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AGRICULTURAL ECONOMICS

**Agricultural Alternatives
For the Salt River
Pima - Maricopa
Indian Community**

by

Roger H. Coupal
Thomas R. McGuire
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Report No. 39
December, 1988

COLLEGE OF AGRICULTURE
The University of Arizona
Tucson, Arizona 85721

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Agricultural Alternatives For the Salt River Pima - Maricopa Indian Community

PREFACE

In 1985, the University of Arizona joined the Salt River Pima-Maricopa Indian Community in a collaborative effort to assess agricultural possibilities and train members of the Community in techniques of farm planning. At the time, agricultural leasing was in decline and water supplies to the reservation were uncertain. But the Community held firmly to the belief that as much of the reservation as possible should remain under crops, buffered from the urban pressures of Scottsdale and Mesa. The analyses contained in this report were efforts to respond to this situation. They are presented here with the conviction that the choices to be made by the Community should be economically sound.

Recent events have reduced the urgency of the situation faced by the Community in 1985 but have not changed our conviction. Leased agricultural acreage has increased, and the Community is well into the process of negotiating a settlement of its water claims, one which seeks to guarantee deliveries to the reservation. The settlement places a burden on tribal leaders to use this water wisely. It is our hope that the economic assessments developed in this report will assist in the difficult choices now facing the Community.

Our intent, in making this report available to a wider audience, is simply to provide methodological guidelines to reservations now facing similar choices. The analyses and conclusions reached here are specific to the Salt River Community; the procedures, however, are of general applicability.

Throughout the project, we have received encouragement and assistance from numerous individuals and institutions. The Community's president, Gerald Anton, and its attorney, Richard Wilks, were instrumental in attracting the interest of the Ford Foundation. Norman Collins of the Foundation has shown continued interest in the project, and has accorded us substantial flexibility to pursue useful leads. The Community's Agricultural Research Office, established with a matching grant from the Foundation, has, in our estimation, performed

superbly, learning to ask the right questions and, we hope, will continue to discover some of the answers. Darren Washington, Angie Silversmith, Berkeley Chough, and Ernie Stacey deserve a great deal of credit.

On campus, we have received sound advice on water and policy from Helen Ingram, co-principal of the project, and have extracted sound analyses from several graduate students, including Charlie Stevens, Daniel Sellen, Ted Goldammer, and Ken Rait. Finally, the manuscript preparation tasks have been placed in the able hands of Connie McKay.

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SUMMARY

Agriculture is in a state of change in Arizona. Due to rising costs and expanding world production, conventional field crops grown in this state are often unprofitable, even with federal government subsidy programs. Consequently, farmers are either leaving the industry or searching for higher-value crops to include with their standard mix of conventional field crops. Native American communities, like rural communities throughout the West, are feeling the effects of a changing and in many cases, a shrinking agricultural sector. As growers change to higher-value crops and diversify production, new management techniques and concepts will have to be used to manage the higher risk associated with specialty crops. Native American reservation planners, such as those associated with the Salt River Pima-Maricopa Indian Community, will also have to adjust to this changing structure of Arizona agriculture in their agricultural leasing program as well as in long term goals of encouraging reservation members to return to farming. The objective of this report is to offer a set of policy recommendations and management concepts for agricultural planning on Community lands to increase information available to community decision-makers on marketing and production techniques of higher risk crops.

The approach taken in this report is based upon concepts of portfolio management. While these techniques can be quite complex, they are based on a rather simple idea, that the components of a portfolio should balance risk and returns. Generally the higher the return on an investment, the higher the risk, so a planner must choose a group of investments that conform to a decision-maker's attitude toward risk, or in the case of a tribally run operation, the community's attitudes toward risk. A risk averse planner will select components for the portfolio that are mostly (though not completely) low risk, low return investments. A risk preferring individual will select a

relatively higher proportion of high and moderate risk investments (as well as some low risk investments).

The same concepts can be applied to agricultural planning. Low risk crops such as cotton, alfalfa, and barley can be combined with high risk vegetable crops or other specialty crops. The increased risk from inclusion of specialty crops is spread across the operation and the grower benefits from higher average income over the years. Indeed, vegetable producers combine vegetable crops with higher price variability such as lettuce, with other vegetable crops that have lower price variability or with the standard field crops.

There are several important sources of risk in an agricultural operation. Market risk is associated with price variability or market uncertainty. Fresh vegetables generally have very high price variability. New specialty crops are also likely to have risks arising from unknown market characteristics. Other sources of risk include variation and uncertainty in yield and financial uncertainty. The decision - maker must consider all these sources of risk when choosing the optimal mix of low-risk, low-return and higher-risk, higher-return crops.

Findings

Feasibility studies are conducted on several alternatives to agricultural leasing, beginning with a low (price) risk, low return crop operation. Each successive alternative presents a higher risk operation and, as expected, net returns also increase.

- A tribal farm producing conventional field crops is, as expected, not an economically feasible option, even accounting for federal government crop subsidy programs.

- Navel oranges and tangelos are a more favorable option. However, they entail a higher risk. Assuming a low estimate of citrus prices over a five year period, the alternative is less profitable than leasing.

- Small acreages of specialty crops such as container trees and vegetables for direct marketing to consumers are also more profitable than leasing. However, due to the limited demand for these crops, small acreages are required and as such should be considered as part of a group of different low risk and high risk crops. This conclusion is relevant also for traditional crops such as tepary beans. Small acreages may be profitable but large acreages may significantly reduce the price.

Marketing studies conducted on alfalfa and 16 varieties of fresh vegetables give a good basis on which to choose a group of crops that can conform to most risk preferences. The findings from the market evaluations are as follows:

- Alfalfa has a very good potential for being a low risk source of cash flow. Dairy operations located in Maricopa County forward contract for alfalfa, thereby reducing grower risk. Furthermore alfalfa hay prices in the County are usually at a premium due to the demand from the dairies; hay prices average around ten dollars per ton higher than the rest of the state.

- Market windows for 16 varieties of vegetables were estimated and evaluated based upon price variability and average net returns. Eleven of the vegetables are rated as having fair to good prospects for profitable marketing. A combination of crops should be selected to spread the risk exposure across products.

-A market survey of the demand for fresh cut herbs among Phoenix area restaurants indicates a small but growing demand for a few varieties. In particular, basil, oregano, parsley, and tarragon are fresh herbs that are bought consistently. While there is a potential for a limited production of herbs, any decision to produce them must consider marketing outside the State for long term economic viability.

- Important information about the production and marketing of specialty crops and most vegetable crops is not generally available from government agencies or the University of Arizona. This void substantially increases the riskiness facing the grower and must be considered when deciding to embark on an investment in of these crops.

Recommendations

The following recommendations are based upon the results of our evaluation and the assumption that the Community will want to proceed more formally into agricultural production. Due to the high-risk nature of specialized crops, market niches may open and close relatively quickly. To be able to evaluate the potential profitability of a new crop, there must be an institutional structure present on the reservation that can respond to a changing market environment. Our first recommendation is to create a position of agricultural manager responsible for overseeing the agricultural leasing program and evaluating alternative lease arrangement or joint venture proposals before the Community.

Our second recommendation is for a small, commercial scale, Community demonstration farm producing a variety of specialty crops and marketed directly to consumers or through wholesalers. This farm, however, should have two objectives: First, the operation must be managed to be commercially feasible. The second objective is to serve in an information and extension capacity for Community members who may be interested in producing specialized crops. In the short term this operation can produce information about the production and marketing of specialty crops and provide a profitable agricultural alternative to simply relying upon agricultural leasing. In the long term however, such an operation can be an example to Community members who decide to return to agriculture, offering expertise and advice on production and marketing of specialty crops.

An operation of this nature would require the part-time employment of both a production specialist or agronomist and a marketing specialist. In many specialty crops there is neither production information nor market information readily available to a manager. Therefore these positions would serve the function of generating information for the research farm and for any Community member that would be interested.

I. INTRODUCTION

Agriculture is changing dramatically in Arizona. Traditional field crops produced in this state are facing increased world production and corresponding low commodity prices, increasing costs of production as other sectors compete for the same resources, and increased risk from possible reductions in farm subsidy programs. The objective of this report is to propose a set of policy recommendations and management concepts for agricultural planning on the Salt River Pima-Maricopa Community's land.

One of the motivations for beginning this study was to respond to concerns by Community leaders that revenues from agricultural leases had become increasingly uncertain. Indeed, acreage data from the Bureau of Indian Affairs (BIA) justifies this concern. Figure 1 summarizes yearly acreage in agricultural production from 1966 to 1985. The record indicates an increasing but erratic acreage in agricultural leases up until 1977 and then a return to the trend levels of the sixties and early seventies. 1984 saw a mild increase but well below the levels attained in the late seventies.

The decline in agricultural leasing, however, preceded the general decline in agricultural acreage in Maricopa County. Agricultural operations, which increased acreage under production through land leasing during the 1970's , reacted to deteriorating economic conditions and higher opportunity cost of land in the 1980's by scaling back and ending lease operations. Adding to the problem, the price of cotton fell and interest rates rose and remained relatively high throughout the eighties. The expected response was to reduce the number of acres farmed. Acreage in the county peaked in 1982 with 511,000 acres and declined to 313,000 acres in 1985.

There are many alternatives to agricultural leasing the Community could pursue, including leaving agriculture altogether. Decisions as to which alternatives the Community would like to pursue require extensive planning and Community input. Figure 2 outlines the decision making process the Community is faced with. This report will not consider commercial alternatives to agricultural leasing but will explore alternative agricultural land uses.

There are three alternative land use strategies that the Community can consider. The first is to continue agricultural leasing, with straight cash leases or experimenting with some profit-sharing or crop-sharing arrangements. The Community can also take over the production management of the land through a Community farm. The final alternative is for Community members to return to farming. Though this last strategy is appealing to the Community leaders, the lack of Community members currently farming indicates that this would probably be the most difficult to achieve. Increasing the number of Indian farmers would require implementing long-term strategies that would generate interest among adults, especially the young adults. This report evaluates alternative crops and implications of the three alternative strategies.

FIGURE 1
AGRICULTURAL PRODUCTION ACREAGE ON THE SALT RIVER
PIMA - MARICOPA INDIAN RESERVATION, 1966 - 1985

The approach taken in this report is based upon concepts of portfolio management. While these techniques can be quite complex, they are based on a rather simple idea that the components of a portfolio should balance risk and returns. Generally the higher the return on an investment, the higher the risk, so a planner must choose a group of investments that conforms to a decision-maker's attitude toward risk. A low-risk portfolio will be composed of investments that are mostly low risk and correspondingly, low return. A risk-preferring individual will select a relatively higher proportion of high and moderate risk investments (as well as low risk investments.) However, to maintain an acceptable level of profitability over the long run, there must be some higher risk, higher return components in the portfolio.

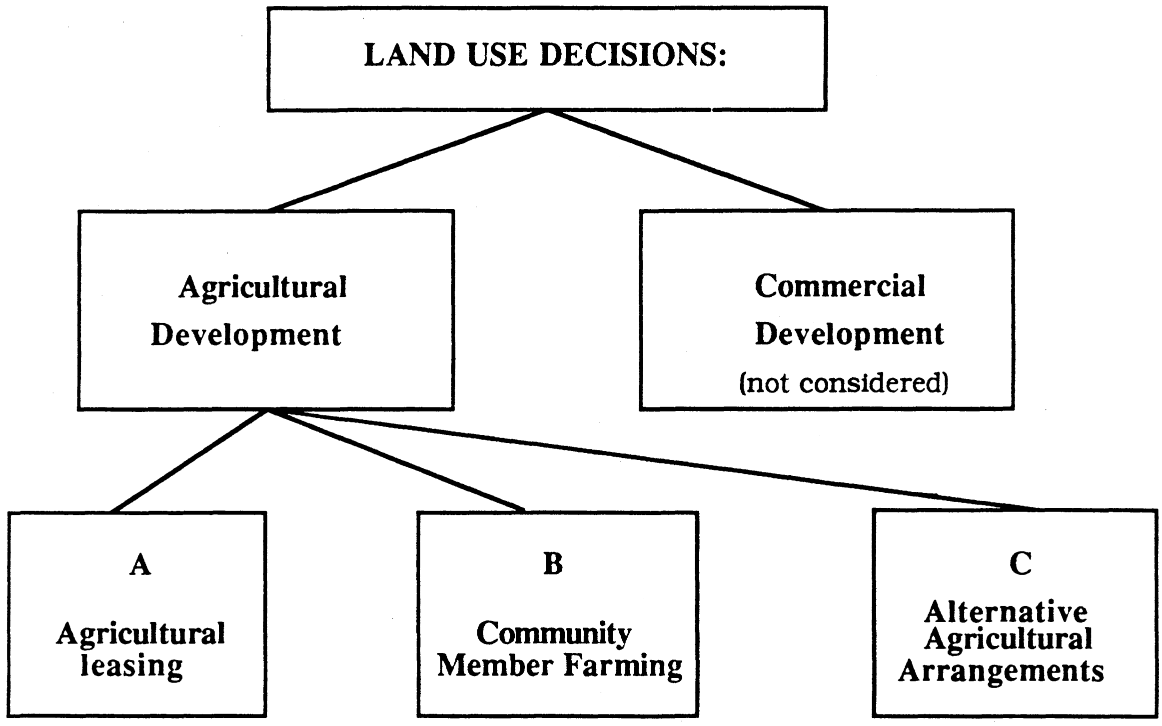
The same concepts can be applied to agricultural planning. Low-risk crops such as cotton, alfalfa, and barley can be combined with high-risk vegetable crops or other specialty crops. Indeed, vegetable producers combine vegetable crops with relatively higher price variability like lettuce, with other vegetable crops that have comparatively lower price variability.

There are several important sources of risk in an agricultural operation. Market risk is associated with price variability or market uncertainty. Fresh vegetables generally have very high price variability. Such operations make positive returns once in three to five years on the average. While increased understanding and monitoring of the markets can reduce some uncertainty, most of the uncertainty originating from price volatility cannot be reduced.

Another source of risk can be called market unfamiliarity. Specialty crops can be classified as having this aspect of risk. Information may not be readily available and may be very costly to attain. Such costs may come from more than consultant fees. For example, marketing of fresh cut herbs may require a limited production to assure potential customers of quality and reliability. Other sources or risk include variation and uncertainty in production and financial uncertainty. The decision - maker must consider all these sources of risk when choosing the optimal crop mix investment.

This report will discuss the agricultural options facing the community and the feasibility of different alternatives to the present policy of leasing. Part II discusses the future prospects of agricultural leasing. Any alternative use of the land must be compared with the present use. Part III summarizes the results of market surveys for various specialty and field crops. Part IV discusses the economic feasibility of different alternatives to leasing, beginning with a low risk, conventional alternative, a tribal farm growing conventional field crops and proceeding on to higher risk crops such as containerized plants, fruits, and vegetables.

Figure 2
LAND USE DECISION - MAKING PROCESS



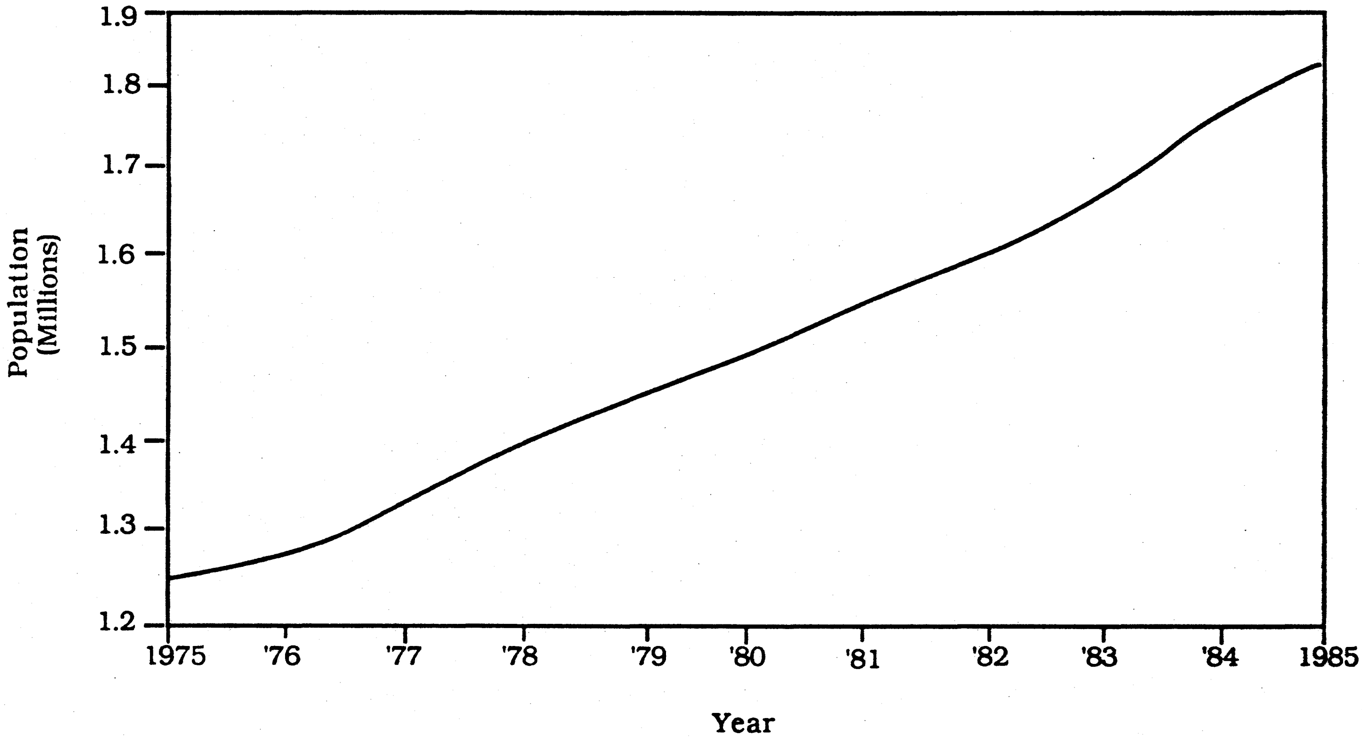
II. The Potential for Agricultural Leasing

The population in Maricopa County has increased steadily (Figure 3) and the rate of increase is not expected to change. This large urban area will provide a strong market for vegetables, which, if not supplied by local producers, will be transported in from California, Yuma, and Mexico. Furthermore, increased pressures on urban land will reduce the quantity of land available for crop production outside the Salt River Community, making reservation land a primary alternative for those individuals that want to continue to farm. We expect, then, to see an increased demand for reservation farmland.

The conclusion suggests some policy implications. The increasing production of high-risk crops will cause increased variability of grower (lessee) cashflows. The ability to raise rental rates then will be constrained by the high risk of the grower's operation. Consequently, there will be more pressures on tribal planners by potential lessees to have the Community share some of the risk through alternative lease arrangements such as profit sharing or joint ventures. The Community should consider how flexible it wants to be in lease arrangements and whether risk-sharing is worth the increased expected revenues. It should be noted that alternatives to the present system of fixed-fee leases may substantially increase the "transactions costs" of leases. These include the direct costs associated with negotiating, supervising, and enforcing leases. All of these have proven troublesome under the existing system. It is the responsibility of Community officials and the advisory Land Board to oversee lease signing procedures, require (often to no avail) reporting by the lessees of crops grown and pesticides used, and collect and distribute the rental payments. Lessees pay a small fee for these services, but the primary beneficiaries are the hundreds of landholders, not the Community government.

Risk-sharing arrangements would require substantially more monitoring and reporting than is presently done. Lessees who now show reluctance even to report acreage will undoubtedly hesitate to provide data on costs and returns. And tribal employees, who already have the difficult task of keeping accurate ownership records of highly-fractionated allotments, may understandably reject new complications.

FIGURE 3
POPULATION GROWTH IN MARICOPA COUNTY, 1975 - 1985



III. Marketing Studies

The proximity of the Phoenix metropolitan area gives local agricultural operations a competitive advantage for some crops. This section contains a summary of studies evaluating the market potential for different field, vegetable, and specialty crops. The studies summarized start with the estimation of alfalfa hay prices for 1987-1988 season beginning April 1987. This crop is included to suggest a feasible low risk, low return crop to balance a portfolio of higher crops. Also included is a market analysis for 16 varieties of vegetables and fruits. Finally, the results of a survey of Maricopa County restaurants is summarized to estimate the quantity of fresh cut herbs that are annually purchased.

The first two sections present market window analyses of the crops considered. Essentially, a market window exists when the price received for a crop is greater than its break-even price (BEP). In the case of alfalfa, the prices used are prices generated by an econometric model developed at the University of Arizona. Prices for the different varieties of fruits and vegetables are from the Market News Service of the United States Department of Agriculture in Phoenix and Los Angeles.

The final section presents the results of a survey of quantities of fresh cut herbs purchased by local Maricopa County restaurants. Prices are not included in the survey because of the extreme instability of a market such as this. Without a long history of prices paid for such crops, a simple reporting of what each establishment paid would be meaningless (for example, the time series for the 16 vegetables studied in this section are weekly prices taken for the past ten years.) For fresh cut herbs the market risk is evident: not only is there extreme price volatility due to the limited shelf life, but there is uncertainty as to the size of the market itself.

A. Market Windows for Alfalfa Hay in Maricopa County

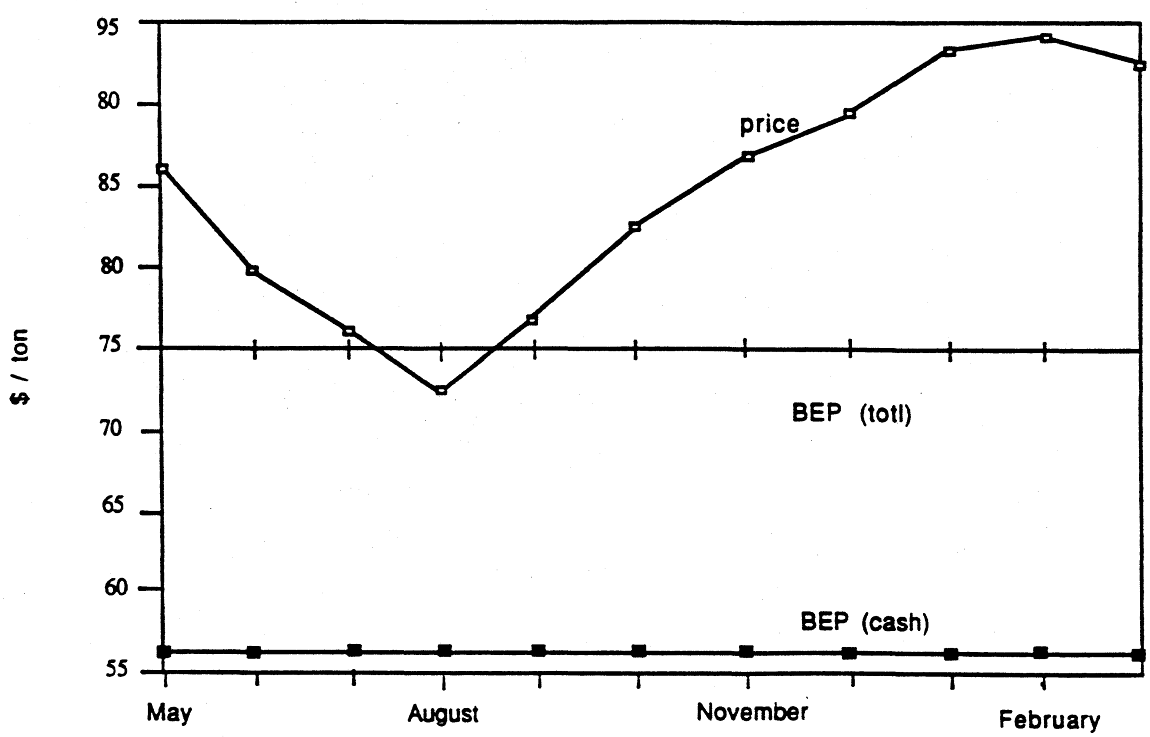
As discussed above, the reason for including this crop in the analysis is to evaluate a potentially profitable, low risk crop. Compared to cotton, alfalfa requires a smaller per acre investment and provides some special benefits. Alfalfa is a very good rotation crop and is grown many times for soil improvement even when the returns are negative. Consequently, the crop is grown with a dual objective: to provide a low risk source of cash income and to improve soil quality for other crops that follow alfalfa.

The market consists mostly of dairy operations, located in Maricopa County, and to a lesser extent, cattle operations and horse breeding operations. Dairies will pay premium prices for top quality alfalfa and often negotiate forward contracts.

The price forecasting model (see Appendix A) estimates average monthly prices across the state beginning with April. Since Maricopa County prices are five to ten dollars higher than the statewide average, prices estimated in this analysis are increased by $7.50. Figure 4 presents the forecasted prices for the 1987/1988 season. While the peaks and troughs vary from year to year, the shape of the price schedule remains consistent. Late summer usually experiences a low price while the January/February period experiences high prices.

FIGURE 4

1987/88 FORECASTED PRICES AND MARKET WINDOWS FOR ALFALFA



In Figure 4, $BEP_{(tot)}$ is the total cost per ton that includes cash costs and ownership costs. $BEP_{(cash)}$ is the cost per ton that only includes cash expenses such as operating costs and interest on investment. For 1987, market windows exist during most of the year except for July/August. However, as the $BEP_{(cash)}$ indicates, as a source of cashflow, the market window for 1987 is very strong the entire year.

B. Market Windows for Fresh Vegetables

The following section summarizes the results of a market window analysis conducted on 16 varieties of fresh vegetables and fruits. An explanation of the market window technique and the graphical representations of the market window for each commodity are presented in Section 2 of Appendix A.

The purpose for conducting a market window analysis is to identify a set of feasible crops to produce. Those crops that have an identifiable market window (for this analysis, a period of at least one month when the average price a grower receives for a crop is greater than the break-even price,) are part of the set. After identifying the set of feasible crops, the grower must then decide which group of crops within the set are to be produced. This depends on the risk/return characteristics of each crop, the grower's attitude toward risk, and personal preference.

There are several factors influencing the length of the market window. On the demand side, such factors include produce prices, prices of substitutes, the size of the market (number of consumers,) consumer income, preferences and tastes, and distribution. Low commodity prices and low prices for a commodity's substitutes shorten the duration of a market window, while market depth and consumer income tend to increase its duration. The other factors could change the duration either way. On the supply side, there is an implicit assumption that there is one constant level of costs for all months and for all producers. Obviously, all producers do not have the same cost structure. Also, because of seasonal water requirements, yield differences, or other factors, production costs per unit of output are likely to vary for different production periods within the growing season.

Market Window Results

A summary of the results of a market window analysis for the 16 fruits and vegetables evaluated is presented in Table 1 and a graphical interpretation of market window periods shown in Figure 5. Yield per acre, HPCM (harvesting, packing, cooling, and marketing costs,) production costs, and yields are taken from surveys with growers and shippers around the state and from published vegetable crop budgets for Maricopa County.[1] The commodities are listed alphabetically with the harvest and market window periods listed on the right hand side. As the results show, some windows are as long as six months while others are less than four weeks.

The market window results presented in Table 1 tell nothing about the risk and return aspects of a commodity being considered. A lengthy market window may have a flat peak while a short window may have a high peak. The next step in choosing a set of vegetable crops is to assess the potential risk and returns of the crops identified. For this study, the index of price risk (or variability) used is the coefficient of variation (CV), defined as the standard deviation of price variability divided by the mean price. Risk and average per acre net return are presented on Table 2. Generally, commodities with a high average net return per acre have a correspondingly high risk associated with them. For example, the price of broccoli varied within a range of 18.9% of its mean and had an average net return of $637 per acre. The price for sweet corn, however, varied within a range of 10.9% around its mean and had an average net return of only $444 per acre.

A more detailed picture of the complexity of choosing which crops to produce can be gained by graphing the average net returns against the risk index (Figure 6). With few exceptions, the higher the return, the higher the risk. What can be seen in this Figure is that simply choosing one vegetable to produce will either expose a grower to high risk or low return. It is, therefore, important to choose a group of crops. There are some notable exceptions to this risk/return tradeoff. In particular, kale and radishes seem to have good risk and good return characteristics. While it is tempting to choose these crops, there may be only market characteristics that should be

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1 Hathorn, Scott and Fred Harper, "1986 Vegetable Crop Budgets, Maricopa County - Volume 1 and 2, Cooperative Extension Service, University of Arizona, Tucson, April 1986.

considered. Kale and radishes have a very limited market, so any substantial increase in production could move the crop over to the low return side of the graph.

Attitudes toward risk differ from individual to individual. Some growers may be willing to accept higher risk in return for higher reward. For other growers, the opposite may be true. What is important is to choose a group of vegetable crops in which the portfolio is balanced according to the attitudes of the decision-makers, with a mixture of lower risk, medium risk, and high risk crops.

