2. Insulation -- $27,580

3. Refrigeration -- $60,000

4. Landscaping, etc. -- $30,000

Grand Total -- $327,500

Other Agricultural Economics Research Publications

No. 90-4	Whey Powder and Whey Protein Concentrate Production Technology Costs and Profitability	Susan Hurst Richard Aplin David Barbano
No. 90-5	Potential Effect of Decoupling on the U.S. Rice Industry	Satoko Watanabe B. F. Stanton Lois S. Willett
No. 90-6	Determination of Butter/Powder Plant Manufacturing Costs Utilizing an Economic Engineering Approach	Mark W. Stephenson Andrew M. Novakovic
No. 90-7	Field Crop Enterprise Budget Update, 1990 Cost and Return Projections and Grower Worksheets, New York State	Darwin P. Snyder
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No. 90-15	A Social Accounting Matrix for Cameroon	Madeleine Gauthier Steve Kyle