TABLE 1
MARKET WINDOW RESULTS AND RELATED INFORMATION FOR 16 VARIETIES OF ARIZONA VEGETABLES

Commodity	Ave. Yield/Acre	PROD $/Unit	HPCM $/Unit	B.E.P. $/Unit	Harvest Season	Market Window Period
Broccoli	375 (14 BUN/CRTN)	2.84	3.11	5.95	11/1 - 3/20	12/7 - 3/1
Fall Cabbage	650 (24 HEADS/CRTN)	1.23	3.13	4.36	8/1 - 2/1	1/1 - 2/1
Carrots	16.50 Tons	60.00	25.00	85.00	10/10 - 7/20	NA
50 Lb. Sack		1.50	2.00	3.50	10/10 - 7/20	1/1 - 6/21
48-1 Lb. Bags		1.50	3.35	4.85	10/10 - 7/20	1/1 - 5/14
Cantaloupe-Fall	480 1/2 (12s/CRTN)	1.47	2.67	4.14	9/20 - 12/1	10/3 - 12/22
	480 1/2 (15s/CRTN)	1.47	2.67	4.14	9/20 - 12/1	10/3 - 12/22
	480 1/2 (18s/CRTN)	1.47	2.67	4.14	9/20 - 12/1	10/3 - 12/22
Cantaloupe-Spring	480 1/2 (12s/CRTN)	1.47	2.67	4.14	5/25 - 8/1	5/28 - 7/22
	480 1/2 (15s/CRTN)	1.47	2.67	4.14	5/25 - 8/1	5/28 - 7/22
	480 1/2 (18s/CRTN)	1.47	2.67	4.14	5/25 - 8/1	5/28 - 7/22
Cauliflower (TPLTS)	460 (9 BUN/CRTN)	1.91	4.17	6.08	11/15 - 5/1	12/10 - 1/19 2/6 - 7/22
	460 (12 BUN/CRTN)	1.91	4.17	6.08	11/15 - 5/1	12/10 - 1/19 2/6 - 4/1
	460 (16 BUN/CRTN)	1.91	4.17	6.08	11/15 - 5/1	12/10 - 1/19 2/6 - 4/1
Collards	750 (24 BUN/CRTN)	1.15	2.35	3.50	8/1 - 1/1	12/16 - 5/7
Dry Onions	1166 50# Medium	1.09	3.21	4.30	5/5 - 7/10	5/9 - 6/5
	1166 50# Prepack	1.09	3.21	4.30	5/5 - 7/10	5/9 - 6/5
Green Onions	1128 (4 DZBUN/CRTN)	0.85	3.82	4.67	8/1 - 2/1	12/18 - 1/27
Honeydews-Fall	766 2/3 (5s/CRTN)	0.95	2.73	3.68	9/15 - 11/25	10/15 - 11/15
	766 2/3 (6s/CRTN)	0.95	2.73	3.68	9/15 - 11/25	10/15 - 11/25
	766 2/3 (8s/CRTN)	0.95	2.73	3.68	9/15 - 11/25	10/15 - 11/25
Kale	750 (24 BUN/CRTN)	1.15	2.35	3.50	8/1 - 1/1	12/16 - 4/22
Lettuce-Spring	640 (24 HEADS/CRTN)	1.79	2.90	4.69	3/5 - 6/20	3/26 - 4/22
Mustard	750 (24 BUN/CRTN)	1.15	2.35	3.50	8/1 - 1/1	12/15 - 5/7
Radishes	865 (4 DZBUN/CRTN)	0.61	2.33	2.94	8/1 - 3/1	1/1 - 5/1
Sweet Corn	200 (5 DZEAR/CRTN)	2.00	2.20	4.20	5/15 - 7/1	5/10 - 6/24
Turnip Tops	750 (24 BUN/CRTN)	1.15	2.35	3.50	8/1 - 1/1	12/16 - 5/7
Watermelons	14 Tons	40.00	40.00	80.00	6/1 - 11/20	6/10 - 7/17

Notes: PROD = production costs
HPCM = harvesting, packing, cooling and marketing costs
BEP = break-even price (PROD + HPCM)

FIGURE 5
CALENDAR OF MARKET WINDOWS FOR SELECTED ARIZONA VEGETABLES

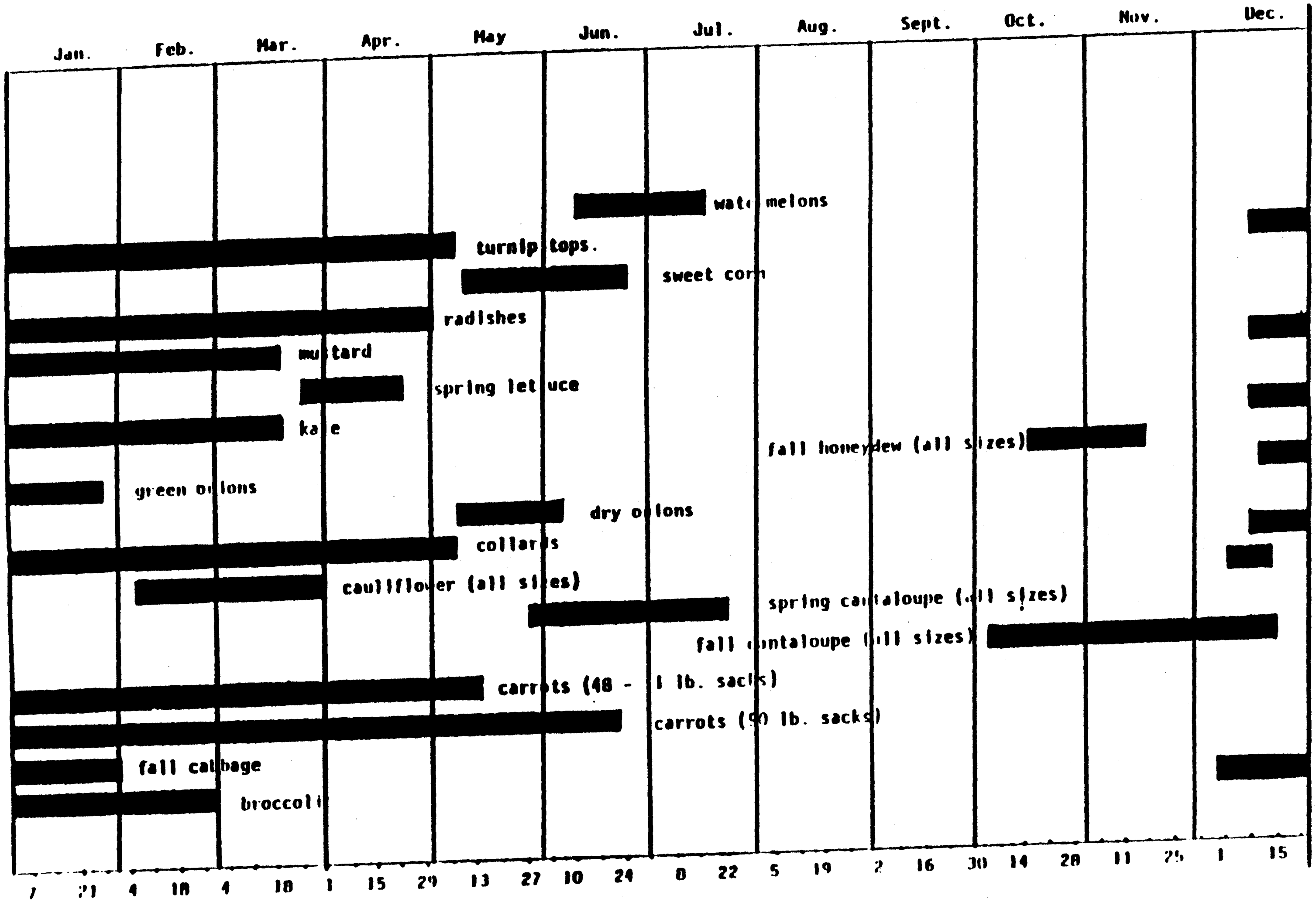


TABLE 2

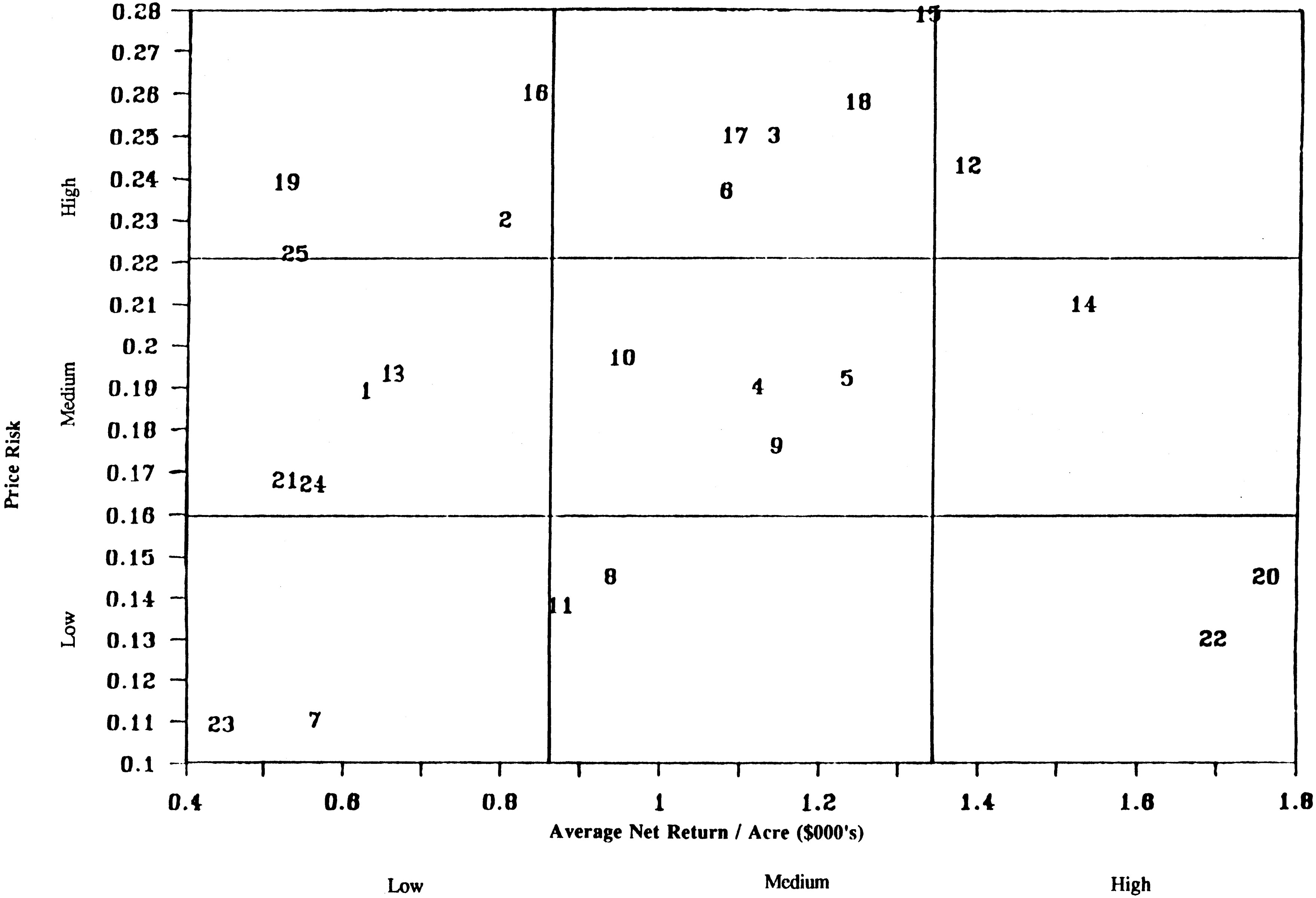
NET RETURNS PER ACRE AND PRIVE VARIABILITY OF SELECTED ARIZONA VEGETABLES

No.	Commodity	Price Risk	Ave. Net Return/Acre (Dollars)
1	Broccoli (4 bunches)	0.189	637
*	Cabbage (Fall)	0.612	1,442
	Carrots		
2	48-1#	0.23	799
3	50# sacks	0.25	1,135
	Cantaloupe		
	Fall		
4	12s	0.19	1,118
5	15s	0.192	1,229
6	18s	0.237	1,075
	Spring		
7	12s	0.11	562
8	15s	0.145	936
9	18s	0.176	1,142
	Cauliflower		
10	9s	0.197	947
11	12s	0.138	874
12	16s	0.243	1,380
13	Collards	0.193	660
	Dry Onions		
14	Prepack	0.21	1,527
15	Medium	0.279	1,329
16	Green Onion	0.26	836
	Honey Dew		
17	5s	0.242	1,087
18	6s	0.258	1,241
19	8s	0.239	523
20	Kale	0.145	1,760
*	Lettuce (spring)	0.41	723
21	Mustard	0.168	534
22	Radishes	0.13	1,695
23	Sweet Corn	0.109	444
24	Turnip Tops	0.167	554
25	Watermelons	0.222	534

* not included in relative risk/return chart (Figure 6)

FIGURE 6

RISK/RETURN RELATIONSHIPS FOR SELECTED ARIZONA VEGETABLES



Note: See Table 2 for commodity list.

C. A Market Survey for Fresh Cut Herbs

Another possibility that could take advantage of the proximity to a major urban area is fresh cut herbs. The market for fresh cut herbs is highly speculative because of very little information about production costs and no source for historical price data. Fresh cut herb production is a potentially profitable operation that requires very little land but extensive production and marketing expertise. Nationwide, fresh cut herb operations sell primarily to restaurants and market to local buyers as well as buyers in other states and cities. Operations in California sell to supermarkets and restaurants in Arizona, operations in Hawaii sell products in Dallas, San Francisco, Detroit, and Connecticut. The existence of such nationwide marketing (and the sophisticated distribution system that has to accompany it) implies that there are potential profits in such an operation. However, it also implies that relying only on a local market is risky since several producers could saturate a local market.

Thirteen Phoenix area restaurants were questioned about the annual quantities of fresh cut herbs they purchase. Prices were not included in the survey because such information would be meaningless given the lack of information about production costs and historical price data. Herbs are generally purchased by the bunch, which is defined as a handful, though some purchases were by the small bunch (two to three small bunches to the bunch) and by the pound. The relationship between weight and bunch varies substantially with the herb and how much water is in the bunch, but range between 0.25 lbs. per bunch to 0.5 lbs. per bunch.

Basil showed the strongest demand among the fresh cut herbs surveyed (Table 3). Some restaurants expressed an interest in buying fresh cut herbs that they do not now purchase on a regular basis and some expressed an interest in purchasing more if supply increased.

TABLE 3

ANNUAL QUANTITIES OF HERBS PURCHASED BY A SAMPLE OF LOCAL RESTAURANTS IN THE PHOENIX AREA FOR 1987

Restaurant Type	Basil	Thyme	Dill	Oregano	Rosemary	Tarragon
French				600 b[1]		
Italian		187 b	187 b		187 b	
Cont.	781 b	624 b	26 lb[2]	26 lb		26 lb
Cont.	1821 b		2808 b			
Cont.	114 b		574 b			
French	1152 sb[3]		104 b			
Italian	3001 b					
Italian	740 lb	222 b		740 lb		1248 b
Italian	2960 lb	888 lb		2960 lb		4992 lb
Italian	126 lb					
Italian	592 b	444 b			592 b	
Italian	52 b					
TOTAL (bunches)						
Low	15,000	3,475	3,725	8,052	779	11,650
High	19,600	5,700	3,777	15,500	779	21,685

[1] bunch - "a handful"

[2] pound

[3] small bunch - two to three small bunches per regular bunch.

IV. Cashflow Studies and Economic Analyses

A. Introduction

This section summarizes the results of feasibility studies of three different types of agricultural operations: a conventional tribal cotton farm, a fifty-acre citrus operation, and a retail nursery. The section concludes with economic analyses of three other specialty crop operations: small acreage vegetable production, tepary bean production, and mint production. The alternatives evaluated in this chapter can be viewed as a progression of increased risk, due to price variability, market unfamiliarity, and production uncertainty.

The first alternative evaluates the economic feasibility of a tribal farm producing conventional crops. This alternative can be considered a low risk alternative to leasing. The purpose of such an operation is to provide a source of stable cashflow from sales of cotton, alfalfa, wheat, and government payments. The next feasibility study concerns the profitability of a citrus orchard, which is associated with higher risks. There is more price variability with citrus production, so there is higher price risk. There is also higher risk from the costs built up during orchard development during the first four years. The third evaluation is of a small retail nursery operation. This alternative can be considered an even higher level of risk because the uncertainty of production costs as well as output prices. While price variability is low, market depth is unknown so a new entrant into the market (such as a tribal operation) may reduce the price substantially.

The final three alternatives evaluated are a small acreage vegetable crop grown for a farmers market, tepary beans, and mint production. The production costs of these crops are highly uncertain and the markets limited. For this reason they are categorized as high risk.

Profitability for each alternative is adjusted using two different opportunity costs, those of land and of capital. The opportunity cost of land is defined as the returns to land from the best alternative use. In this study an agricultural lease rate of $75 per acre is used. While rates for commercial/industrial leases are substantially higher, the agricultural lease rate is used because current tribal policy reflects a Community preference for agricultural leases over commercial leases. The second opportunity cost included in this operation is the opportunity cost of capital or "the time value of money". All alternatives considered in this section require a substantial amount of money invested and time devoted by tribal managers or individuals (depending upon whether the operation is a tribal operation or an operation run by a Community member.) Consequently, the opportunity cost of capital represents a baseline rate of return that could have been made if the capital had been invested in the best available alternative. This rate of return is called the discount rate and for this study is assumed to be 10%. This is assumed to be the highest riskless rate of return given the quantity of capital invested.

The analysis will estimate the net present value of the annual economic returns and the internal rate of return (IRR) to compare the economic profitability of choosing each alternative over leasing. The net present value of the cashflows sums the discounted net cash returns from the operation, subtracting out what could have been made from leasing over a designated planning period (in this case, ten years). At the end of the planning period, if the total of discounted cashflows minus the investment costs is greater than zero, then the alternative of developing a tribal farm is more profitable than leasing.

A negative IRR means that the alternative considered is less profitable than continuing to lease. If the IRR is greater than the opportunity cost of funds used to finance the alternative, a surplus accrues to the owners after paying for the capital. A negative IRR means that choosing the tribal farm option will impose a cost on the owners. Furthermore, if the IRR is less than the cost of debt (even though positive) then, depending upon the proportion of debt, the likelihood of failure is high due to negative cashflows in the early years.

B. Tribal Farm Producing Conventional Farm Products

An analysis of a tribal farm was initiated at the request of Community officials interested in the possibility of supplanting revenues lost from the reduction in leasing and making maximum use of their water allotment for the short term. The purpose of this analysis is to identify institutional and economic benefits that the Community incurs and to evaluate the economic profitability of a tribal farm. The farm would produce conventional crops such as cotton, wheat, and alfalfa and take advantage of the government programs. Tribal operations producing crops covered under government programs have an advantage over individual operations in that they can receive the full deficiency payment, thereby receiving a price per unit equal to the target price. For example, instead of receiving the market price and a portion of the potential deficiency payment, they receive the market price plus the full deficiency payment.

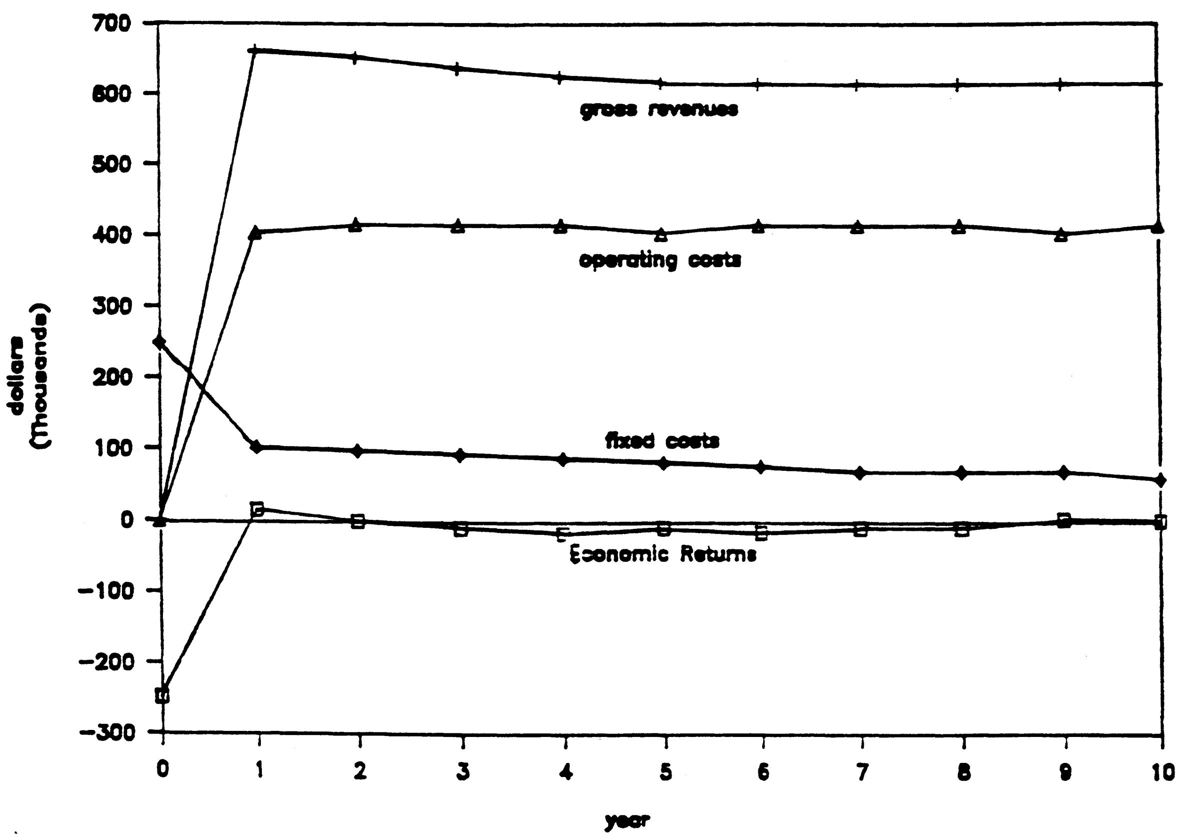
While faced with the same sort of economic forces causing the decline in agriculture in Arizona in general, a tribal farm could take advantage of relatively low water costs and institutional incentives from government programs. The crop mix used is approximately the same as what is generally found in Maricopa County. For a complete discussion of the model used to evaluate this alternative, see Appendix B.

Capital requirements estimated for an operation of 1,000 acres with 828 under production, total approximately $473,500 in equipment and another $150,000 in fixed assets. The debt is divided into a medium-term or seven-year loan and a long-term or thirty-year loan. Annual payments for the medium-term debt are $71,379 (at a 11.5% cost of capital) and $8,147 for the long term (at a 8.25% cost of capital).

Total yearly operating capital required for this operation varies from just under $200,000 to over $250,000. Custom hiring and harvesting costs make up the largest portion of annual costs, with water costs the next largest. Annual water use for a thousand acres would be over 4,000 acre-feet, costing $54,000 for Salt River Project pump water and a surface water assessment of $13,400. Due to the highly mechanized nature of these crops, labor costs are relatively low.

Net returns to the tribe are estimated for a ten year planning horizon (Figure 7). The economic profits (losses) estimated on the bottom line of the graph are the net returns to the tribe (NRT) minus the opportunity cost of land. At a yearly lease value of $75 per acre, the present value of the NRT is a -$213,555 and the internal rate of return is -37%. This implies that at a lease rate rate of $75 per acre or greater, leasing is the alternative which maximizes net returns over the ten year planning horizon.

FIGURE 7
NET CASHFLOW FOR A 1000 ACRE TRIBAL FARM
PRODUCING COTTON, WHEAT, AND ALFALFA



A sensitivity analysis conducted on product prices, input prices, and yields showed that profitability is sensitive to both prices received and yields. For instance, attaining cotton yields 10% greater (120 lbs more lint per acre) than the average lessee yield of 1200 lbs. lint per acre will make the IRR positive, thereby reversing the previous implication that leasing is more profitable than a tribal operation. Increasing alfalfa yields or alfalfa prices can also improve the IRR substantially, though still negative. Consequently, alfalfa, coupled with another low risk crop is not a viable alternative.

The main conclusion drawn from this analysis is that the expected profits from a tribal operation growing standard field crops would not justify the investment required to initiate such a farm.

C. Fifty Acre Citrus Farm Producing Navel Oranges and Tangelos

Citrus production is another alternative to leasing. This crop is a higher income producing operation and could take advantage of the local urban market, although most Arizona citrus is marketed by large marketing organizations such as Sunkist. This section evaluates a 50-acre orchard, with 25 acres each of navel oranges and tangelos. Unlike the previous alternative, citrus markets experience substantially more price variability. This analysis evaluates an alternative which has a higher risk and higher return characteristic than field crops.

The capital investment required for a 50-acre orchard is substantial, which adds considerably to the riskiness of the venture. Total capital expenditure for a fifty acre citrus orchard is estimated at $270,000. This is comprised of $120,000 for machinery and equipment, $45,000 for fixed structures and trees, and another $105,000 to pay operating expenses until there is enough production to cover operations and debt obligations. This final component of capital is an important constraint since production on citrus trees does not begin until the fourth year. Assuming a 35% margin requirement, this operation would need approximately $93,000 of its own capital to satisfy most lenders.

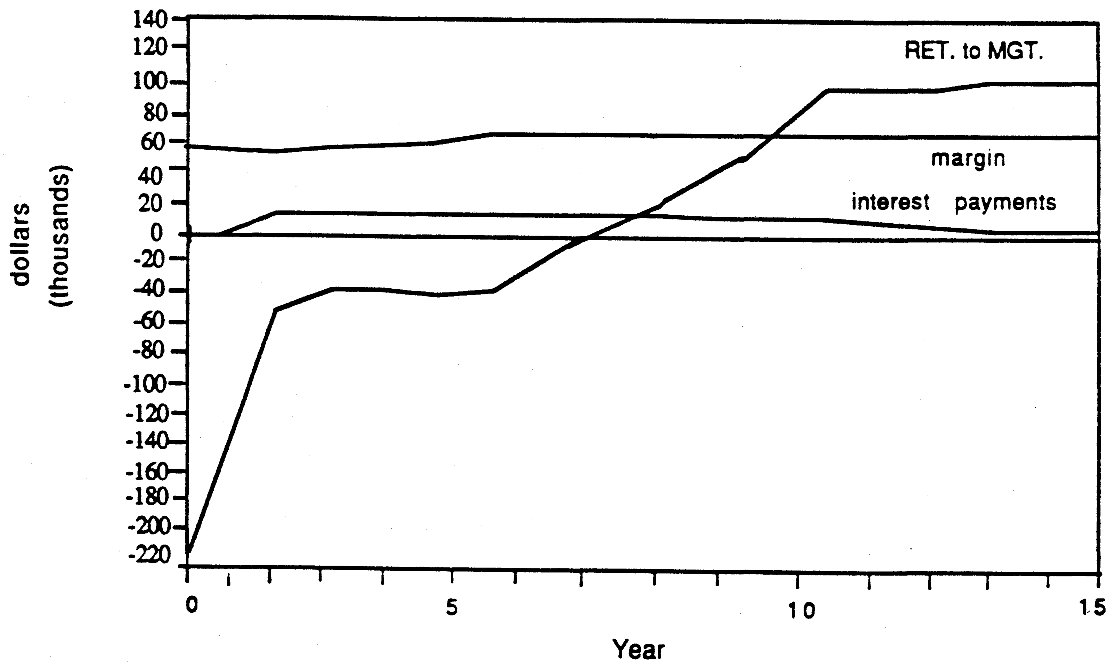
Operating capital for fifty acres of citrus begins at $23,850 the first year and increases to $78,500 by the eleventh year. Chemical application, chemicals, and water costs comprise the majority of the cash expense required for production. Water usage per acre is assumed to be 25 acre - inches the first year and increasing up to over 60 acre - inches by the fifth year and beyond. For a fifty acre orchard then, over 250 acre-feet of water per year are needed. Operating costs increase as the trees mature but are significantly lower than interest costs from the development loan. The high operating cost experienced in the first year is due to high labor costs for planting and wrapping the trees. (The cost of the tree is capitalized and not considered part of the cost of operations). Production reaches a maximum by the sixth year while interest costs begin to decline. The price per carton for tangelos and navel oranges are an average of prices over five years. For a complete description of the annual costs of operation see Appendix C.

Fixed costs include insurance, depreciation, general farm maintenance, and the BIA water assessment. Insurance for such an operation can vary significantly depending upon the attitudes of management and the history of the area. For this analysis an annual premium of 0.6% of the total value of assets is assumed.

The "cash returns to land and management" measure the net cash benefits of the operation. These returns are calculated by subtracting margin and interest on investment from the returns to the operation (gross revenues - operating costs - fixed costs.) The cash returns to land and management are negative up until the sixth year and reach a maximum by the fifteenth year of $124,000. However, the large negative values of the first six years offset these future revenues substantially. The internal rate of return for this operation is 5.8%. Figure 8 traces the returns to land and management, debt and equity level over the planning horizon.

The returns to management are obtained by subtracting the opportunity cost of land from the cash returns to land and management. As in the previous analysis, the opportunity cost of land used is an agricultural land lease rate of $75 per acre. The internal rate of return for management is 7.0%. The sensitivity of the estimated internal rate of return was tested for changes in output prices and yields below what is expected. A ten percent reduction in output prices below expectations results in a reduction of the internal rate of return by two percentage points.

FIGURE 8
NET CASHFLOW FLOW FOR A 50 ACRE CITRUS ORCHARD



The low internal rate of return, significantly below the cost of debt though positive, suggests the possibility of financial difficulties during the early years when negative cashflows occur. Programs that encourage citrus development should also consider financial support programs to reduce the risk that an individual faces.

D. Retail Nursery

This section analyzes the economic potential of a two-acre retail nursery producing a mixture of desert and temperate trees and shrubs. The production plan includes propagation in a small greenhouse and production under a cloth shade. The nursery produces 6,480 plants after it reaches full production by the fifth year.

A retail nursery operation, like the citrus operation in the previous section, is a high-risk and high-return operation. However, unlike the citrus operation, the risk associated with a retail nursery is not due to high price variability of the plants but the uncertainty of the characteristics of the market itself. A limited market could mean a large drop in the prices for containerized plants (and therefore, a drop in total revenues) when a new nursery begins operation. Location, effective product grouping, and advertising effectiveness are other factors that also influence risk.

Capital requirements for the nursery are $38,500 in equipment and machinery and another $33,000 in fixed structures, for a total capital, requirement of $71,530. Budgeted into this alternative is the capability of using Salt River Project surface water, so included in the investment is the cost of a small reservoir that would hold about a week's supply of water, a pump and a filtration unit. A nursery operation has a much higher capital investment per acre than the previous two alternatives. But, because the scale of the alternatives are different, the overall capital requirement is lower for the two-acre nursery. (A nursery operation comparable in acreage to even the fifty-acre orchard would flood the local market for container plants, and therefore, would not be feasible without further market development.)

Operating costs are estimated to reach $41,260 by the fourth year. Of this, production and propagation costs comprise 65%, with marketing costs the remainder. Soil mix and containers are the most important components of production. For this analysis soil mix is purchased. However, it is possible that significant savings can be made by investing in a soil mixing machine and sterilizer and purchasing the basic soil components such as vermiculite and peat moss. Yearly operating costs and cashflows are summarized in Figure 9. Appendix D provides a detailed analysis of the cashflows for a small nursery operation.

Marketing costs are a very important part of the operation. For this analysis advertising is conducted through the local newspaper. Once each month an advertisement is placed in the Saturday newspaper. The current rate is $92.20 per column - inch per day. The yearly expense for a small advertisement is considerable but is extremely important. An important decision that a manager must make is how much advertising should be done throughout the year. The decision to increase or decrease the amount of advertisements must be based upon the impact upon sales.

Due to the uncertainty involved in selling container plants, a sensitivity analysis was conducted by varying the average price of the plants sold. Low prices and high prices are estimated by subtracting and adding one standard deviation to the mean price respectively. A low average price clearly makes the operation unprofitable. Given a normal distribution of prices around the mean, there is approximately a one in five chance that low prices will occur.

The present value of the discounted cashflows, given average prices, is $41,286 and the internal rate of return is 16%. The nursery alternative is significantly more profitable than agricultural leasing. However, as discussed in the previous paragraph, profitability is very sensitive to prices. Low prices will make the alternative unprofitable compared to leasing. Figure 10 shows the yearly returns to land and management across the planning horizon at different price levels. The low price levels produce negative annual returns. A sensitivity analysis was conducted by varying the proportion of container plants sold between average and low price levels (Figure 11) through sales or inventory clear-outs. Reducing the proportion of plants sold at average price levels from 100% to 75% will reduce the internal rate of return to 10.70%. A proportion of low price sales to average price sales of 75:25 will further reduce the internal rate of return to -2.92%.

FIGURE 9
TEN YEAR CASHFLOW BUDGET FOR A SMALL
RETAIL NURSERY

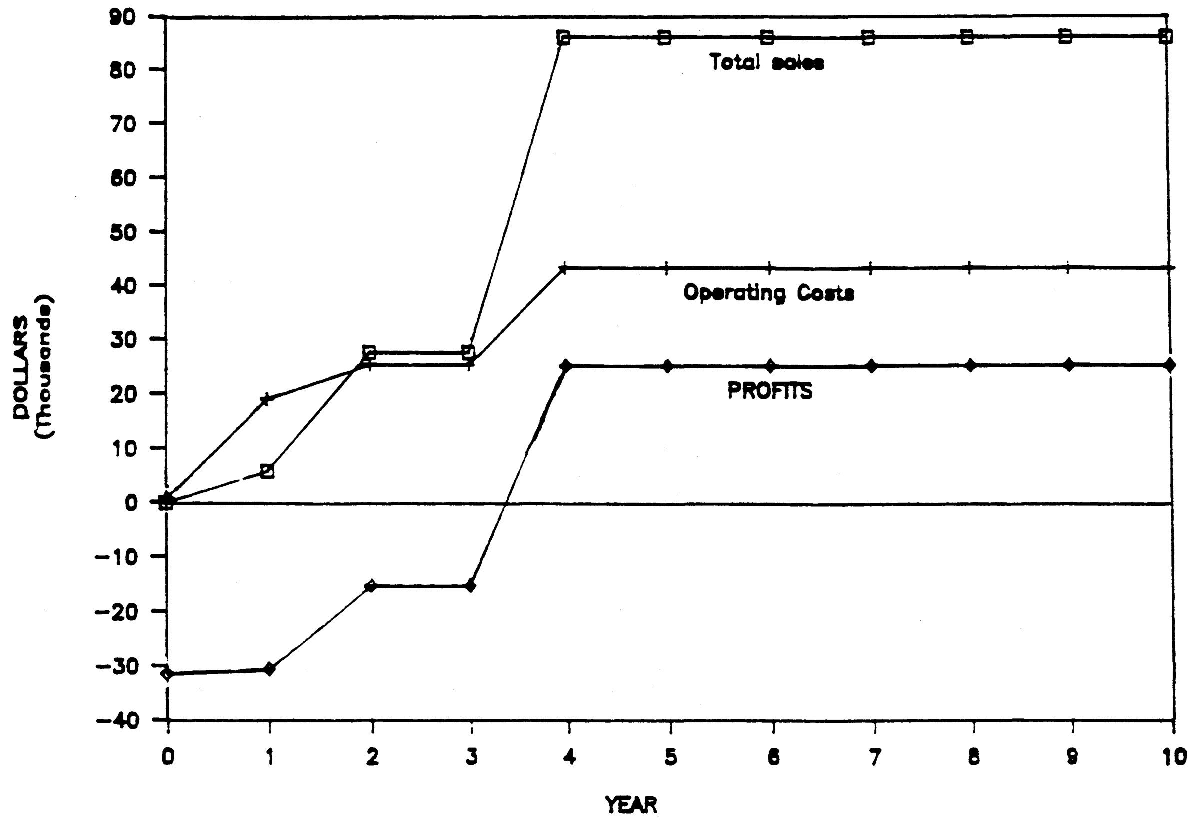


FIGURE 10
ANNUAL CASH RETURNS FOR A RETAIL NURSERY
AT VARYING PRICE LEVELS

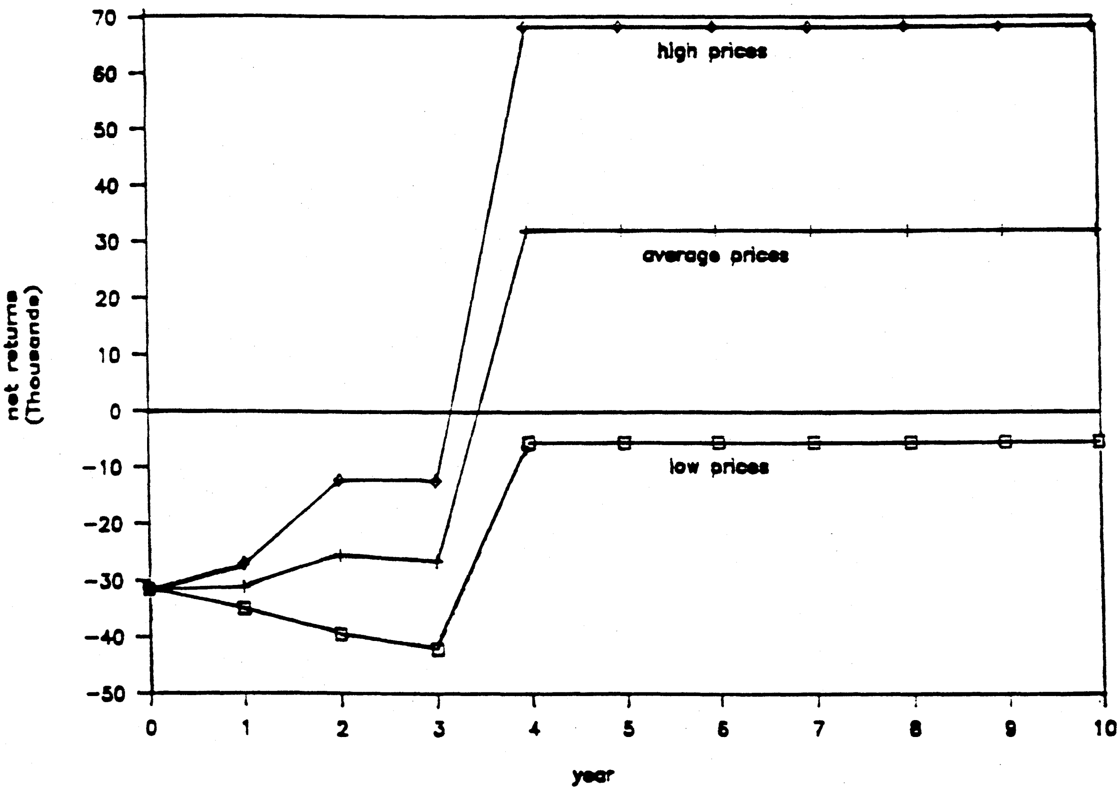
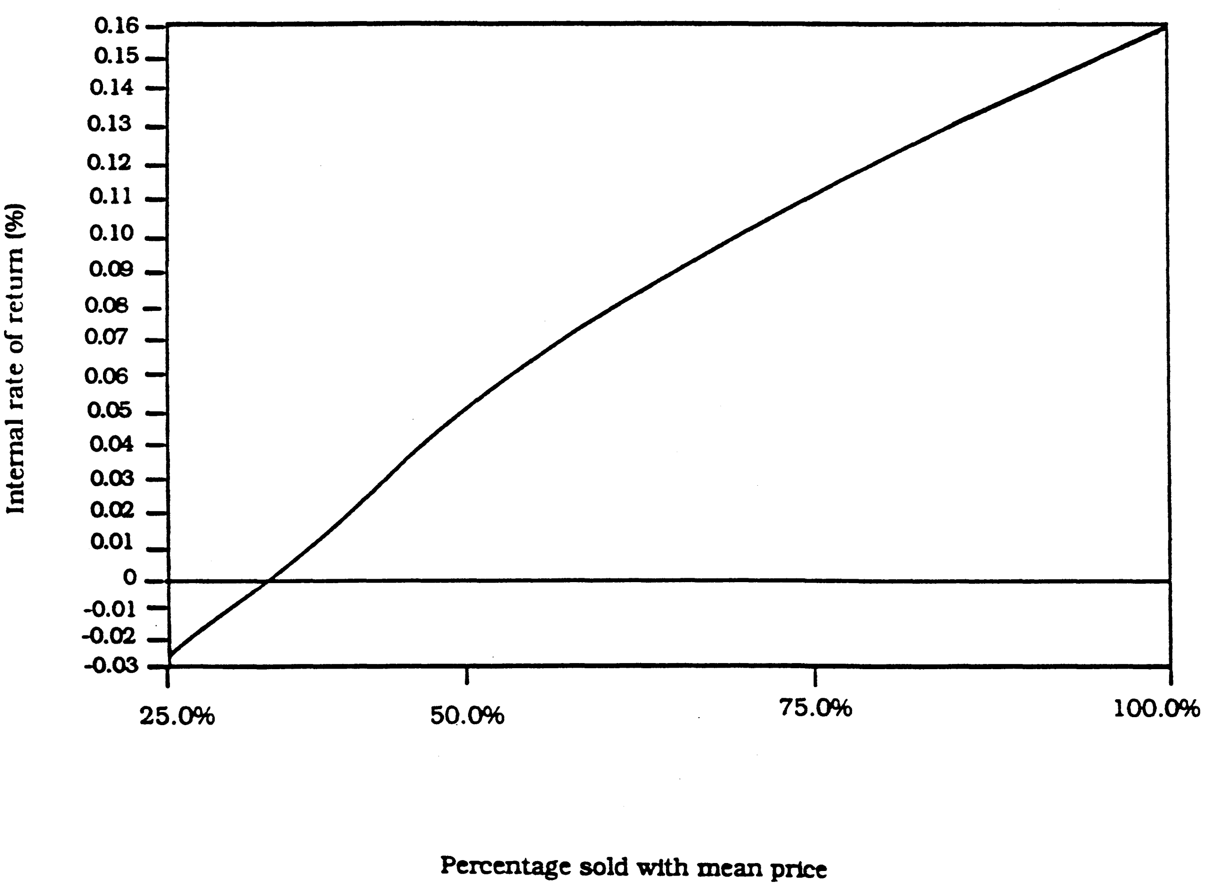


FIGURE 11

INTERNAL RATE OF RETURN FOR THE NURSERY OPERATION VARYING THE PROPORTION OF PLANTS SOLD AT THE MEAN PRICE AND LOW PRICE LEVELS



E. Other Potential Crops

This section covers several additional small acreage crops. First is an economic analysis of a small acreage vegetable production / farmers market operation. Then we evaluate two other specialty crops, tepary beans and mint.

Community Member Production for a Farmers Market

The idea that Community members produce small acreages of vegetables to be sold directly to consumers in the Phoenix metropolitan area is appealing to some Community leaders. Such operations would provide members with income directly from the land without having to deal with leasing to off-reservation farmers. Indeed, vegetable production is generally a more profitable venture than most other agricultural opportunities. A hypothetical vegetable operation producing five varieties is evaluated at varying acreage levels. Since the variations in such an operation are too numerous to all be evaluated, several simplifying assumptions are made. First, only five crops are considered, and there are always equal acreages of each being produced. Also, we are concerned, and there are always equal acreages of each being produced. Also, we are concerned with total acreage farmed as opposed to individual farmer shares. An evaluation of the latter would require information on individual incomes; information that is not available. So the returns to the growers and tribe generated in this analysis are returns to the total acreage farmed and not to an individual grower.

The basis of the operation is an equipment leasing facility for all the equipment necessary to produce the vegetables and a farmers market. The equipment component is large enough for 100 acres of vegetables. Interest and depreciation costs are charged on a per acre basis to the growers, with the tribe making up the difference. The purpose for this is to allow interested individuals the chance to enter into production at a small acreage and operating capital requirement and be protected from the high fixed costs associated with small scale production. If Community interest is enough to result in participation rates of 100 acres, then all interest and depreciation charges are paid by the growers. Since it is the tribe's objective to encourage individuals to start vegetable

TABLE 4
REVENUES AND COSTS OF PRODUCING BROCCOLLI, DRY ONIONS, GREEN ONIONS, RADISHES, AND SWEET CORN IN A COMMUNITY RUN TRUCK FARM OPERATION

Production	**Total ac: Ac/crop: Prices**	**5 acres 1 acre**	**25 acres 5 acres**	**50 acres 10 acres**	**100 acres 20 acres**
Broccoli (14 b/crtn)	$5.91	$375	$1,875	$3,750	$7,500
Dry onions (50# bag,p)	4.71	1,166	5,830	11,660	23,320
Green onions (4 doz/cr)	4.05	1,128	5,640	11,280	22,560
Radishes (4 doz/crtn)	4.48	865	4,325	8,650	17,300
Sweet corn (5 dz ear/cr)	6.15	200	1,000	2,000	4,000
TOTAL REVENUES ($)		17,382	86,909	173,817	347,634
COSTS ($)					
Machinery fuel and oil		173	865	1,730	3,460
Materials and Service		9,013	45,063	90,127	180,253
Labor		463	2,315	4,630	9,261
Water		44	566	1,133	2,266
TOTAL		9,692	48,810	97,620	195,240
RETURNS OVER VARIABLE COSTS ($)		7,689	38,099	76,197	152,395
GROWER FIXED COSTS ($)					
General Farm Maintenance		85	425	850	1,700
Water Assessment		67	335	670	1,340
TOTAL		152	760	1,520	3,040
GROWER RETURNS ($)					
TO LAND,MGT.,AND CAPITAL		7,537	37,339	74,677	149,355
EQUIPMENT COSTS ($)					
Housing and insurance		104	520	1,040	2,080
Equipment repair		218	1,092	2,184	4,368
Depreciation		680	3,398	6,796	13,591
Interest		1,004	5,020	10,040	20,080
TOTAL		2,006	10,030	20,060	40,119
MARKETING COSTS ($)					
Utilities and insurance		292	1,085	2,075	4,057
Sales and stocking		2,169	10,846	21,692	43,385
Interest on market bldg.		19	94	188	375
TOTAL		2,480	12,024	23,955	47,817
Returns to Land & Allottee		3,051	15,284	30,662	61,419
ANNUAL COSTS TO THE COMMUNITY ($)					
Allottee benefits		3,051	15,284	30,662	61,419
Costs					
Management and supervision		986	4,928	9,848	19,688
Interest on machinery		19,076	15,060	10,040	0
Machinery replacement (depr.)		12,912	10,194	6,796	0
Interest on marketplace struct.		356	281	188	0
TOTAL		33,330	30,462	26,871	19,688
Net benefits to allottee and Community		-30278.49	-15177.98	3791.66	41730.83

farming, this subsidy paid by the tribe can be seen as a human investment cost. The average investment for the production equipment is $160,000 and for the farmers market, $40,000.

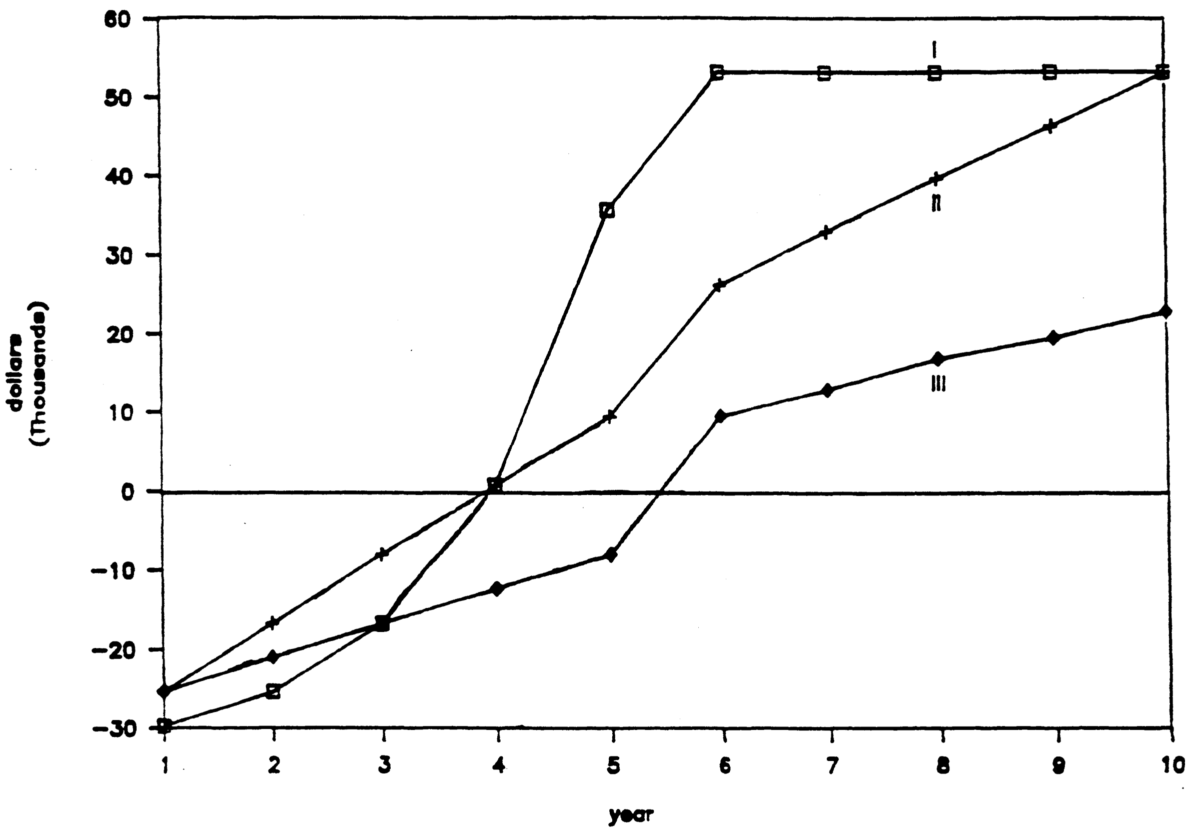
The costs and returns to the grower are summarized in Table 4 for five crops at varying quantities of acreages. The crops chosen are a group of medium and high risk crops chosen from the market window analysis in Section II. Average gross returns for one acre per crop (five acres total) is $18,523 and for 20 acres per crop (100 acres total,) is $370,452.

The returns to growers are considerably more than leasing. Subtracting the lease revenue as an opportunity cost of the land still yields a positive return, indicating a more profitable alternative in the long run. There are, however, several risky aspects to such an operation. First, price volatility of vegetable crops makes such an operation financially risky even though profitable in the long run. Another source of risk for this operation that the Community must consider is that since there is no member farming on the reservation, there is the distinct possibility that Community members will not participate in such an operation or will participate at levels below 100 acres, requiring the Community to subsidize capital costs permanently. These two sources of risk are considered over a ten year planning horizon.

To determine annual net benefits, the costs of the tribal investment (the cost of paying the difference on the interest and depreciation charges for the equipment, housing, and farmers market plus the management fee) is subtracted from total grower returns to land for each year, Figure 12. The greater the number of acres farmed (the greater the participation) the lower the subsidy cost required by the Community.

Three different participation rates are assumed. Participation rate I is a rapid rate where the acreage doubles each year until 100 acres are farmed at year six. Participation rate II is a slower rate where the acreage increases additively by ten acres per year, reaching 100 acres at the end of the planning horizon. The last rate is a deficient rate where the acreage reaches 55 acres at the end of ten years.

FIGURE 12
YEARLY COSTS AND RETURNS TO A COMMUNITY VEGETABLE PRODUCING OPERATION AT VARYING PRICES AND PARTICIPATION RATES



I. Participation doubles each year until year six when 100 acres are reached.

II. Participation increases additively by ten acres per year.

III. Deficient participation where only 55 acres are achieved after 10 years.

The profitability of the three participation rates are evaluated at varying price levels, Table 5. The "breakeven" acreage level at mean prices can be approximated by referring to the deficient participation rate. In other words, the program will not be profitable, if after ten years, less than 55 acres are being farmed. Assuming low prices the "breakeven" acreage increases to 66 acres.

TABLE 5
INTERNAL RATE OF RETURN FOR THE COMMUNITY VEGETABLE PRODUCTION PROGRAM AT VARYING PRICE LEVELS AND PARTICIPATION RATES

	Low Price	Average Price	High Price
Particip. Rate I	15.4	29.7	41.8
Particip. Rate II	9.4	25.7	41.0
Deficient Part.	-15.5	-0.3	11.0

Tepary Bean Production

Tepary beans, an indigenous crop historically consumed by Native American societies in the Southwest, were cultivated on the project's demonstration farm during 1986. The primary market for the beans will be for sale to Community members. Per acre costs of production are estimated in Table 6. The operations are the same used for many field and vegetable crops. Two crops per year can be produced if the first crop is planted in March and harvested by July. A preliminary budget was estimated based upon a limited amount of production research. A comparison of the preliminary budget with the actual pilot project, Table 7, suggests that more savings can be made by reducing the quantity of water applied. A caution must be made concerning the comparison of the preliminary results with the actual figures. Neither set should be taken as the best indicator of the true costs associated with a commercial operation. The preliminary budget should be used to suggest where the manager could look for possible savings.

While production of tepary beans can be considered largely a success, a caution must be noted concerning the market potential for such a crop. The market for tepary beans is generally

TABLE 6
A PRELIMINARY BUDGET FOR TEPARY BEANS

Operations	Per Acre Operating Cost ($) Machine	Labor	Service	Materials	Total Cost
Disk	10.25	2.76			13.01
Plow	8.31	4.15			12.46
Float	4.58	2.77			7.35
Apply fert./manure list	4.04	1.04			5.08
Preirrigate		6.59			6.59
Mulch	4.04	1.04			5.08
Plant	5.61	5.53		6.4	17.54
Organic herbicide					0
Irrigate		10			10
Cultivate	2.96	2.08			5.04
Irrigate		5			5
Cut root	14.45	0.42			14.87
Harvest			30		30
Haul	31.55	18.27			49.82
Hand clean				100	100
Total	85.79	59.65	30	106.4	281.84

TABLE 7
COMPARISON OF PRELIMINARY ESTIMATES AND ACTUAL EXPERIMENTAL COSTS FOR TEPARY BEAN PRODUCTION

	Per Acre Operating Costs ($)	
	Preliminary Budget	Pilot Project Costs
Disk	13	48
Plow	12	18
Float	7	
List	5	
Mulch	5	
Total Seed bed Preparation	43	66
Plant	18	10
Cultivate	5	8
Total Planting Costs	23	18
Irrigation labor	22	18
Irrigation water (excess water @ $6.75 / a-f)	12	17
Total Irrigation Costs	34	51
Apply herbicide		
Apply fert.		
Total Chemical Appl. Costs	0	0
Undercut root	15	16
Harvest	30	102
Haul	50	34
Hand clean	100	224
Total Harvest & Misc. Costs	195	37
TOTAL COST OF OPERATION	272	493

among Native Americans in the southwest (though a market may be developed in northern Mexico,) so any significant development of tepary bean production could very likely saturate the market. This particular crop should at most be produced in small acreages in conjunction with other crops.

A still more important aspect concerning the market for tepary beans is that the market is largely untested except for a few outlets. A high degree of risk is associated with a new product and the uncertainty related to potential profit should be considered before initiating significant production.

Mint Production

Other potential specialty crops are peppermint and spearmint. While there are serious doubts about the agronomic feasibility of such crops in the arid southwest climate, the Cooperative Extension Service is in the process of evaluating them, so a preliminary economic assessment is warranted. The purpose of this assessment is not so much to evaluate the profitability of mint since major agronomic questions have yet to be answered, but to identify aspects of production and marketing of mint which must be investigated before commercial production is initiated.

Mint production uses similar machinery as alfalfa except that a mulcher is used to plant mother roots not seed. One acre of mother root can plant about five acres of mint. Like alfalfa, mint is produced for a period of years before other crops are rotated onto it. In the midwest, mint is grown on a field for three to five years and then rotated off because of disease problems. Since mint has never been produced in the arid southwest, there is a potential to produce mint longer on a piece of land. However, there is no assurance that the same pests will not occur here. A potential competitive advantage to mint production in the arid southwest, however, is that the low winter temperatures means that as many as three or four cuttings per year are possible.

There are several agronomic questions that must be considered before embarking on commercial mint production. Perhaps the most important is the quality of mint that can be produced in Maricopa County. High summer temperatures could affect the oil by evaporating much of the "volatiles" (organic components within the oil) and thereby lowering the quality of the oil produced (and therefore the price received). Water requirements are another important uncertainty. Preliminary estimates by the Cooperative Extension Service indicated that around 4.5 to 5.5 acre feet of water are required per season.

Average prices for peppermint as of summer 1987 range from $12 to $14 dollars per lb. of oil. This price is quoted from buyers located in Oregon and varies due to small differences in the chemical make-up and contaminants in the oil peculiar to different regions. While this implies that a certain amount of variation can occur in the oil, there are generally only two classes of marketable oil, acceptable and unacceptable. (There does seem to be a small secondary market for low quality oil with pesticide producers. However, there is no indication that a similar market exists in the west).

A schedule of operations and production costs is presented in Table 8. The operations listed are only preliminary since there is no commercial operation in Arizona. The fertilizer quantities used in this analysis are taken from recommendations from the mid-west and by the County Extension Agent. Specifically, 100 units of nitrogen and 150 units of phosphorus are applied as well as 150 lbs of available potassium in the form of potash (K_2SO_4) before planting. Planting costs are similar to mulching since a modified mulcher is used to plant the mother root.

The most important factor concerning the feasibility of mint production in arid southwest will be whether the quality of the oil is good enough to sell. If the quality is acceptable, the potential returns to producing can be considerable. The market for mint oil is large and there is little chance that one new entrant can significantly affect the market price.

TABLE 8

PRELIMINARY ENTERPRISE BUDGET FOR PRODUCTION OF MINT IN THE DESERT SOUTHWEST

STAND ESTABLISHMENT and FIRST YEAR PRODUCTION

	Labor usage hrs/acre	Labor usage Cost ($)	Mach Cost ($)	Service & Materials ($)	Total Cost ($)
Chisel	0.238	1.56	3.37		4.93
Plow	0.286	1.88	4.79		6.67
Apply Fert.				25.00	25.00
Disk	0.189	1.24	3.36		4.60
Lasar plane	0.571	3.75	7.83		11.58
Make borders	0.050	0.33	0.43		0.76
Plant	0.222	1.46	2.34	33.00	36.80
Irrigate	0.700	3.68		0.00	3.68
Herbicide				4.68	4.68
Swathing	0.4	2.63	7.41		10.04
Rake	0.333	2.19	3.20		5.38
Haul	0.2	1.31	2.74		4.05
TOTAL	3.189	20.02	35.47	62.68	118.18
Production Costs During Years Two through Four					
Apply insect.				9.14	9.14
Apply herb				4.68	4.68
Irrigate	3.752	19.71		94.59	118.06
Apply herb				4.68	4.68
Swathing	0.600	3.94	11.12		15.66
Raking	0.500	3.28	4.93		8.71
Apply fert.				29.25	29.25
Renovate	0.020	0.13	0.20		0.35
Haul					0.00
TOTAL	4.872	27.07	16.25	142.34	190.53
Hauling					5.00
Processing Costs					20.00
MINT OIL PRODUCTION COSTS					215.53

COSTS AND RETURNS PER ACRE FOR MINT OIL PRODUCTION

		Qty per cut per acre	
Mint oil yield-lb.	35		105
Mint oil price-$/lb		13.00	
Revenue ($)			1,365
- Production Costs ($)			216
Returns over - Production Costs ($)			1,149
Ownership Costs ($)			
-Field Equipment			
-Processing Equipment		35.00	
Water Assessment		13.00	
Gen. Farm Maint.		7.00	
Total Overhead		55.00	
Returns to Land & Mgt. ($)			1,094

V. Conclusions and Recommendations

Alternatives to conventional agriculture exist for the desert southwest. These crops are, over the long run, more profitable and will be an important part of Arizona agriculture. However, successful operations require new thinking in management as well as land use policies. Managers must be much more market oriented as market niches for specialty crops open and close. Land use policies must also be more flexible as crops change that have different risks and cashflows. Though specialty crop markets have the potential for higher profits, they are also extremely risky. Managing the level of risk a planner or decision-maker is willing to face, then, has become an important tool in farm management.

There are several sources of risk that must be considered when choosing a set of high risk and low risk components in an agricultural portfolio. One is price volatility, an important consideration in vegetable crops. Other sources, such as production risk are also important. Production may vary due to unpredictable changes in environmental charateristics such as rainfall or pest problems. It may also vary due to simple lack of available knowledge about appropriate production techniques, as will be the case for many specialized crops.

A final source of risk that always must be considered is the general uncertainty about the size of the market. If a commodity has a very limited market, additional production from a new entrant could severly reduce the market price, making the operation unprofitable. The analysis of the retail nursery operation assuming the low prices is a good example. (Though this is not to imply that in the case of containerized plants, this will in fact happen.)

This last source of risk can be seen in the section summarizing the feasibility studies. The more specialized the market the higher the risk and the higher the return. The profitability of a conventional farm operation producing crops that are highly sensitive to world market prices are very low (negative, in our estimation) while the market for citrus has a higher return. Finally, containerized plants, which have a very specialzed market in the Phoenix area have an even higher profitability. However, while profitability increases as the market becomes more specialized, so does risk.

The market analyses that were conducted give a mixture of high risk and low risk crops from which a planner can choose. Alfalfa is seen as a good low risk crop with a relatively stable yearly return. (It must be stressed that while alfalfa prices are obviously not sensitive to any world price, the widespread production of alfalfa as a rotation crop reduces the price volatility enough to classify it as a low risk crop. Furthermore, the practice of forward contracting for alfalfa also reduces price variability.) While kale and radishes seem to have appealing risk / return characteristics, the market size would be an important consideration before investing heavily in these crops.

The differences in relative risk / return characteristics make no two crops really comparable. The decision-maker must choose not just one crop but a group of crops that reflect the his or her attitudes toward risk. The high risk, speculative ventures must be balanced by low risk operations to maintain cashflow and the portfolio risk at an appropriate level. What the level of risk is will depend upon the risk attitudes of the managers and owners.

The Community and allottees will face two possibilities in choosing a high-risk operations. Allottees will either have to accept variable returns from year to year with some years having little or no returns to land, though average returns would be much higher than the present lease payment. If, however, variable cash payments to allottees are politically unacceptable, than the tribal administration will have to absorb these losses in the hopes of regaining them in successive years.

Low-risk operations such as cash leasing can continue to provide a stable source of revenue to the community but will remain a low productive source and very possibly a declining source of revenue.

Recommendations

The information presented in detail above does not give specific policy alternatives to pursue and indeed cannot prescribe specific policy. The policy can only come from the objectives the Community sets for its lands and the impact the information presented has on those objectives. While there has been no explicit statement of Community goals involving agricultural land to our knowledge (other than to keep the land in agricultural use), there are indications of certain objectives the Community would like to achieve. In particular, there appears to be a desire to continue agricultural leasing and stabilize annual lease revenues. There also appears to be a desire to develop the capability to advise and encourage Community members to utilize the land themselves. From the general goal of continued agricultural production on Community lands, two objectives can be identified: agricultural leasing and Community member farming. Another objective which might be considered, in light of the information developed, is alternative arrangements such as profit sharing and joint ventures.

The economic climate in Arizona agriculture is becoming increasingly variable, so our first recommendation is for an agricultural manager with a background in evaluating agricultural operations, not only for the standard cash leases but also for alternative arrangements such as joint ventures and share tenancy.

The second recommendation assumes that the Community will want to proceed more formally into agricultural production. Due to the high risk nature of specialized crops, market niches may open and close relatively quickly. To be able to evaluate the potential profitability of a new crop, the Community must have an institutional structure which can respond. We recommend that a demonstration farm be established for the purpose of evaluating new crops and new markets. This farm, however, should have a dual objective: the first objective is to maximize profits, and the second objective is to serve in a research and extension capacity for Community members interested in producing specialized crops.

An operation of this nature would require the hiring of both a production specialist or agronomist and a marketing specialist (which could be the agricultural manager with an expertise in marketing). In many specialty crops there is neither production information nor market information readily available to a manager. Therefore these positions would serve the function of generating information for the demonstration farm and any Community member who might be interested. In this way information about new crops, new markets, or new production techniques can be distributed to the community much quicker than only relying upon the Cooperative Extension Service.

APPENDIX A

MARKETING STUDIES

This appendix discusses the techniques and results of the market evaluations of alfalfa and vegetables. Market analysis of any new crop or operation is an important first step in evaluating the feasibility of a business decision. For conventional crops with markets already well established and well defined, extensive market analysis is easy and less important than for new crops. However, with new crops, the historical record on market and price information may be incomplete at best or non-existent at worst. As discussed extensively in the main body of the text, it is this aspect of new crop development that is a major source of risk. For this reason the extent of market analysis required varies from product to product. For example, the alfalfa market is a well-defined market with both price and quantity data available. As such an actual econometric model can be developed to forecast prices, which can be used by growers to aid them in their planning.

The first part of this appendix reviews an Extension Bulletin explaining the "on-farm" price forecasting model developed by Dr. Steven Blank[1]. The model developed, however, forecasts average alfalfa prices across the state which are usually around ten dollars lower than Maricopa County prices. This is due to the fact the almost all the dairies in the state (the primary buyer of alfalfa), are located in Maricopa County. To use this model to forecast Maricopa County prices, prices can be adjusted upward by ten dollars per ton.

The final section reports the results of the market window analysis on twenty-eight different fresh vegetables. Unlike the forecasting model, the market window analysis cannot forecast a price. The prices used in the analysis are simply averages from the

1. Blank, Steven, C., "On-Farm Price Forecasting," Cooperative Extension Service, Bulletin No. 8660, University of Arizona, September, 1986.

previous seven to ten years and should not be used to forecast a forthcoming year. They can, however, indicate general conditions as long as structural factors such as market size, market penetration by other producing regions, and institutional factors are the same. As such the information that can be obtained from this technique is much more general than an actual price forecast (a market window analysis does not evaluate price and quantity relationships like an econometric model would), and therefore more uncertain than the previous technique. However, given the level of information available, market window analysis is the only technique that can be used.

A Summary of "On-Farm Price Forecating"

An important part of evaluating the feasibility of an agricultural project is market assessment. The decision - maker evaluates the expected demand and market size for a product. Price estimation requires accounting for both supply and demand for a commodity as well as prices of substitutes. For most agricultural commodities this process may just require forming a subjective estimate of expected price and indeed for many commodities, such simple estimates may be all that is required. Other commodities that exhibit more price fluctuation may require more analysis. One such technique to estimate prices directly is using a statistical price forecasting model.

Supply is affected by the quantity of acreage under production and the productivity. Since generally one is also concerned with price in a certain area such as a county, state, or region (the desert southwest for example), supply is also affected by quantities imported into the area of concern.

The demand side of the model is usually represented as a price and prices of substitutes. For a statistical model historical prices are used and statistical techniques isolate the influence of different factors. As can be noted from this discussion, the market clearing price (the price that one sees in the market) results from a very complex system relating diverse factors such as land under production and productivity to prices of substitutes. For this reason a simple historical trend line is clearly inadequate.

The model developed for estimating average alfalfa prices in Arizona was developed at the University of Arizona and can be used in an electronic spreadsheet program or with a good hand calculator. The model can be divided into two parts, the overall supply and demand equations and monthly price equations. All of the data for the variables are taken from annual publications of the Arizona Agricultural Statistal Service. The first part of the model estimates acreage under production and a statewide average price for alfalfa in the month of April:

$$AA_t = 69.27042 + 0.71059AA_{t-1} - .2403808GSP_{t-1}$$

$$(2.62) \qquad (6.02) \qquad (-3.04)$$

$$R^2 = .875$$

$$AP_t = 91.31724 - .3924694AA_{t-1} - .382466AA_t + .2667277CNP_t$$

$$(2.09) \qquad (-3.05) \qquad (-2.28) \qquad (4,72)$$

$$+ .04338784LS_{t-1} + .4527487DS_{t-1}$$

$$(2.60) \qquad (1.74)$$

$$R^2 = .964$$

where:

AA = Arizona alfalfa hay acreage harvested (1,000 acres);
AP = Alfalfa hay price <u>during April</u> ($/ton);
CNP = Average corn price ($/ton);
DS = Dairy cattle on farms (1,000's);
GSP = Average grain sorghum price during November ($/ton);
LS = Total cattle on farms (1,000's); and
t = year.

The next series of equations estimates statewide average prices for each month beginning in May and ending in March:

May = -.57014 + .9897783April

(-0.29) (30.55) R^2 = .980

June = 3.2086 + .88743May

(1.85) (28.76) R^2 = .977

July = 2.300372 + .9229608June

(1.27) (28.56) R^2 = .978

August = 2.128906 + .922173July

(1.19) (28.56) R^2 = .977

September = 2.4843115 + 1.024418August - .0256441HS

(0.63) (22.36) (-1.23) R^2 = .976

October = 8.233275 - .991549September - .0620174HS

(1.76) (19.04) (-2.45) R^2 = .971

November = 1.238343 + 1.037292October

(0.67) (32.04) R^2 = .982

December = 1.147111 + 1.2047November

(0.83) (44.35) R^2 = .990

January = 0.1668456 + 1.02047December

(0.07) (26.79) R^2 = .974

February = 0.1900994 + 1.006516January

(0.15) (24.83) R^2 = .992

March = 4.09311 + .9359748February

(1.68) (24.83) R^2 = .969

where HS is hay stocks (1,000 tons) in Arizona on May 1.

There are two limitations of the model as a management tool. First, much of the information needed to calculate the price forecast is not available until the Arizona Agricultural Statistics Service Annual Report is out in July. This means that from May to July the model cannot be used. Since planting decisions concerning alfalfa are not made until fall this may not necessarily be important. There also may be longterm changes in economic conditions that may affect the estimated parameters. A user should always be aware that a model such as this will eventually become obsolete.

Market Window Analysis

This section discusses the market window analysis and presents the graphical results of the market window analysis conducted be Ted Goldammer and Dr. Steven Blank[2] on 28 different varieties of fresh produce.

As discussed in the text of this report, market window analysis compares produce prices over a portion of the year with estimated breakeven prices. When average prices are greater than breakeven prices, the vegetable evaluated is potentially profitable. For this study a market window exists if the average price remains above the breakeven price for over one month.

Average prices used in the analysis are weekly average prices over several years of buying seasons (in this analysis, seven years are used). Prices are taken from weekly prices recorded by the Market News Service of the USDA out of both Phoenix and Los Angeles. If a commodity price is not recorded in Phoenix but is recorded in another location, a transportation cost is added to the price.

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2. Their analysis is also included in a general Extension Bulletin that includes the commodities in this report as well as consideration of out-of-state market windows. See Steven C. Blank and Ted Goldammer, "Market Windows for Arizona's Produce," (Publication Pending) Cooperative Extension Service, University of Arizona.

Breakeven prices are estimated using standard budgets published by the University of Arizona[3] and surveys of growers, packers, and brokers in Arizona. In the following graphs, breakeven prices are represented by the horizontal line that crosses the lower part of the graph. Prices are represented as high, low, and average (median). The Market News Service records for each week a high and low price and a median price is calculated to get a point estimate.

3. Hathorn, Scott and Fred Harper, "1987 Vegetable Crop Budgets, Maricopa County, volume 1 and 2," Coopertive Extension Service, University of Arizona, June 1987.

FIGURE A1
F.O.B. Broccoli Prices

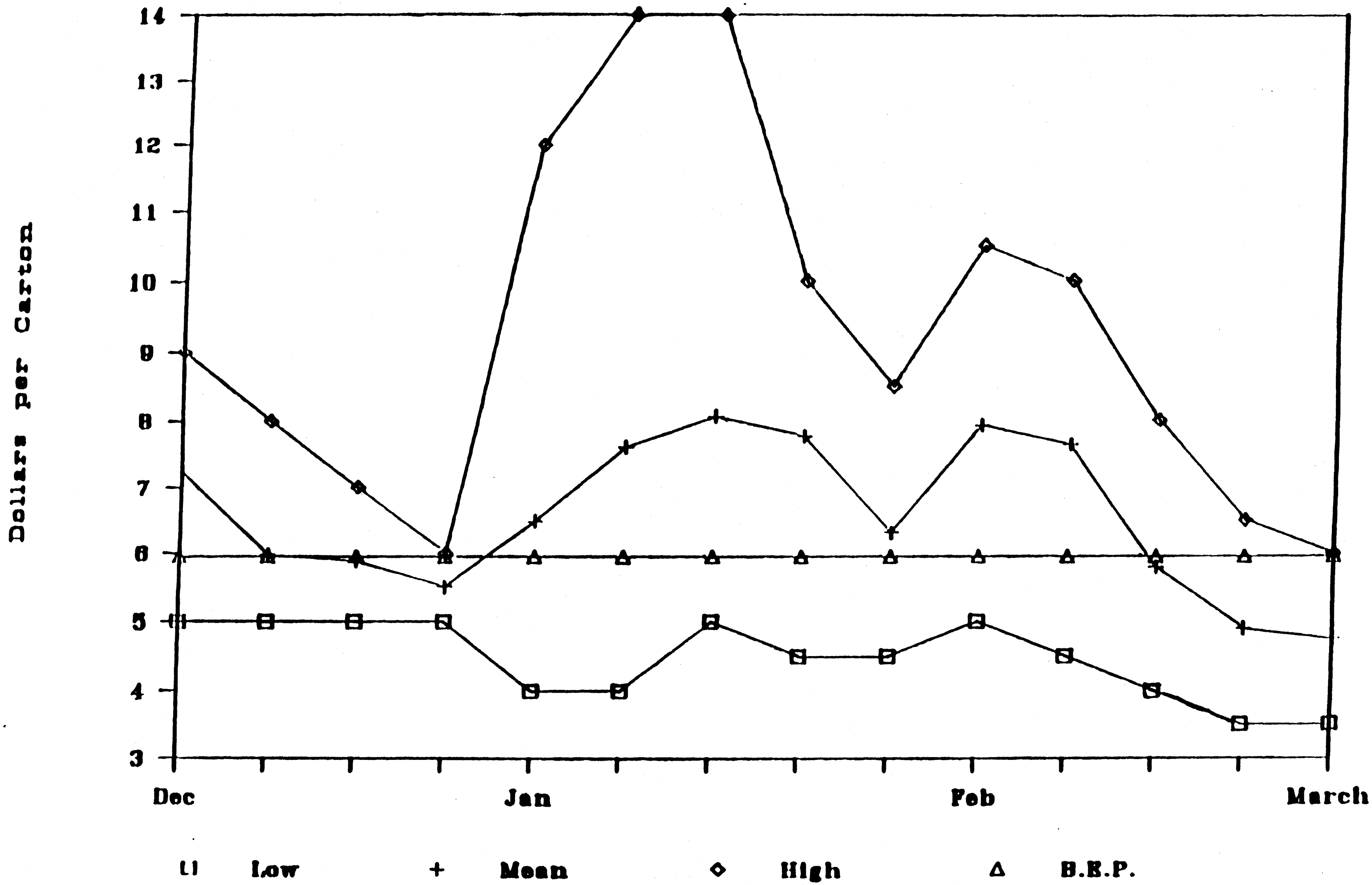


FIGURE A2
F.O.B. CABBAGE PRICES - 24 heads per carton

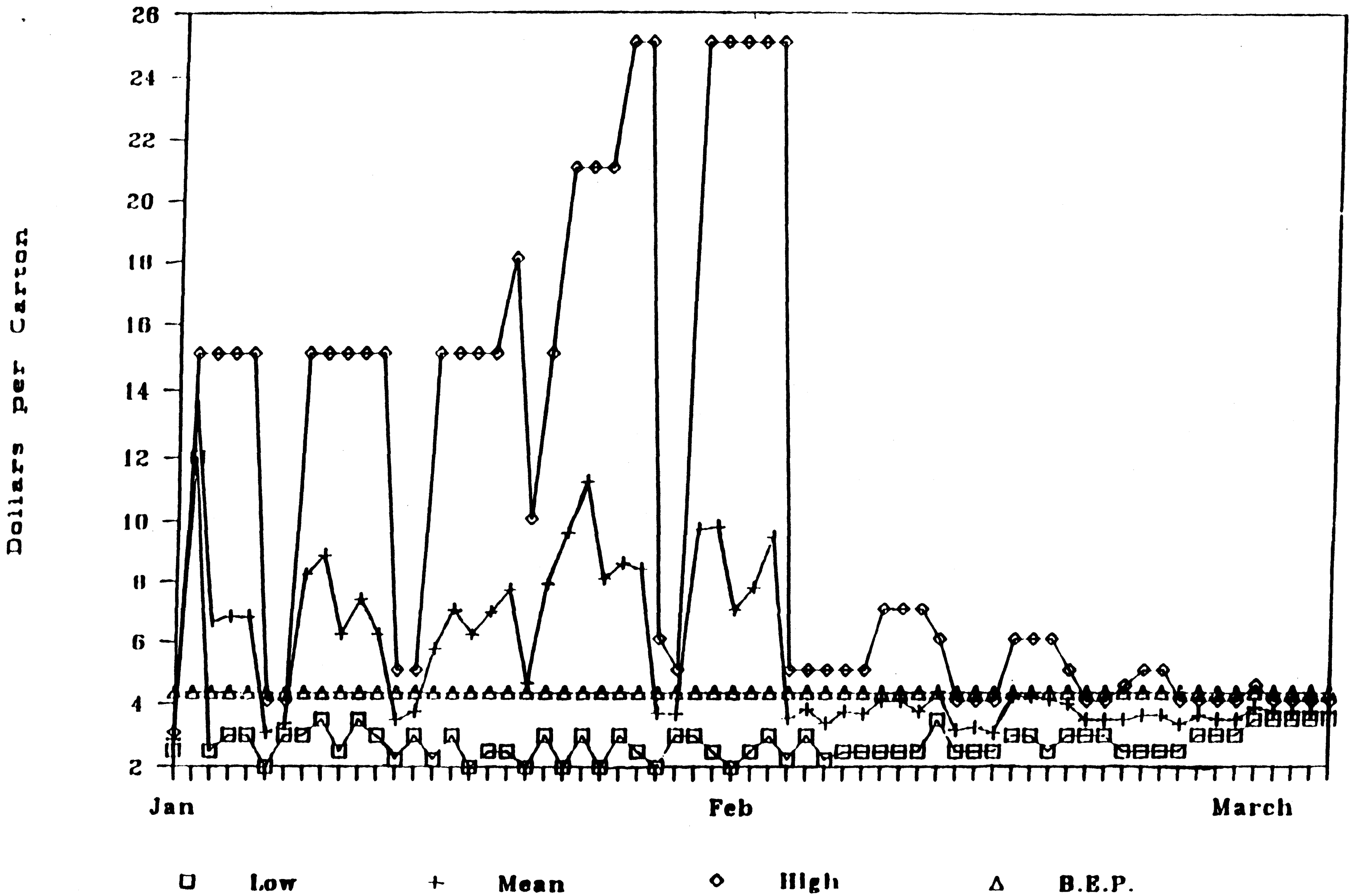


FIGURE A3
F.O.B. Carrot Prices - 48-1lb. bags per carton

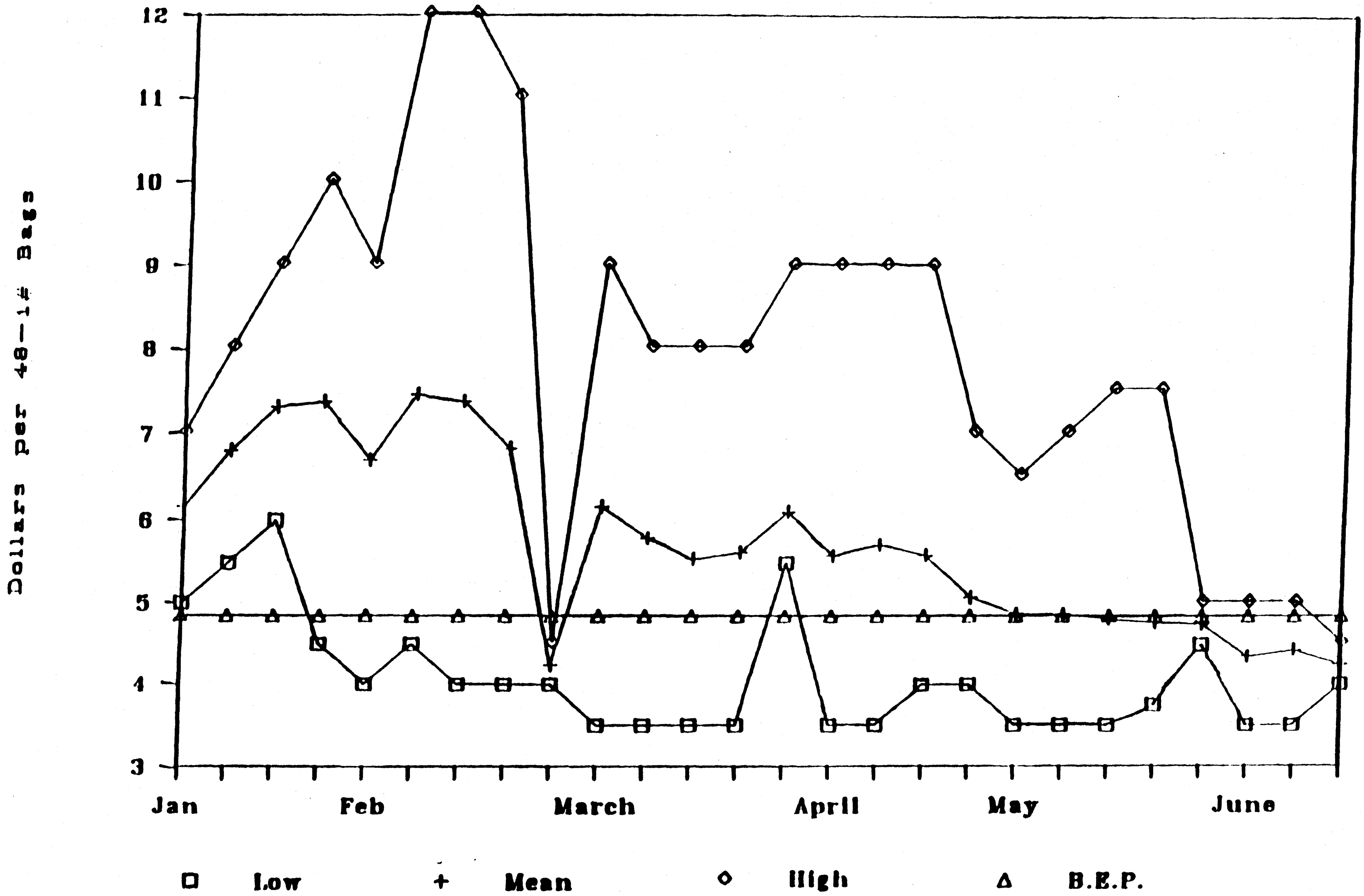


FIGURE A4
F.O.B. Carrot Prices - 50 lb. sacks

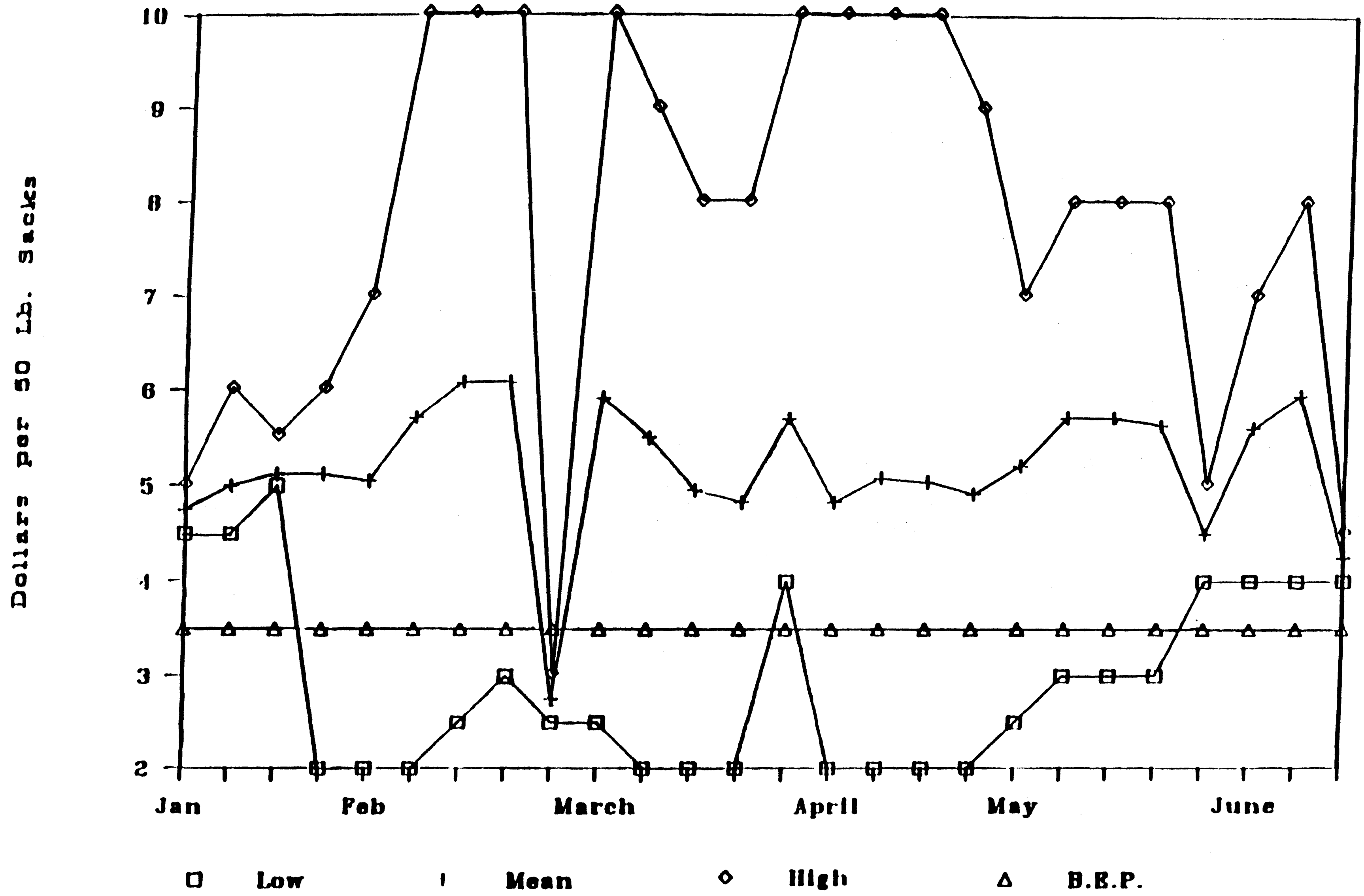


FIGURE A5
F.O.B Fall Cantaloupe Prices - 12s per 1/2 carton

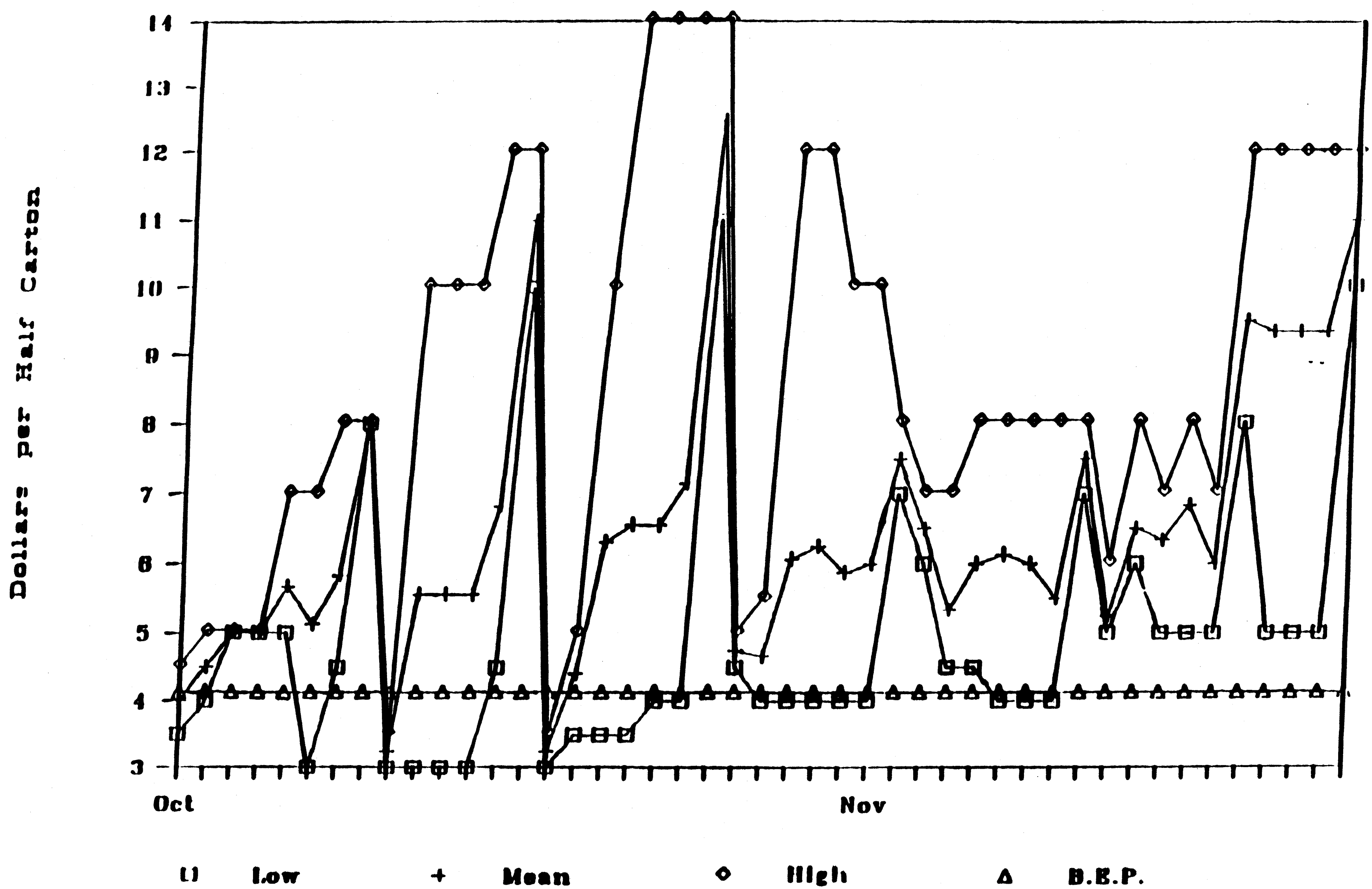


FIGURE A6
F.O.B. Fall Cantaloupe Prices 15s per 1/2 carton

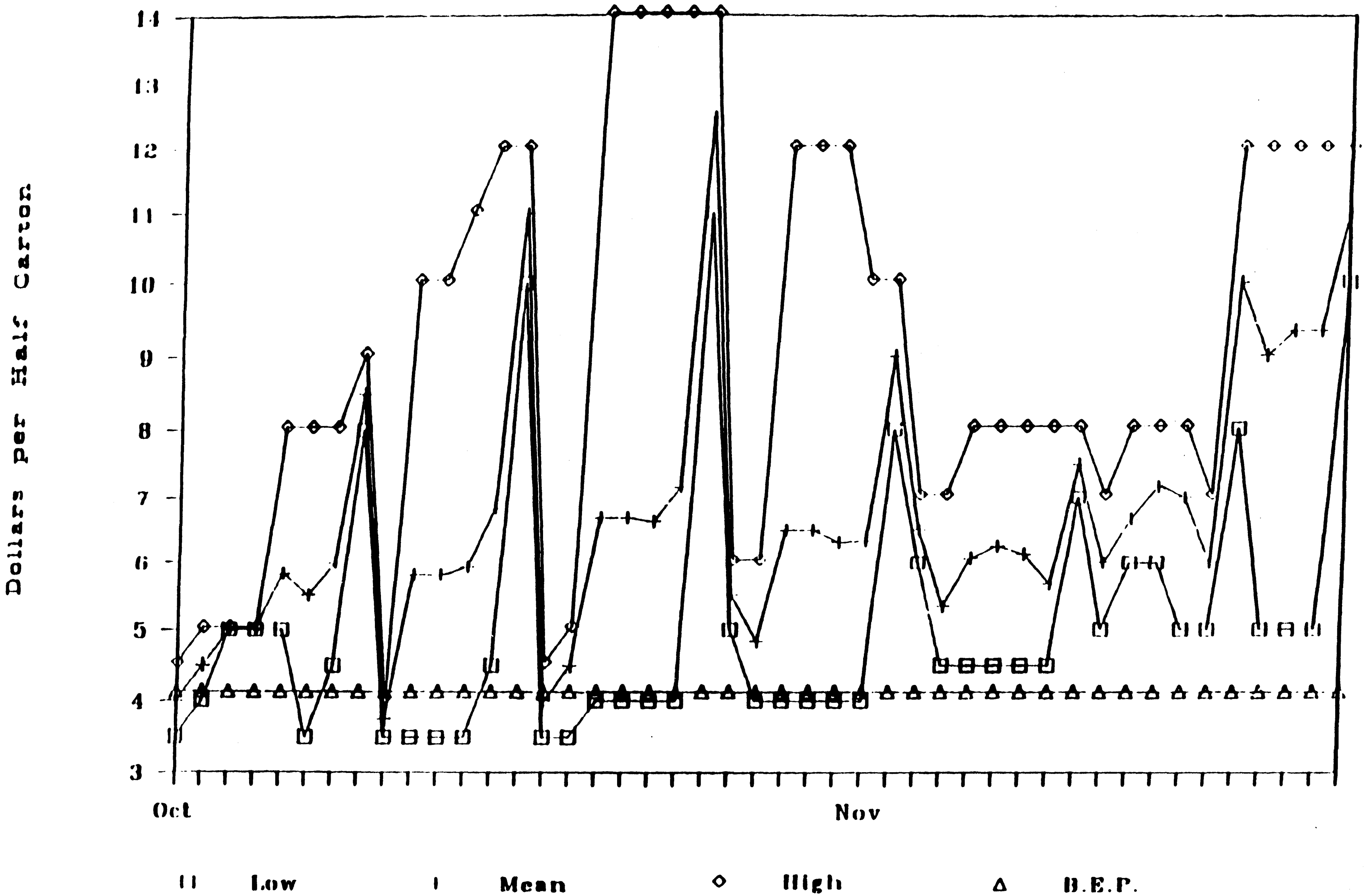


FIGURE A7
F.O.B. Fall Cantaloupe Prices - 18s per 1/2 carton

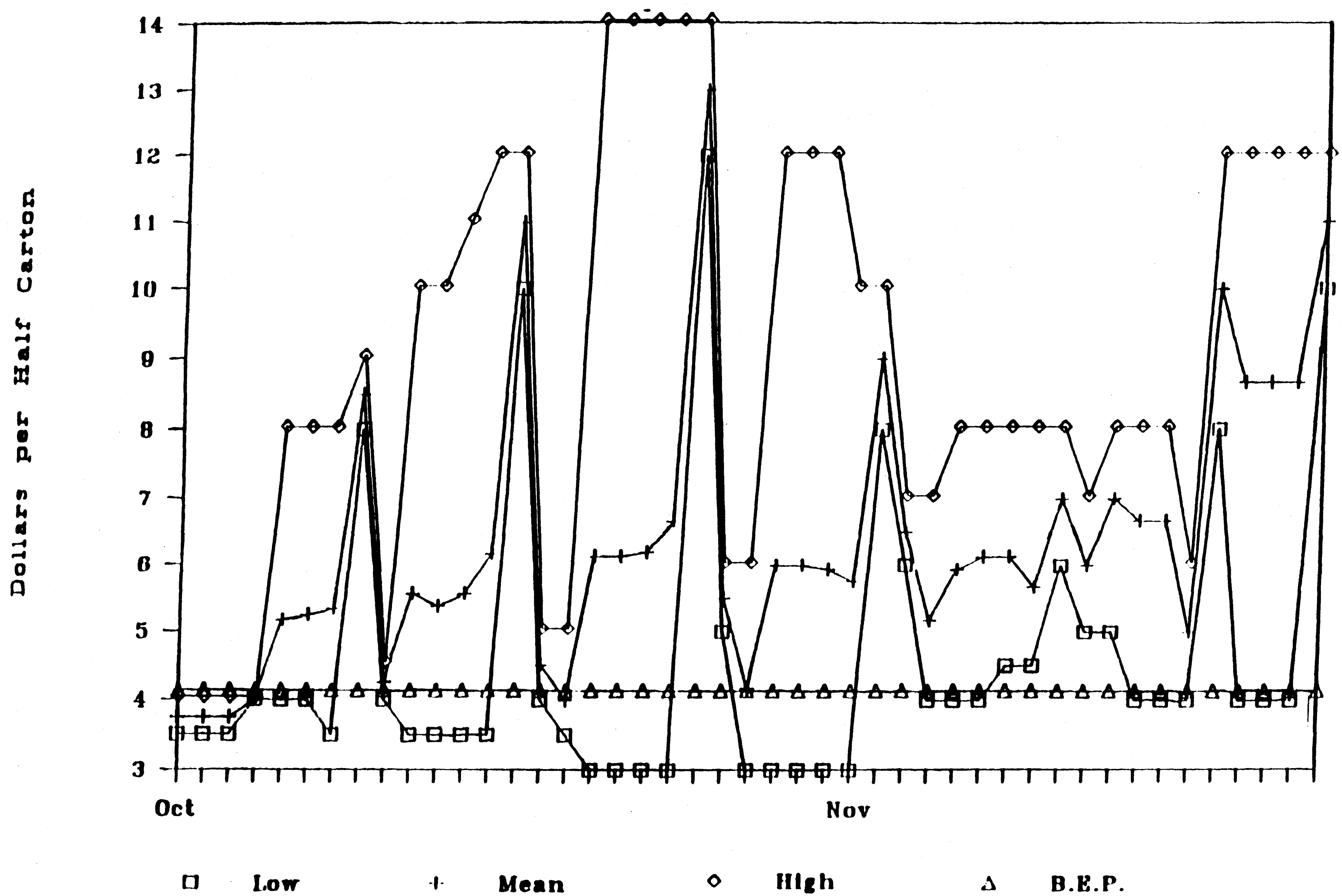


FIGURE A8
F.O.B Spring Cantaloupe Prices - 12s per 1/2 carton

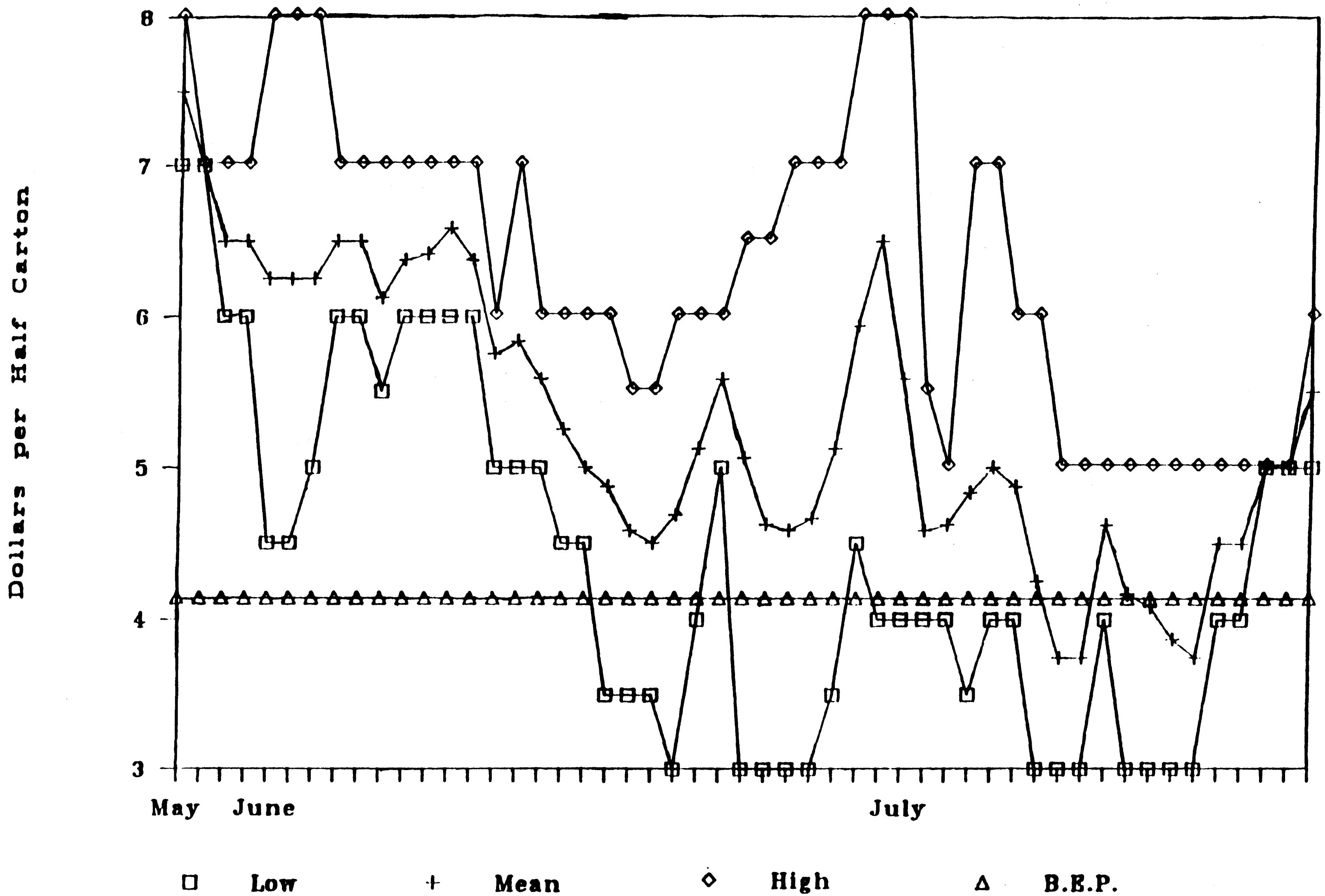


FIGURE A9
F.O.B. Spring Cantaloupe Prices - 15s per 1/2 carton

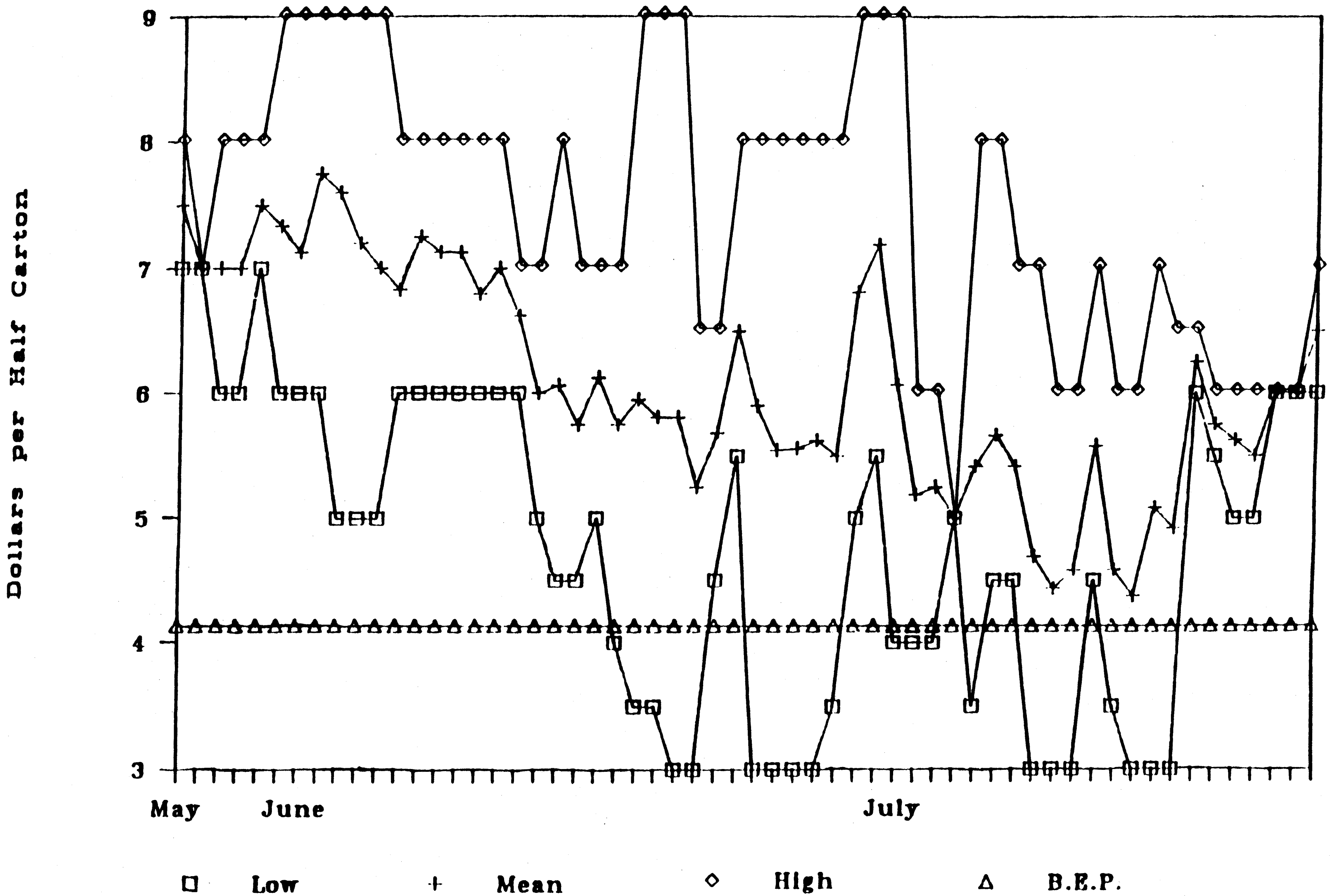


FIGURE A10
F.O.B. Spring Cantaloupe Prices - 18s per 1/2 carton

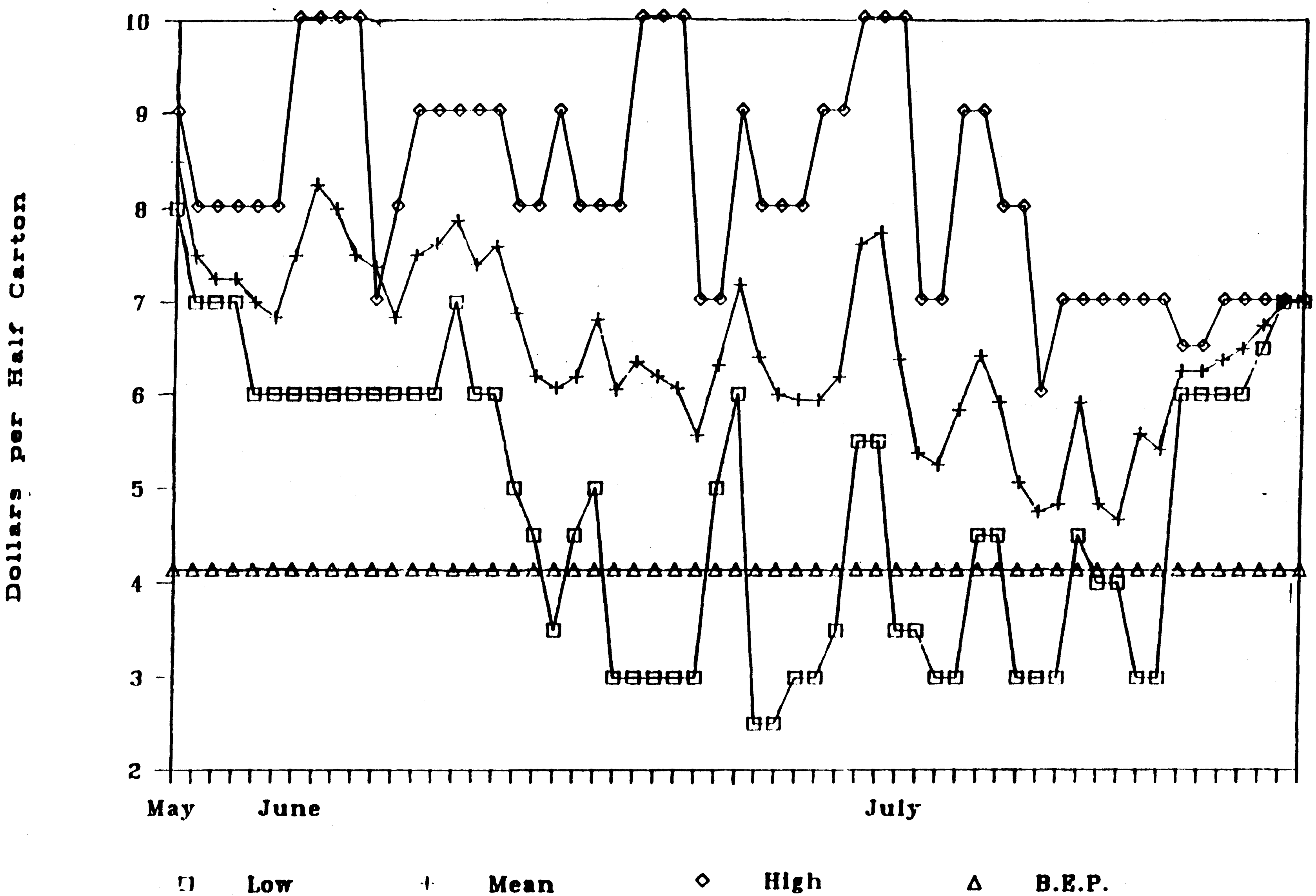


FIGURE A11
F.O.B. Cauliflower Prices - 9 heads per carton

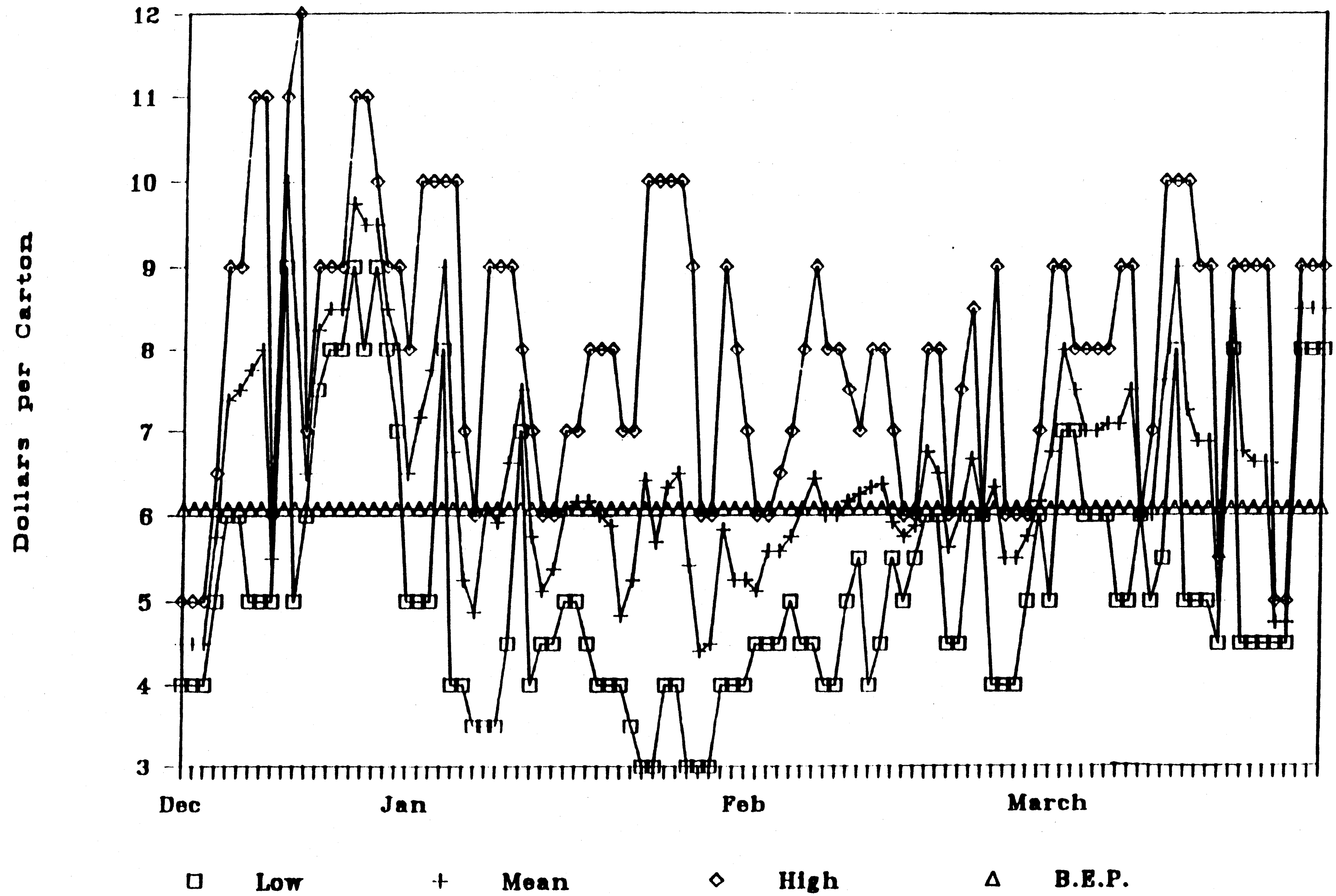


FIGURE A12
F.O.B. Cauliflower Prices - 12 heads per carton

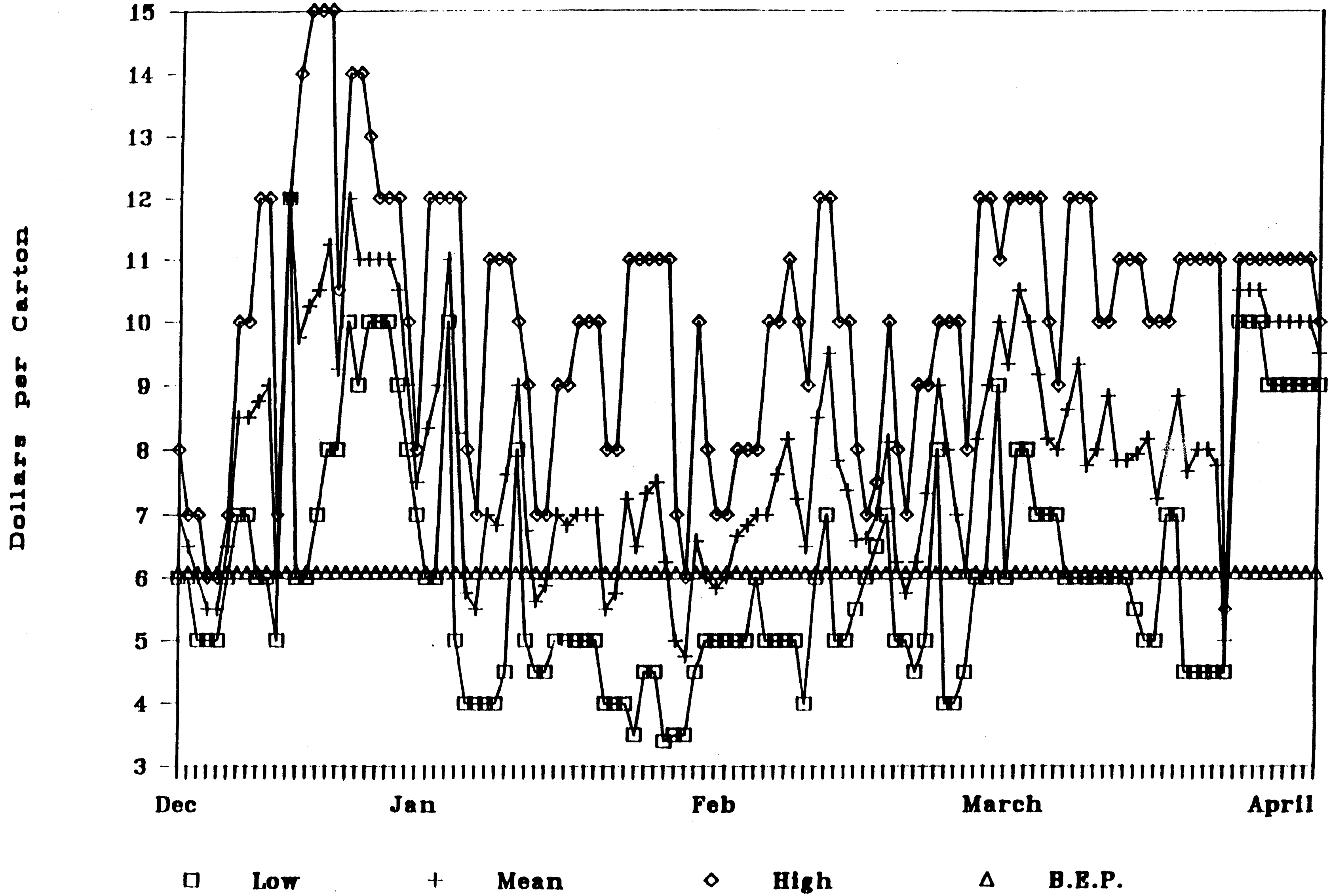


FIGURE A13
F.O.B. Cauliflower Prices - 16 heads per carton

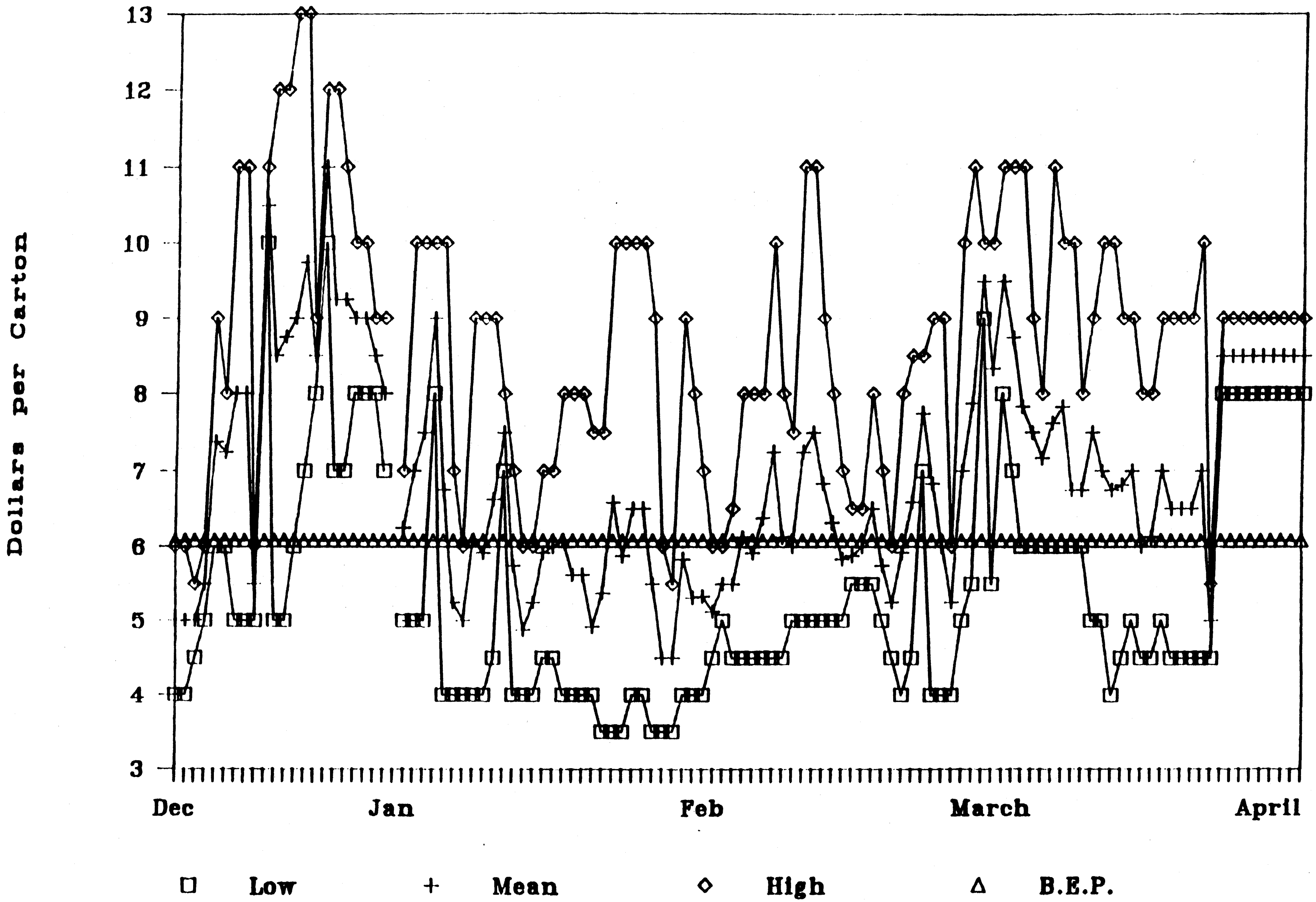


FIGURE A14
F.O.B. Collard Prices - 24 bunches per carton

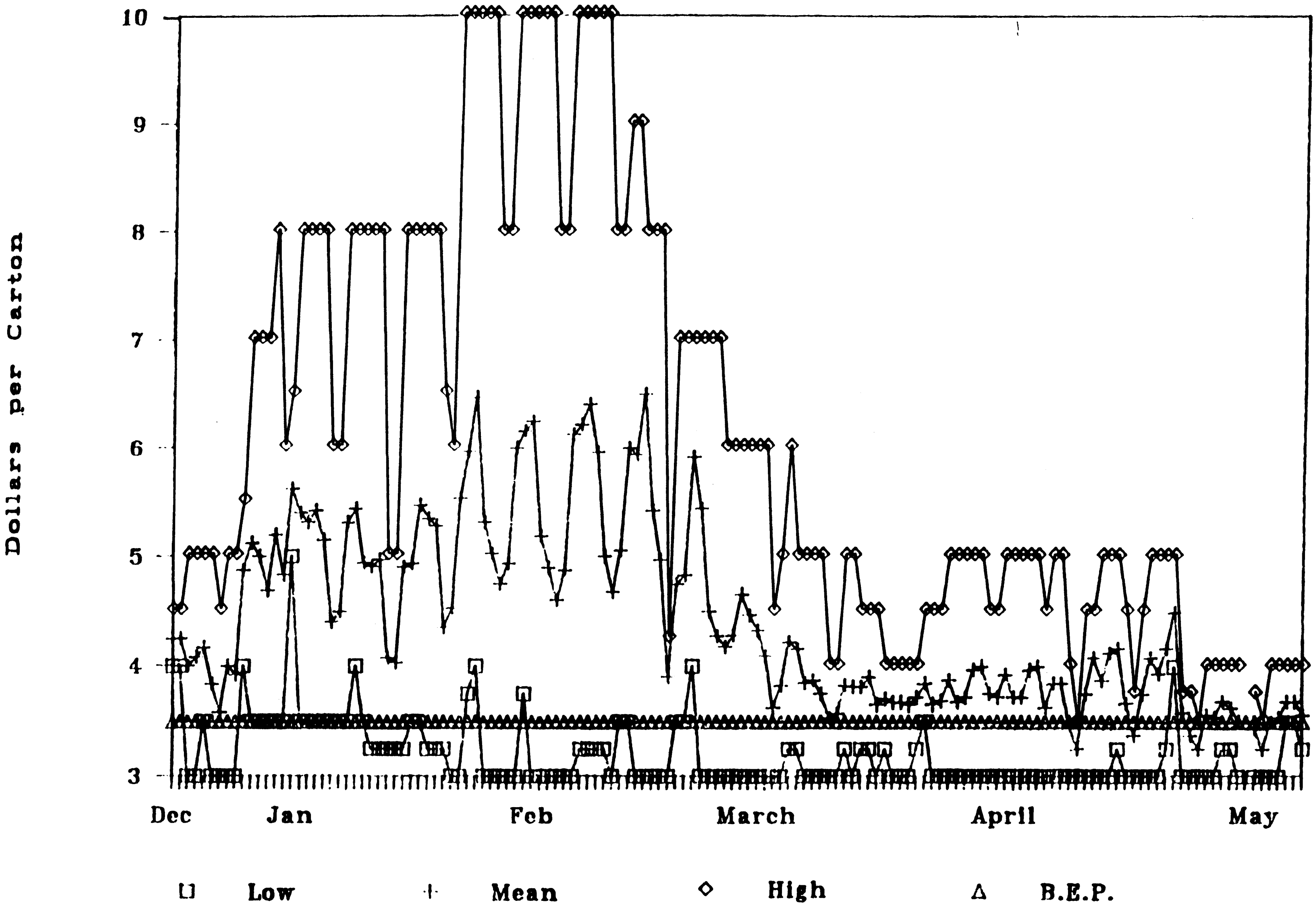


FIGURE A15
F.O.B. Dry Onion Prices - 50# Sacks, prepack

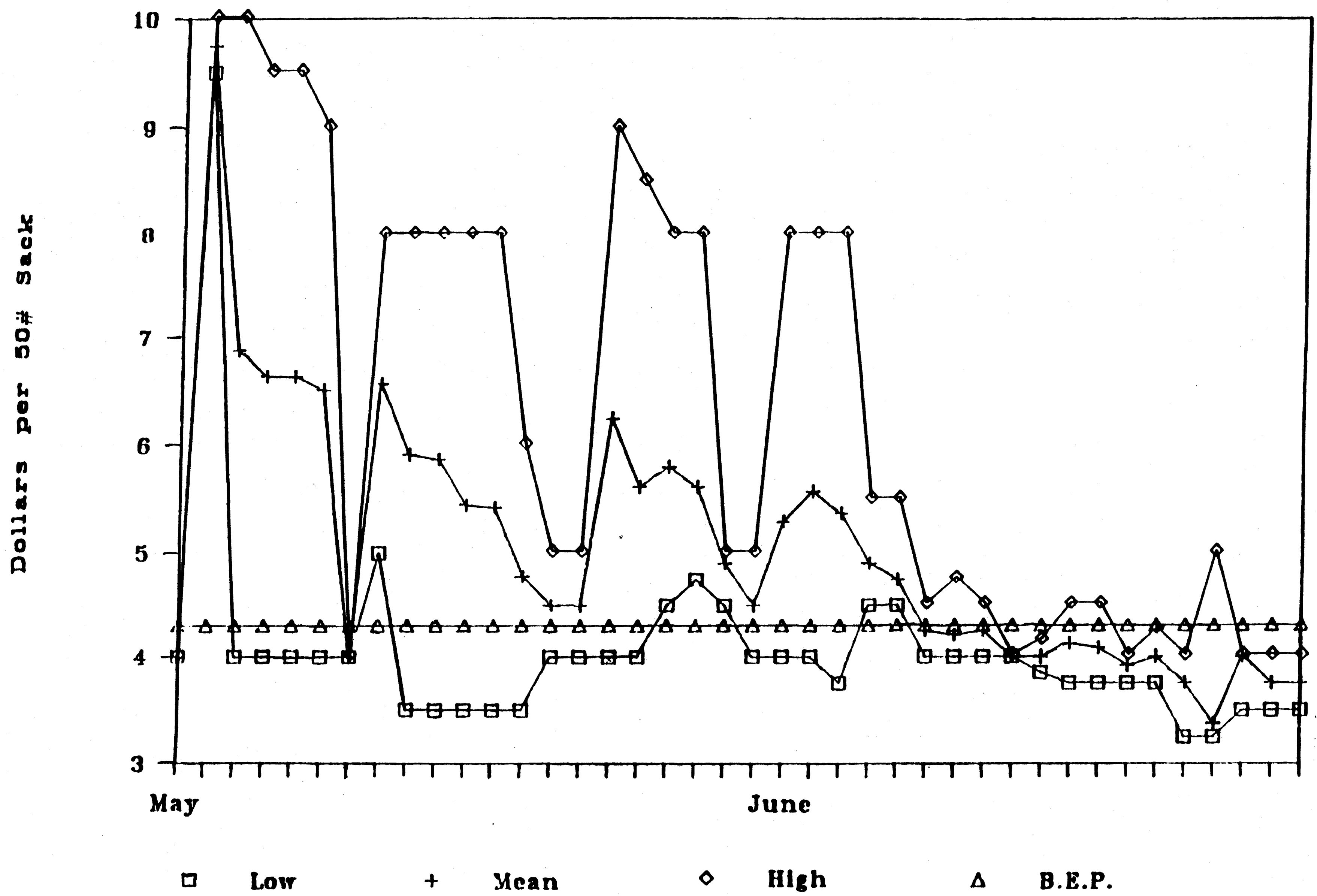


FIGURE A16
F.O.B. Dry Onion Prices - 50# Sacks, medium

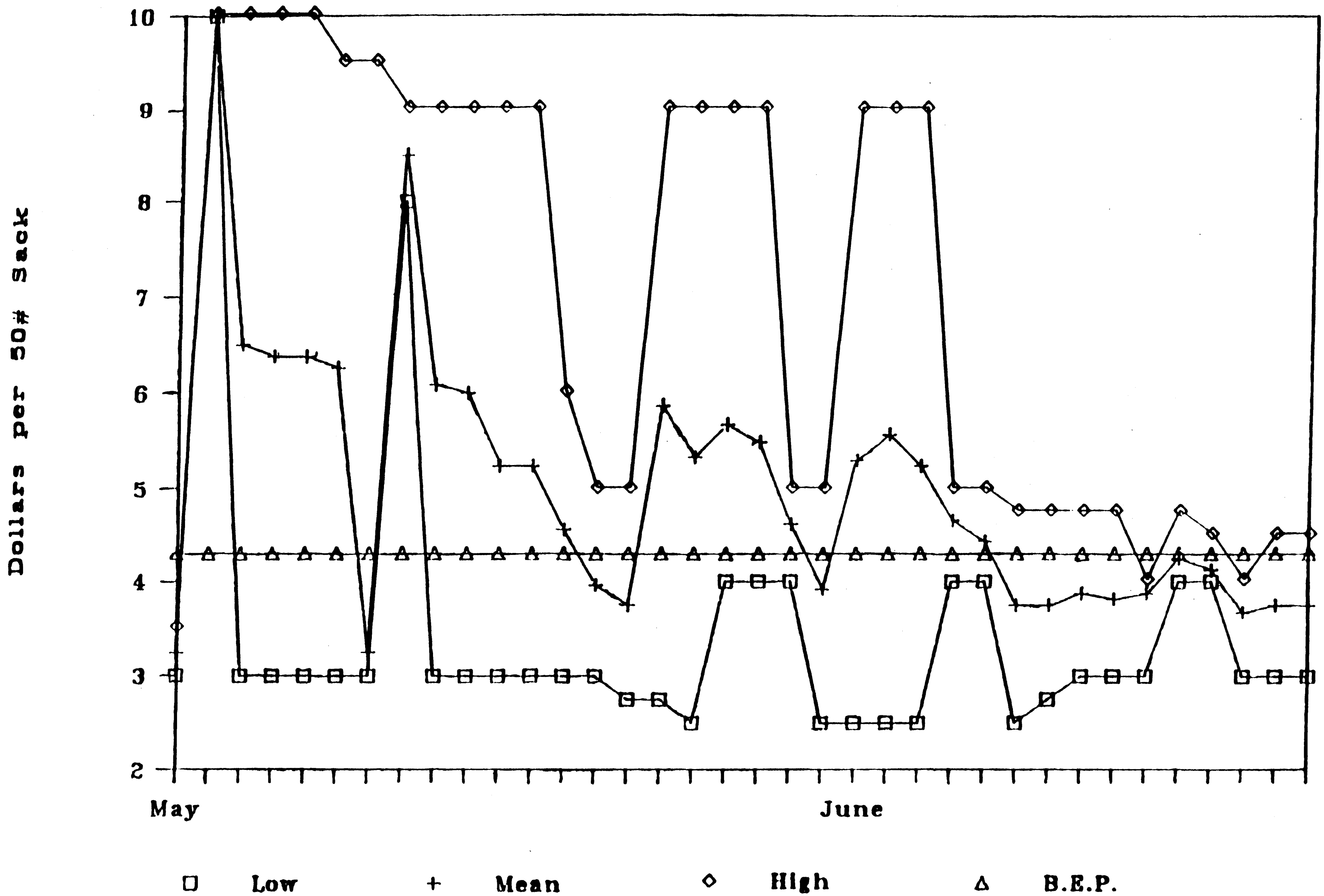


FIGURE A17
F.O.B. Green Onions Prices - 4 doz. bunches per carton

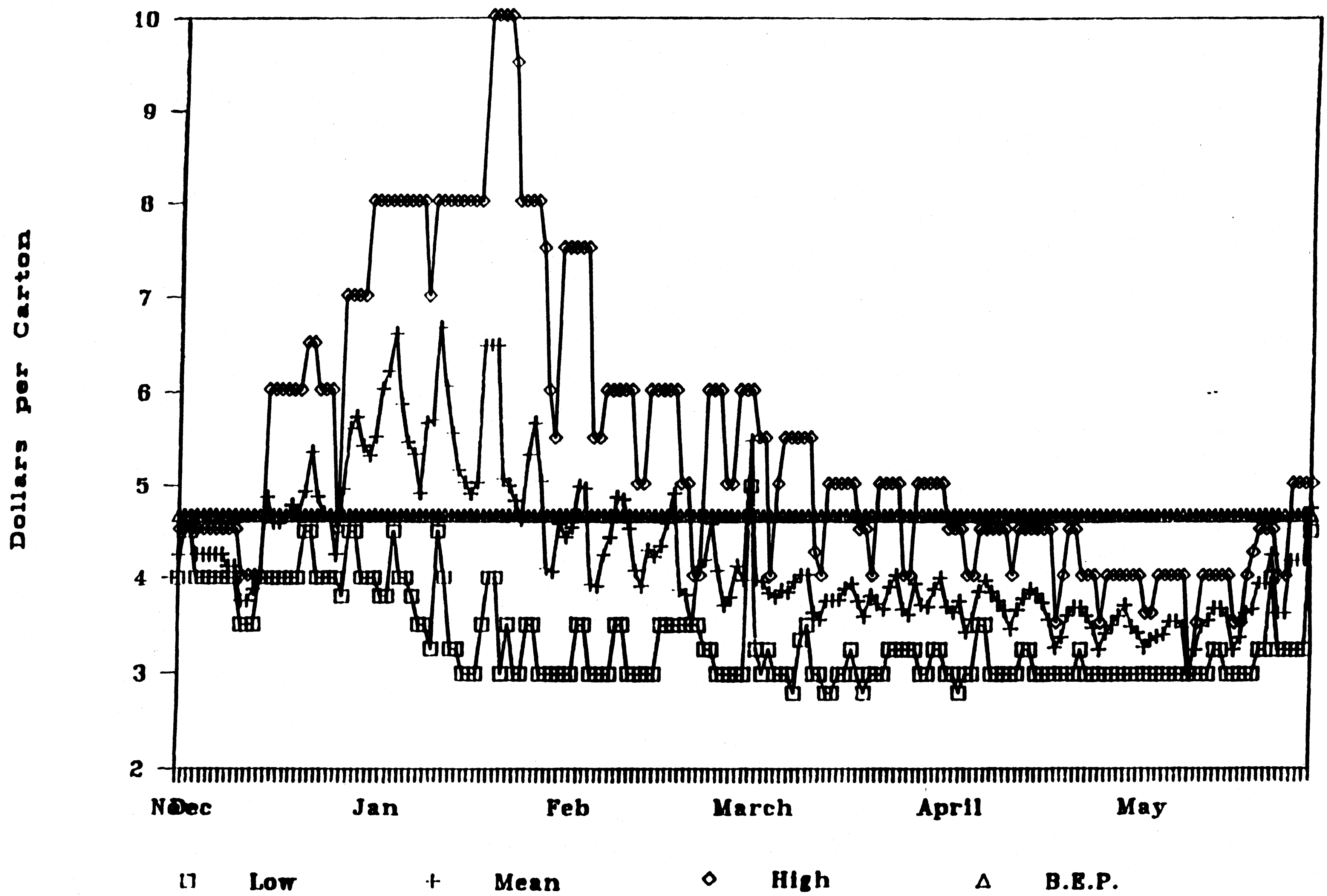


FIGURE A18
F.O.B Honeydew Prices - 5s per 2/3 carton

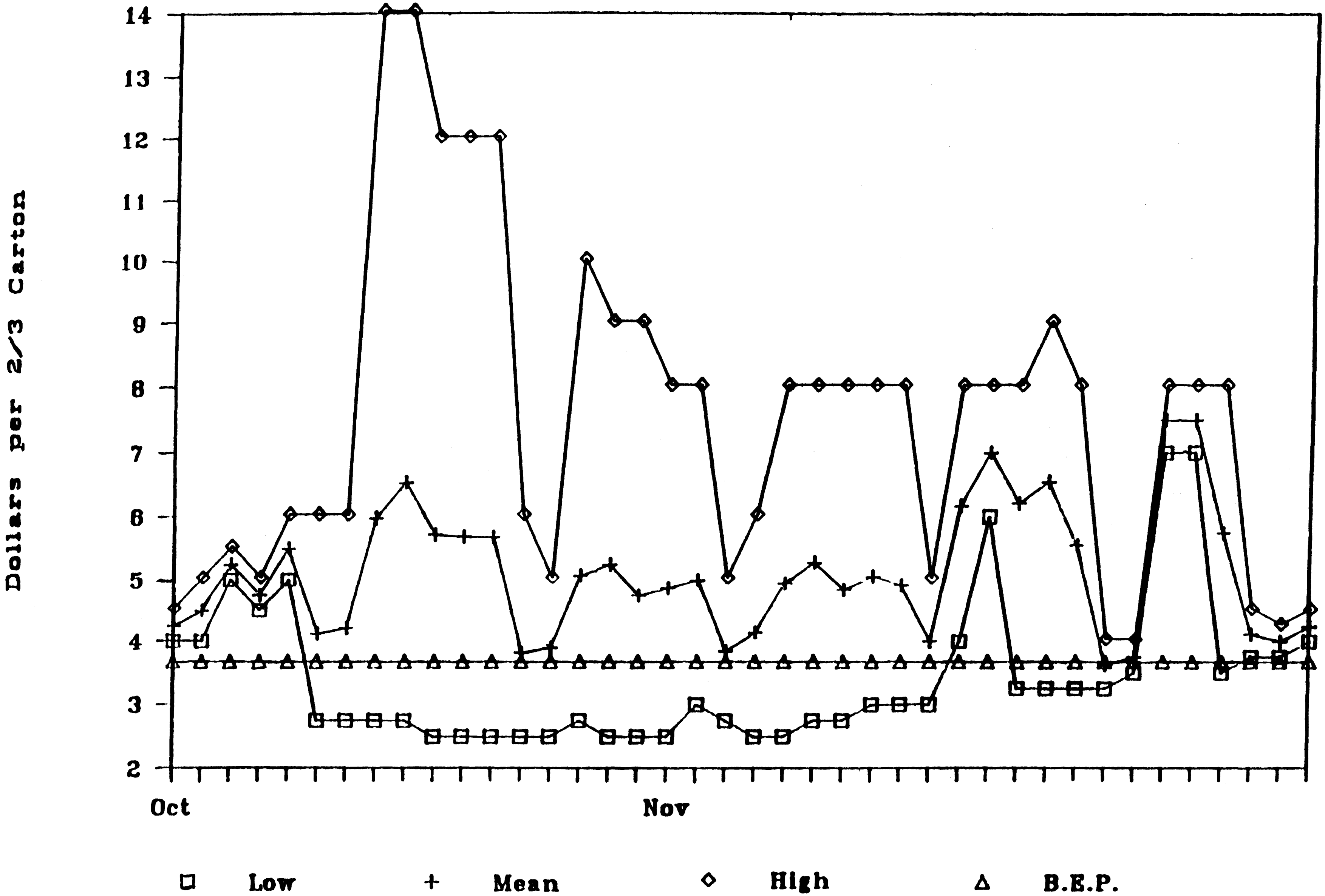


FIGURE A19
F.O.B Honeydew Prices - 6s per 2/3 carton

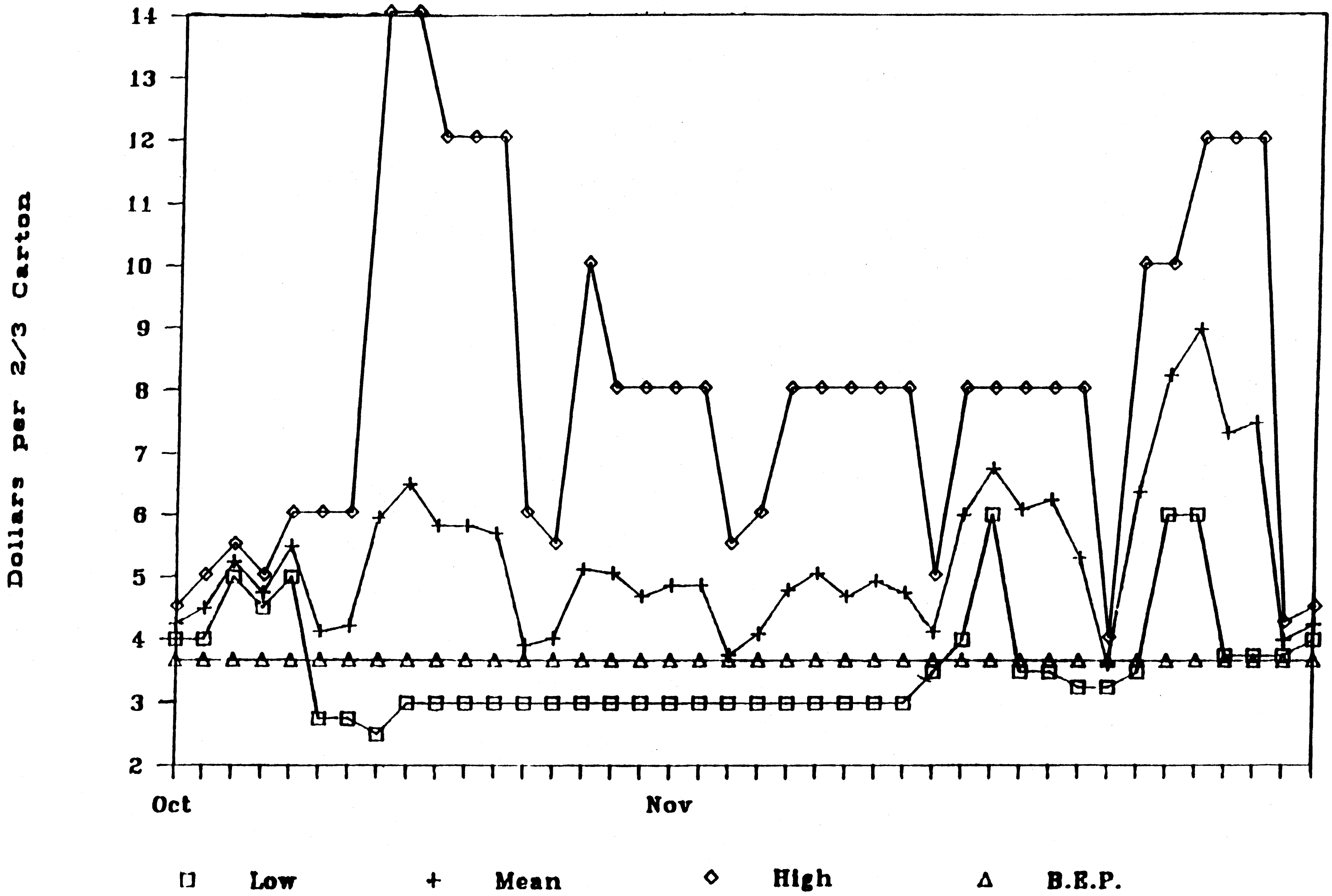


FIGURE A20
F.O.B Honeydew Prices - 8s per 2/3 carton

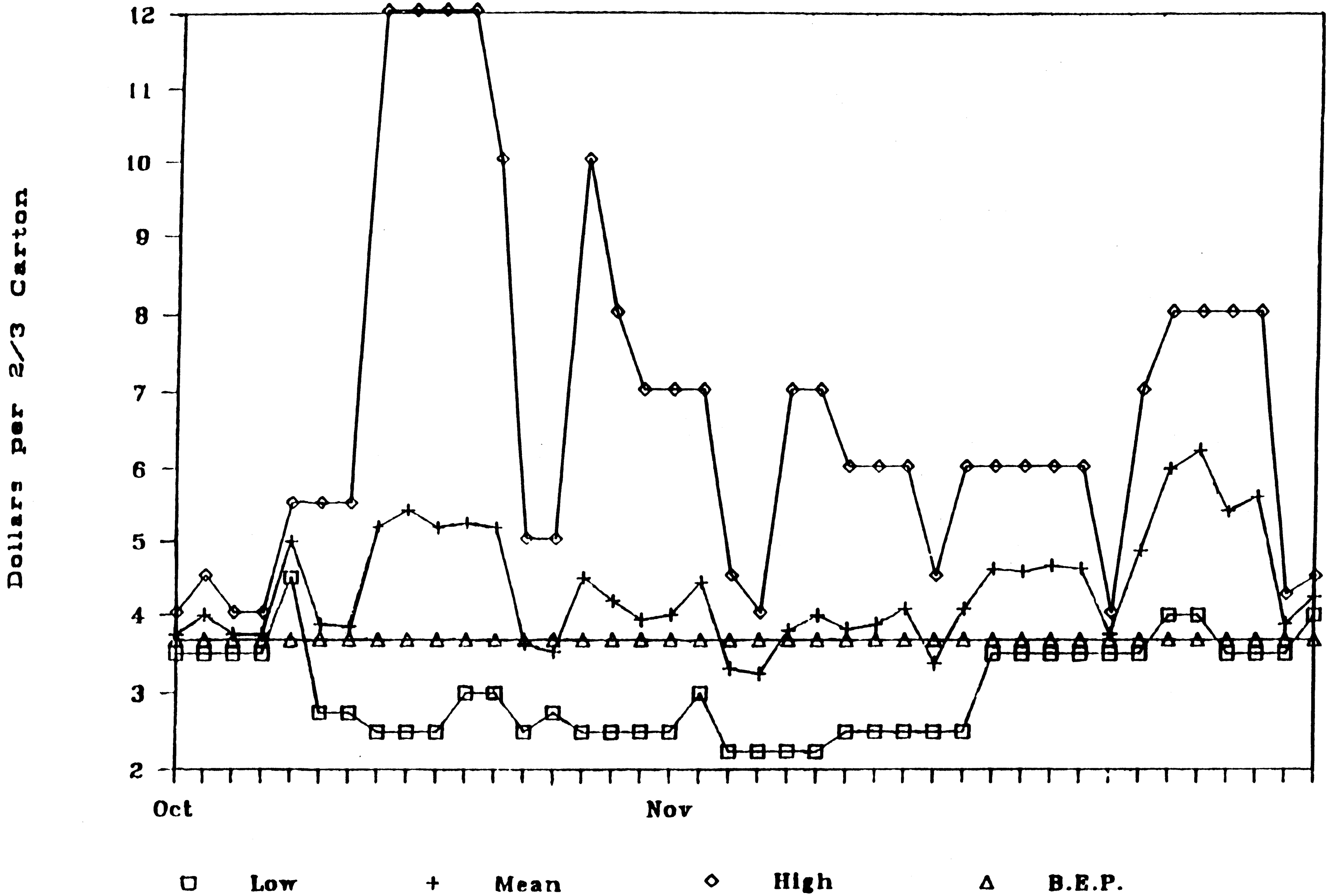


FIGURE A21
F.O.B. Kale Prices - 24 bunches per carton

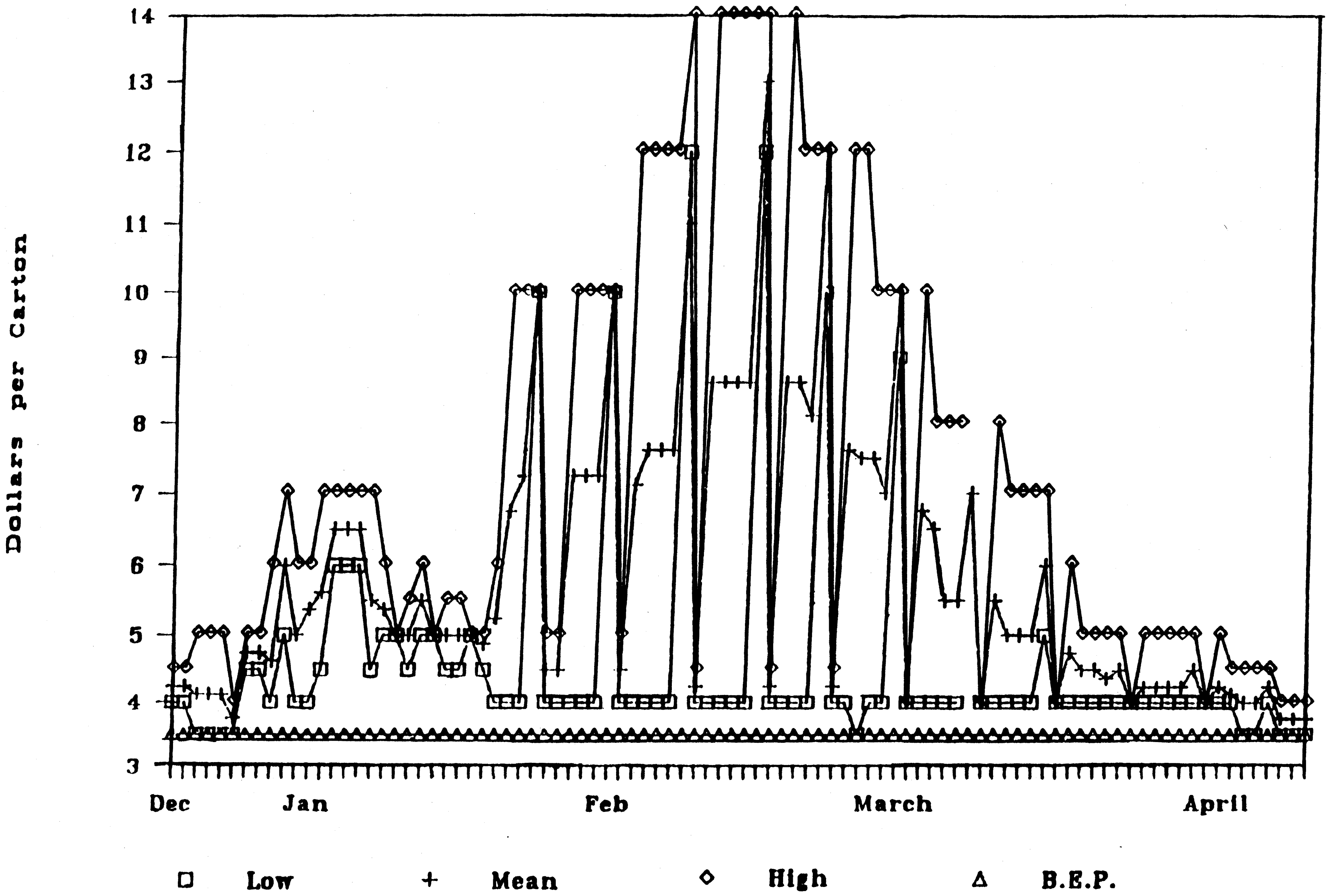


FIGURE A22
F.O.B. Spring Lettuce Prices - 24 heads per carton

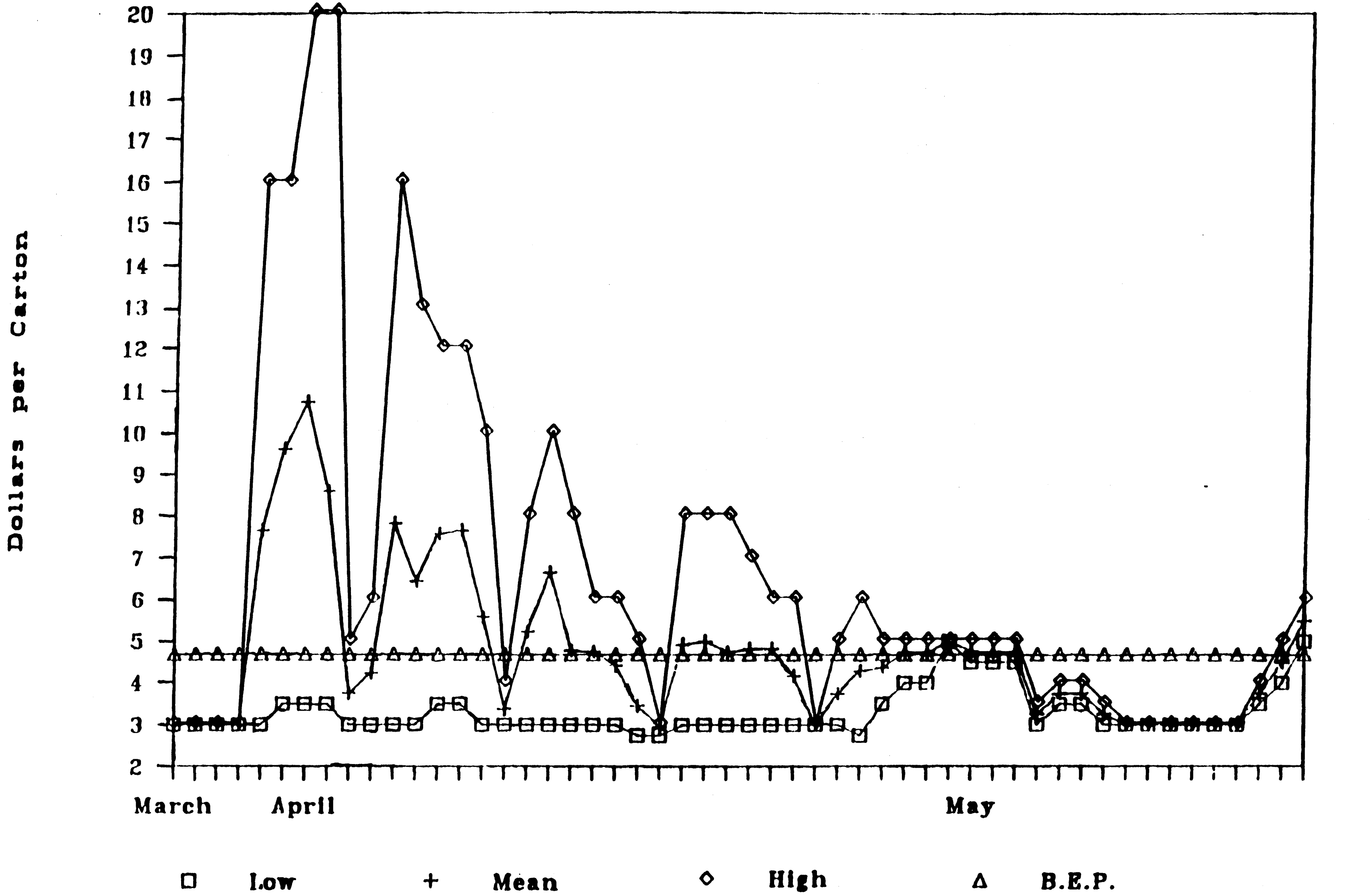


FIGURE A23
F.O.B Mustard Prices - 24 bunches per carton

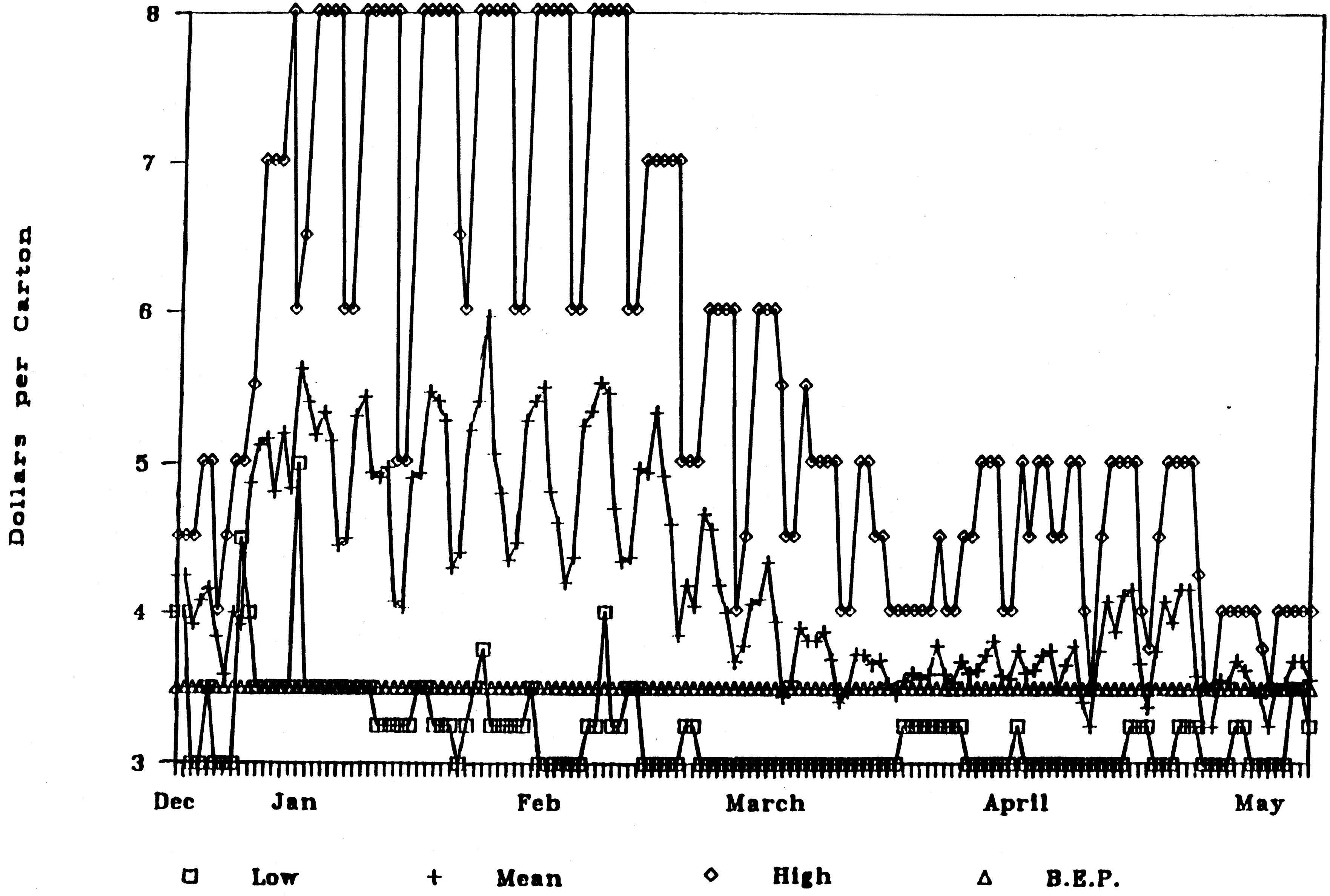


FIGURE A24
F.O.B. Radish Prices 4 doz bunches per carton

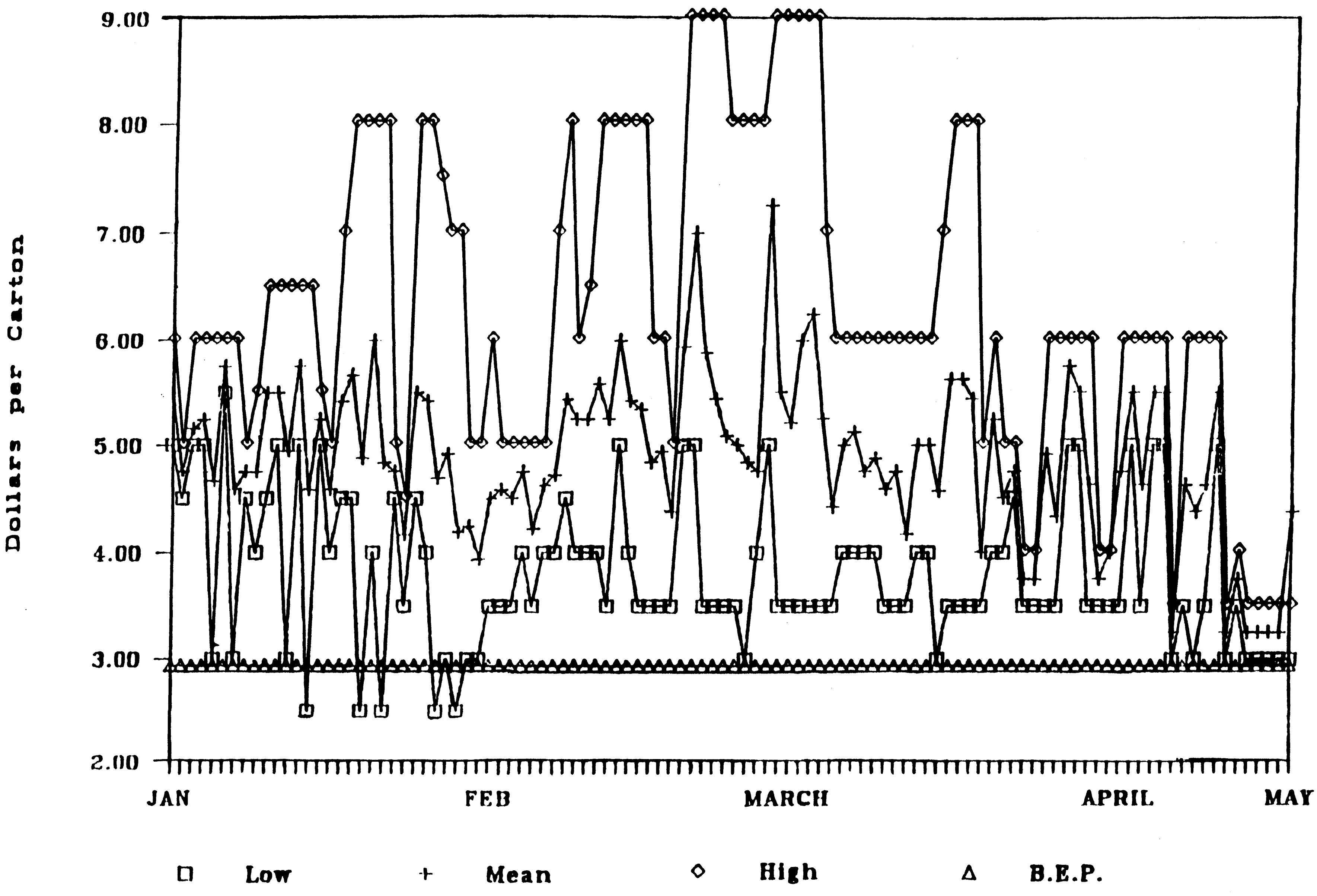


FIGURE A25
F.O.B. Sweet Corn Prices - 5 doz ears per carton

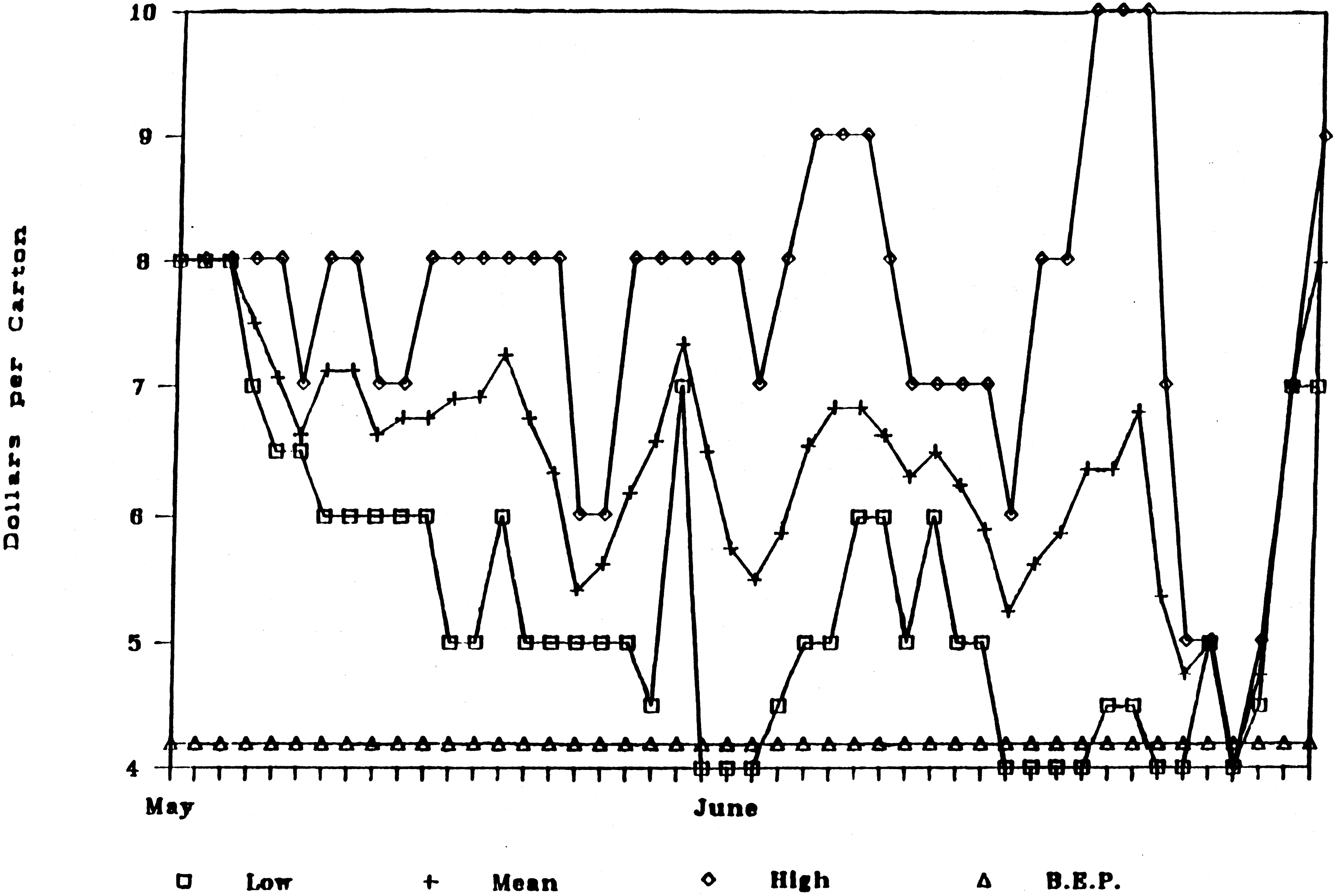


FIGURE A26
F.O.B. Turnip Top Prices - 24 bunches per carton

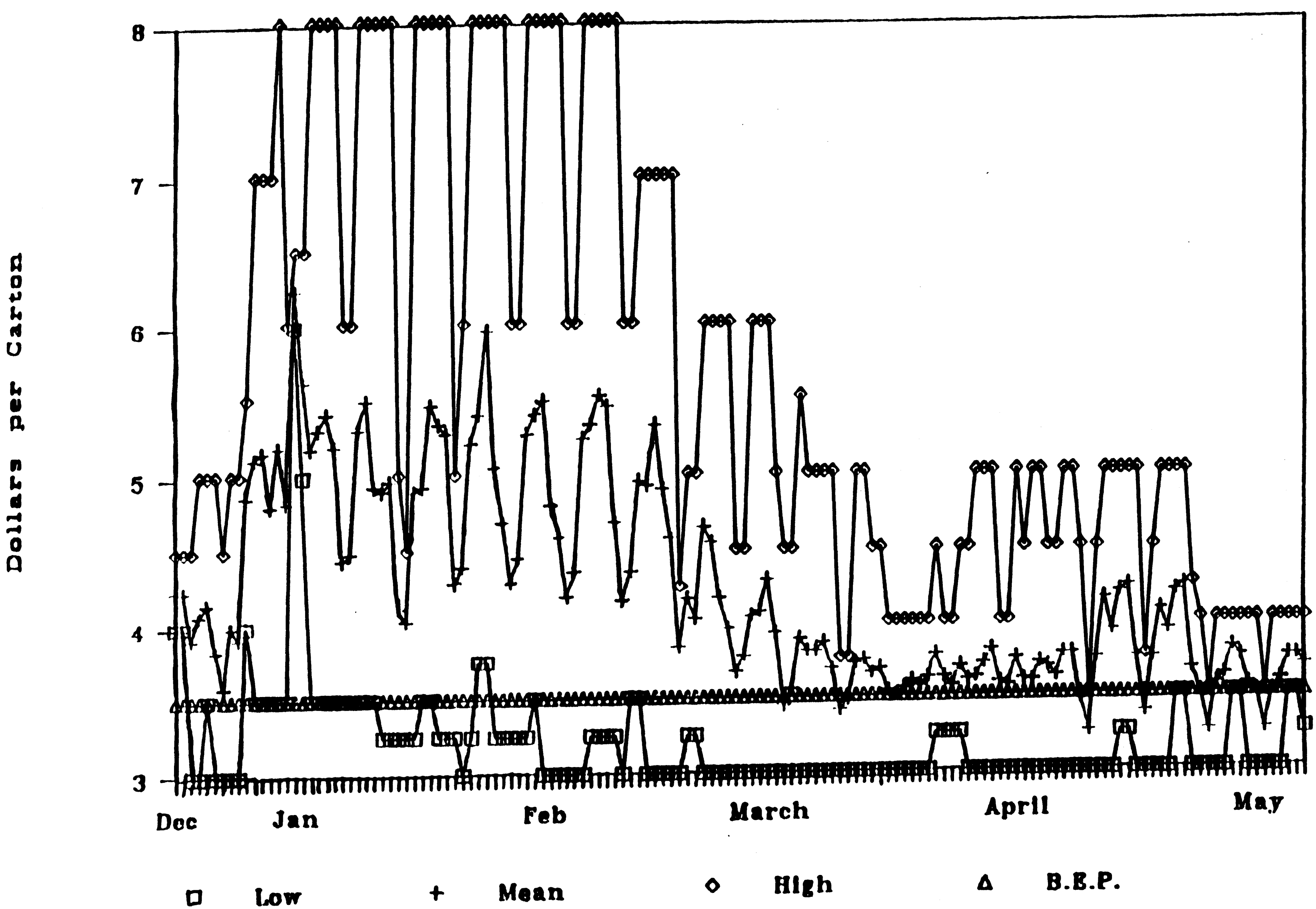
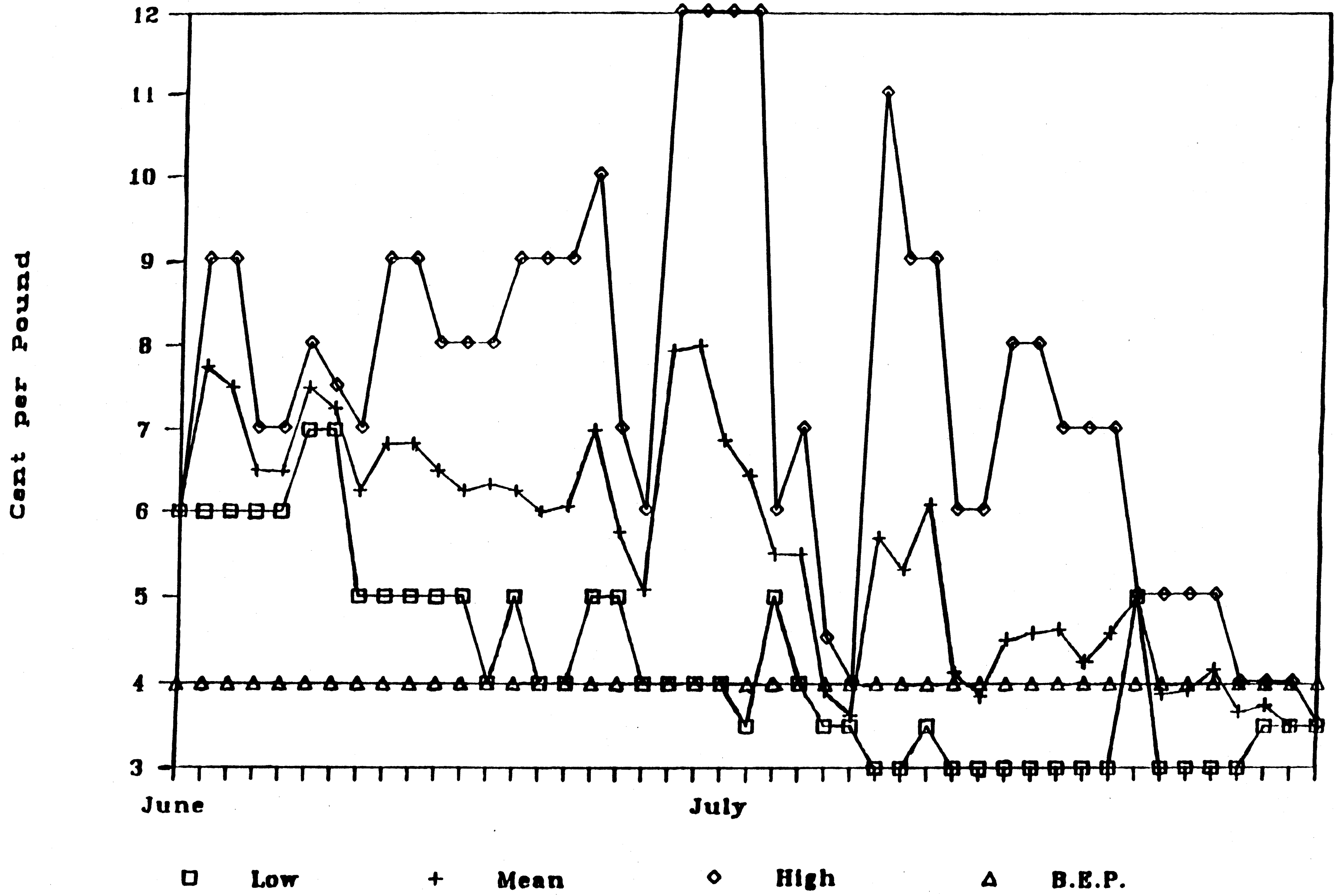


FIGURE A27
F.O.B. Watermelon Prices



APPENDIX B
1000 ACRE TRIBAL FARM

TABLE B1
ACREAGES, PRODUCTION, AND PRICES FOR THE TRIBAL FARM ALTERNATIVE

CROP	TARGET ACRES PRICE	PER ACRE YIELD	MARKET PRICE	
Upl. cott	448 $0.79	1200lb	$0.60	
Dur. wht.	160 $0.081	4900lb	$0.07	
Alfalfa	220	7.7 tns	$75.00	N/A

TABLE B2
EQUIPMENT LIST AND VALUE FOR DEBT FINANCING
1,000 ACRE TRIBAL FARM

EQUIPMENT	VALUE	
150 pto trac. (2)	$121,874	
100 pto	39,723	
1/2 ton pickups (2)	20,676	
combine	103,892	
16 ft double offset	12,683	
12x45 ft land planes (2)	15,540	
lister	5,849	
5-16 2 way mold. plow	11,049	
13.5 ft. offset disk (u)	6,531	
21 ft offset disk	8,320	
6 row power mulcher	6,038	
6 row rolling cult.	5,329	
section harrow	1,468	
spring tooth renovator	5,174	
12 foot tandem disk	5,675	
swather	44,994	
14 ft grain drill	7,055	
6 row planter	10,235	
Fert. side dress unit	5,969	
rotary stalk cutter	6,291	
10 foot row buck	1,549	
1000 gal diesel tank	800	
misc. equip.	3,000	
TOTAL EQUIPMENT VALUE		$449,714
FIXED ASSETS		
Office and Shop		100,000
LAND		
Irrigation system rehab.		39,600
TOTAL ASSETS		$589,314

(2) signifies two pieces
Annualized Equipment costs (11.5% interest and a 7 year loan) $102,120
Annualized Longterm Costs (8.25% interest and a 30 year loan) $12,690

TABLE B3
COSTS AND RETURNS TO A 1,000 ACRE TRIBAL FARM GROWING CONVENTIONAL FIELD CROPS, YEARS 0 - 5

	YEAR					
	0	1	2	3	4	5
COTTON YIELD (lbs)	0	537600	537600	537600	537600	537600
COTTON REV ($)	0	341892	341892	341892	341892	341892
WHEAT YIELD (lbs)	0	646800	646800	646800	646800	646800
WHEAT REV. ($)	0	44694	44694	43340	44694	44694
ALFALFA YIELD (tons)	0	1540	1540	1540	1540	1540
ALFALFA REV ($)	0	115500	115500	115500	115500	115500
DEFICIENCY PYMTS & PAD	0	160110	151572	138767	124801	115774
TOTAL REVENUE	0	662195	653658	639498	626887	617860
OPERATING COSTS (OPCO $)						
SRP pump water costs:						
-Cotton		34194	34194	34194	34194	34194
-Wheat		0	0	0	0	0
-Alfalfa		19845	19845	19845	19845	19845
-Irrigation labor		11448	11448	11448	11448	11448
Fuel, Oil, & Repairs		36294	43984	43984	43984	36294
Labor		11515	14343	14343	14343	11515
Custom Hire & Materials		127105	128445	128445	128445	127105
Harvest & Ginning		165228	165228	165228	165228	165228
Total Operating Costs	0	405627	417485	417485	417485	405627
Returns to operating costs	0	256568	236173	222013	209402	212232
Total acre feet		4088	4088	4088	4088	4088
FIXED COSTS (FIXCO $)						
Management salary		35000	35000	35000	35000	35000
General Farm Main.		600	600	600	600	600
BIA water assessment	13400	13400	13400	13400	13400	13400
Interest on investment	45909	42350	38385	33968	29046	23562
Margin requirement	189405					
Insurance		10273	10273	10273	10273	10273
Total Overhead	248714	101623	97658	93240	88319	82835
Returns to land, Capital & Own.	-248714	154945	138515	128773	121083	129398
Depreciation		56339	56339	56339	56339	56339
Management fee		7747	6926	6439	6054	6470
Returns to tribe oper	-248714	90859	75251	65995	58691	66589
Ret-LSVALUE (NRT)	-248714	15859	251	-9005	-16309	-8411

TABLE B3 (continued)
COSTS AND RETURNS TO A 1,000 ACRE TRIBAL FARM GROWING CONVENTIONAL FIELD CROPS, YEARS 6 -10

	YEAR				
	6	7	8	9	10
COTTON YIELD (lbs)	537600	537600	537600	537600	537600
COTTON REV ($)	341892	341892	341892	341892	341892
WHEAT YIELD (lbs)	646800	646800	646800	646800	646800
WHEAT REV. ($)	44694	44694	43340	44694	44694
ALFALFA YIELD (tons)	1540	1540	1540	1540	1540
ALFALFA REV ($)	115500	115500	115500	115500	115500
DEFICIENCY PYMTS & PAD	114793	114793	114793	114793	114793
TOTAL REVENUE	616879	616879	616879	616879	616879
OPERATING COSTS (OPCO $)					
SRP pump water costs:					
-Cotton	34194	34194	34194	34194	34194
-Wheat	0	0	0	0	0
-Alfalfa	19845	19845	19845	19845	19845
-Irrigation labor	11448	11448	11448	11448	11448
Fuel, Oil, & Repairs	43984	43984	43984	36294	36294
Labor	14343	14343	14343	11515	14343
Custom Hire & Materials	127105	128445	128445	127105	128445
Harvest & Ginning	165228	165228	165228	165228	165228
Total Operating Costs	417485	417485	417485	405627	417485
Returns to operating costs	199393	199393	199393	211251	199393
Total acre feet	4088	4088	4088	4088	4088
FIXED COSTS (FIXCO $)					
Management salary	35000	35000	35000	35000	35000
General Farm Main.	600	600	600	600	600
BIA water assessment	13400	13400	13400	13400	13400
Interest on investment	17452	10644	10475	10292	0
Margin requirement					
Insurance	10273	10273	10273	10273	10273
Total Overhead	76725	69917	69747	69564	59273
Returns to land, Capital & Own.	122669	129477	129646	141687	140121
Depreciation	56339	56339	56339	56339	56339
Management fee	6133	6474	6482	7084	7006
Returns to tribe oper	60196	66664	66825	78264	76776
Ret-LSVALUE (NRT)	-14804	-8336	-8175	3264	1776

APPENDIX C
EVALUATION OF A FIFTY ACRE CITRUS ORCHARD

TABLE C1
EQUIPMENT INVESTMENT FOR A 50 ACRE CITRUS ORCHARD

70 PTO tractor	$ 26,129
1/2 ton truck	10,388
Sprayer	4,180
Subsoiler	1,785
Fertilizer sider dress	5,969
Row buck	1,549
Cotton trailer	3,000
Wind sprayer	2,622
Air blast sprayer	4,320
Five wind machines	60,000
TOTAL MACHINERY INVESTMENT	$119,942

TABLE C2
PER ACRE COSTS OF OPERATION FOR NAVEL ORANGES
YEARS 1 AND 2

OPERATION	HOURS PER ACRE Mach	Labor	COST PER ACRE ($) Mach	Labor	Serv	Matls	TOTAL
YEAR 1							
Survey					5.00		5.00
Level					80.00		80.00
Chisel					20.00		20.00
Make borders	0.3	0.3	1.27	1.93			3.20
Irrigate		0.3		1.87			1.87
Knock borders	0.3	0.3	1.27	1.93			3.20
Disk	0.2custom				7.00		7.00
Finish level							0.00
Apply herb.					8.50	22.50	31.00
Incorp. herb.	0.5	0.5	2.03	2.90			4.93
Stake trees		1.0		5.80		25.00	30.80
List	0.1custom				8.00		8.00
Plant	0.9	1.0	10.36	62.25		0.00	72.61
Wrap trees		4.0		17.00		50.00	67.00
Irrigate		1.2		5.12			5.12
Irrigate		4.3		18.42			18.42
Spot spray	0.9	1.0	7.20	10.05		6.00	23.25
Hand fert.		1.0	4.25			4.65	8.90
Disk ends	0.1custom				7.00		7.00
Make borders	0.3	0.3	4.27	1.93			6.20
Buck rows	0.0	0.1	0.25	0.29			0.54
Irrigate		5.8		24.59			24.59
Frost protection	0.9	9.0	7.65	52.20			59.85
Frost protection	3.6	0.2	11.07	0.97			12.04
Pickup use	2.0		13.46				13.46
COLUMN TOTALS				63.07	207.25	135.50	108.15
	513.97						
YEAR 2							
Frost Protection	3.6	0.2	11.07	0.97			12.04
Irrigate	0.0	7.4		31.61			31.61
Apply N fertilizer	0.0	0.0				2.25	2.25
Spot spray weeds	2.1	4.7	16.80	27.07		11.25	55.12
Replant	0.0	0.2		1.16		0.00	1.16
Remove stalks	0.0	5.3		22.67			22.67
Apply insecticides	0.7	0.0			4.40	3.20	7.60
Apply minor elements	0.0	0.0				7.76	7.76
Irrigate	0.0	8.3		35.12			35.12
Pickup use	2.0		13.46				13.46
COLUMN TOTALS					41.33	118.60	4.40
	24.46	188.79					

TABLE C3

PER ACRE COSTS OF OPERATION FOR NAVEL ORANGES YEARS 3 AND 4

OPERATION	HOURS PER ACRE		COST PER ACRE ($)				
	Mach	Labor	Mach	Labor	Serv	Matls	TOTAL
YEAR 3							
Frost protection	3.6	0.2	11.07	0.97			12.04
Irrigate		4.1		17.56			17.56
Apply N fertilizer					2.25	2.25	
Apply insecticides					4.40	4.00	8.40
Apply minor elements						7.76	7.76
Knock borders	0.3	0.3	1.27	1.93			3.20
Apply herbicide	0.2	0.3	1.69	1.45	8.50	22.50	34.14
Herbicide incorp.	0.5	0.5	2.03	2.90			4.93
Make borders	0.3	0.3	1.27	1.93			3.20
Buck rows	0.0	0.1	0.25	0.30			0.55
Irrigate		4.8		20.40			20.40
Spot spray weeds	1.2	2.7	9.6	15.47		13.5	38.57
Irrigate		0.8		3.40			3.40
Pickup use	2.0		13.46				13.46
COLUMN TOTALS			40.64	66.31	12.90	50.01	169.86
YEAR 4							
Frost Protection	3.6	0.2	11.07	0.97			12.04
Irrigate		3.6		20.88		2.25	23.13
Apply N fertilizer						13.50	13.50
Spot spray weeds	1.8	4.0	14.40	23.20			37.60
Suckering		2.0		11.60			11.60
Apply insecticides					4.40	6.40	10.80
Apply minor elements						7.76	7.76
Knock borders	0.3	0.3	1.27	1.93			3.20
Apply herbicides	0.2	0.3	1.69	1.45	8.50	22.50	34.14
Incorp. herb.	0.5	0.5	2.03	2.90			4.93
Make borders	0.3	0.3	1.27	1.93			3.20
Buck rows	0.0	0.1	0.25	0.29			0.54
Irrigate		4.0		23.20		5.10	28.30
Pickup use	2.0		13.46				13.46
COLUMN TOTALS			45.44	88.35	12.90	57.51	204.20

TABLE C4
PER ACRE COSTS OF OPERATION FOR NAVEL ORANGES
YEARS 5 AND 6

OPERATION	HOURS PER ACRE		COST PER ACRE ($)				
	Mach	Labor	Mach	Labor	Serv	Matls	TOTAL
YEAR 5							
Frost protection	3.6	0.2	11.07	0.97			12.04
Irrigate		2.9		12.34			12.34
Apply N fertilizer					0.00	36.90	36.90
Spot spray weeds	1.8	2.0	14.40	11.60		30.00	56.00
Suckering		2.0		11.60			11.60
Knock borders	0.9	1.0	3.80	5.80			9.60
Pick and haul				0.00	100.00		100.00
Make borders	0.9	1.0	3.80	5.80			9.60
Buck rows	0.1	0.2	0.57	0.87			1.44
Apply insecticides	0.2	0.3		1.45	8.00	9.73	19.18
Apply insecticides	0.2	0.3		1.45	4.40	6.40	12.25
Apply minor elements				0.00		7.76	7.76
Apply herb	0.2	0.3		1.45	8.50	22.50	32.45
Herbicide incorp.	0.5	0.5	2.03	2.90			4.93
Irrigate		3.2		13.71		65.79	79.50
Pickup use	2.0		13.46	0.00			13.46
COLUMN TOTALS			49.13	69.94	120.90	179.08	419.05
YEAR 6							
Frost Protection	3.6	0.2	11.07	0.97			12.04
Irrigate		2.9		12.34			12.34
Water run fertilizer				0.00		36.90	36.90
Spot spray weeds	1.8	4.0	14.40	23.20		30.00	67.60
Knock borders	0.9	1.0	3.80	5.80			9.60
Pick and haul				0.00	134.00		134.00
Make borders	0.9	1.0	3.80	5.80			9.60
Buck rows	0.1	0.2	0.57	0.87			1.44
Apply insecticides	0.2	0.3		1.45	8.00	9.73	19.18
Suckering		2.0		11.60			11.60
Apply insecticide	0.2	0.3		1.45	4.40	6.40	12.25
Apply minor elements				0.00		7.76	7.76
Apply herbicide	0.2	0.3		1.45	8.00	31.00	40.45
Irrigate		3.2		13.71		65.80	79.50
Pickup use	2.0		13.46				13.46
COLUMN TOTALS			47.10	78.64	154.40	187.58	467.72

TABLE C5
SUMMARY OF PER ACRE COSTS FOR NAVEL ORANGES

	YEAR					
	1	2	3	4	5	6
-Survey	5.0					
-Level	80.0					
-Chisel	20.0					
-Disk	7.0					
Total preparation costs	112.00					
-Stake trees	30.8					
-Plant	72.6					
-Replant		1.2				
-Wrap	67.0					
-List	8.0					
Planting total	178.4	1.2	0.00	0.00	0.00	0.00
-Make borders	9.4		3.20	3.20	9.60	9.60
-Knock borders	3.2		3.20	3.20	9.60	9.60
-Disk ends	7.0					
-Buck rows	0.5		0.55	0.54	1.44	1.44
-Suckering				11.60	11.60	11.60
-Remove stalks		22.7				
-Frost protection	71.9	12.0	12.04	12.04	12.04	12.04
-Pickup use	13.5	13.5	3.40	13.46	13.46	79.50
Total cultivation costs	105.5	48.2	22.40	44.00	57.70	123.80
-Irrigat. water costs	0.0	0.0	0.00	7.35	65.79	65.79
-Irrigat. water costs	50.0	66.7	41.36	44.08	26.05	26.05
Irrigation costs	50.0	66.7	41.40	51.40	91.80	91.80
-Spray weeds	23.3	55.1	38.57	37.60	56.00	67.60
-Nitro fert.		2.3	2.25	13.50	36.90	36.90
-Hand fert.	8.9					
-Apply minor elements		7.8	7.76	7.76	7.76	7.76
-Apply insect.		7.6	8.40	10.80	31.43	31.43
-Apply herb.	31.0		34.14	34.14	32.45	40.45
-Incorp. herb.	4.9		4.93	4.93	4.93	
-Chemical & appl.costs	68.1	72.7	96.00	108.70	169.50	184.10
PREHARVEST TOTAL	514.0	188.8	159.80	204.20	319.00	399.80

TABLE C6
PER ACRE COSTS OF OPERATION FOR TANGELOS
YEARS 1 AND 2

OPERATION	HOURS PER ACRE		COST PER ACRE ($)				
	Mach	Labor	Mach	Labor	Serv	Matls	TOTAL
YEAR 1							
Survey					5.00		5.00
Level					80.00		80.00
Chisel					20.00		20.00
Make borders	0.3	0.3	1.27	1.93			3.20
Irrigate		0.3		1.37			1.37
Knock borders	0.3	0.3	1.27	1.93			3.20
Disk	0.2custom				7.00		7.00
Finish level							0.00
Apply herb.					8.50	22.50	31.00
Incorp. herb.	0.5	0.5	2.03	2.90			4.93
Stake trees		1.0		5.80		25.00	16.16
List	0.1custom				8.00		8.00
Plant	0.9	1.0	10.36	5.80		0.00	72.61
Wrap trees		4.0		23.20		50.00	73.20
Irrigate		1.2		5.12			5.12
Irrigate		4.3		18.42			18.42
Spot spray	0.9	1.0	7.20	5.80		6.00	19.00
Hand fert.		1.0	0.00	5.80		4.65	10.45
Disk ends	0.1custom				7.00		7.00
Make borders	0.3	0.3	4.27	1.93			6.20
Buck rows	0.0	0.1	0.25	0.29			0.54
Irrigate		5.8		33.55			33.55
Frost protection	0.9	9.0	7.65	52.20			59.85
Frost protection	3.6	0.2	11.07	0.97			12.04
Pickup use	2.0		13.46				13.46
COLUMN TOTALS			58.82	167.02	135.50	108.15	469.49
YEAR 2							
Frost Protection	3.6	0.2	11.07	0.97			12.04
Irrigate	0.0	7.4		31.61			31.61
Apply N fertilizer	0.0	0.0				2.25	2.25
Spot spray weeds	2.1	4.7	16.80	27.07		13.50	57.37
Replant	0.0	0.2		1.16		0.00	1.16
Remove stalks	0.0	5.3		30.93			30.93
Apply insecticides	0.7	0.0		0.00	4.40	3.20	7.60
Apply minor elements	0.0	0.0		0.00		7.76	7.76
Irrigate	0.0	8.3		35.12			35.12
Pickup use	2.0		13.46	0.00			13.46
COLUMN TOTALS			41.33	126.86	4.40	26.71	199.30

TABLE C7
PER ACRE COSTS OF OPERATION FOR TANGELOS
YEARS 3 AND 4

OPERATION	HOURS PER ACRE		COST PER ACRE ($)				
	Mach	Labor	Mach	Labor	Serv	Matls	TOTAL
YEAR 3							
Frost protection	3.6	0.2	11.07	0.97			12.04
Irrigate		4.1		17.56			17.56
Apply fertilizer				0.00		2.25	2.25
Apply insecticides				0.00	4.40	4.00	8.40
Apply minor elements				0.00		7.76	7.76
Knock borders	0.3	0.3	1.27	1.93			3.20
Apply herbicide	0.2	0.3	1.69	1.45	8.50	22.50	34.14
Herbicide incorp.	0.5	0.5	2.03	2.90			4.93
Make borders	0.3	0.3	1.27	1.93			3.20
Buck rows	0.0	0.1	0.25	0.30			0.55
Irrigate		4.8		20.40			20.40
Spot spray weeds	1.2	2.7	9.6	15.47		13.50	38.57
Irrigate		0.8		3.40			3.40
Pickup use	2.0		13.46				13.46
COLUMN TOTALS			40.64	66.31	12.90	50.01	169.86
YEAR 2							
Frost Protection	3.6	0.2	11.07	0.97			12.04
Irrigate	0.0	3.6		20.88		2.25	23.13
Apply N fertilizer	0.0	0.0		0.00		13.50	13.50
Spot spray weeds	1.8	4.0	14.40	23.20			37.60
Suckering		2.0		11.60			11.60
Apply insecticides				0.00	4.40	6.40	10.80
Apply minor elements				0.00		7.76	7.76
Knock borders	0.3	0.3	1.27	1.93			3.20
Apply herbicides	0.2	0.3	1.69	1.45	8.50	22.50	34.14
Incorp. herb.	0.5	0.5	2.03	2.90			4.93
Make borders	0.3	0.3	1.27	1.93			3.20
Buck rows	0.0	0.1	0.25	0.29			0.54
Irrigate		4.0		23.20		0.00	23.20
Pickup use	2.0		13.46	0.00			13.46
COLUMN TOTALS			45.44	88.35	12.90	52.41	199.10

TABLE C8
PER ACRE COSTS OF OPERATION FOR TANGELOS
YEARS 5 AND 6

OPERATION	HOURS PER ACRE Mach	Labor	COST PER ACRE ($) Mach	Labor	Serv	Matls	TOTAL
YEAR 5							
Frost protection	3.6	0.2	11.07	0.97			12.04
Irrigate		2.9		12.34			12.34
Apply N fertilizer				0.00		36.90	36.90
Spot spray weeds	1.8	2.0	14.40	11.60		30.00	56.00
Suckering		2.0		11.60			11.60
Knock borders	0.9	1.0	3.80	5.80			9.60
Pick and Haul				0.00	200.00		200.00
Make borders	0.9	1.0	3.80	5.80			9.60
Buck rows	0.1	0.2	0.57	0.87			1.44
Apply insecticide	0.2	0.3		1.45	8.00	9.73	19.18
Apply insecticide	0.2	0.3		1.45	4.40	6.40	12.25
Apply minor elements				0.00		7.76	7.76
Apply herbicides	0.2	0.3		1.45	8.50	22.50	32.45
Herbicide incorp.	0.5	0.5	2.03	2.90			4.93
Irrigate		3.2		13.71		0.00	13.71
Pickup use	2.0		13.46	0.00			13.46
COLUMN TOTALS			49.13	69.94	220.90	113.29	453.26
YEAR 6							
Frost Protection	3.6	0.2	11.07	0.97			12.04
Irrigate		2.9		12.34			12.34
Water run fertilizer				0.00		36.90	36.90
Spot spray weeds	1.8	4.0	14.40	23.20		30.00	67.60
Knock borders	0.9	1.0	3.80	5.80			9.60
Pick and Haul				0.00	400.00		400.00
Make borders	0.9	1.0	3.80	5.80			5.80
Buck rows	0.1	0.2	0.57	0.87			1.44
Apply insecticide	0.2	0.3		1.45	8.00	9.73	19.18
Suckering		2.0		11.60			11.60
Apply insecticide	0.2	0.3		1.45	4.40	6.40	12.25
Apply minor elements				0.00		7.76	7.76
Apply herbicide	0.2	0.3		1.45	8.00	31.00	40.45
Irrigate		3.2		13.71		0.00	13.71
Pickup use	2.0		13.46	0.00			13.46
COLUMN TOTALS			47.10	78.64	420.40	121.79	667.93

TABLE C9
SUMMARY OF PER ACRE COSTS FOR TANGELOS

	YEAR					
	1	2	3	4	5	6
-Survey	5.0					
-Level	80.0					
-Chisel	20.0					
-Disk	7.0					
Total preparation costs	112.00					
-Stake trees	30.8					
-Plant	16.2					
-Replant		1.2				
-Wrap	73.2					
-List	8.0					
Planting total	128.2	1.2	0.00	0.00	0.00	0.00
-Make borders	9.4		3.20	3.20	9.60	9.60
-Knock borders	3.2		3.20	3.20	9.60	9.60
-Disk ends	7.0					
-Buck rows	0.5		0.55	0.54	1.44	1.44
-Suckering				11.60	11.60	11.60
-Remove stalks		30.9				
-Frost protection	71.9	12.0	12.04	12.04	12.04	12.04
-Pickup use	13.5	13.5	3.40	13.46	13.46	13.71
Total cultivation costs	105.5	56.4	22.40	44.00	57.70	58.00
-Irrigat. water costs	0.0	0.0	0.00	2.25	0.00	0.00
-Irrigat. water costs	58.5	66.7	41.36	44.08	26.05	26.05
Irrigation costs	58.5	66.7	41.40	46.30	26.00	26.00
-Spray weeds	19.0	57.4	38.57	37.60	56.00	67.60
-Nitro fert.		2.3	2.25	13.50	36.90	36.90
-Hand fert.	10.5					
-Apply minor elements		7.8	7.76	7.76	7.76	7.76
-Apply insect.		7.6	8.40	10.80	31.43	31.43
-Apply herb.	31.0		34.14	34.14	32.45	40.45
-Incorp. herb.	4.9		4.93	4.93	4.93	
Chemical & appl.costs	65.4	75.0	96.00	108.70	169.50	184.10
PREHARVEST TOTAL	469.50	199.3	159.80	199.10	253.30	268.20

TABLE C10
COSTS AND RETURNS FOR A FIFTY ACRE CITRUS ORCHARD PRODUCING NAVEL ORANGES AND TANGELOS, YEARS 1 - 7

	YEAR							
	0	1	2	3	4	5	6	7
YIELD AND GROSS REVENUES								
Navel orange yield (field boxes/25ac.)	0.0	0.0	0.0	0.0	0.0	1,250.0	1,675.0	2,500.0
Navel orange revenue ($6.70/box)	0.0	0.0	0.0	0.0	0.0	8,375.0	11,222.5	16,750.0
Tangelo yield (field boxes/25ac.)	0.0	0.0	0.0	0.0	0.0	2,500.0	5,000.0	7,500.0
Tangelo revenue ($7.70/box)	0.0	0.0	0.0	0.0	0.0	19,250.0	38,500.0	57,750.0
Gross revenue ($)	0.0	0.0	0.0	0.0	0.0	27,625.0	49,722.5	74,500.0
OPERATING COSTS ($)								
Preharvest:								
Navel Operating Cost								
-Prepar. and planting	0.0	7,260.2	29.0	0.0	0.0	0.0	0.00	0.0
-Cultivation and prep.	0.0	2,637.2	1,204.1	559.8	1,101.0	1,443.5	3,094.5	3,094.5
-Chemical and applic.	0.0	1,702.0	1,818.2	2,401.2	2,718.3	4,236.8	4,603.5	3,094.5
-Irrigation costs	0.0	1,249.9	1,668.3	1,034.0	1,285.8	2,296.0	2,296.0	3,094.5
Tangelo Operating Cost								
-Prepar. and planting	0.0	6,004.0	29.0	0.0	0.0	0.0	0.0	0.0
-Cultivation and prep.	0.0	1,634.5	1,874.5	2,401.2	2,718.3	4,236.8	4,603.5	3,094.5
-Chemical and applic.	0.0	1,634.5	1,874.5	2,401.2	2,718.3	4,236.8	4,603.5	3,094.5
-Irrigation costs	0.0	1,461.6	1,668.3	1,034.0	1,158.3	651.2	651.2	3,094.5
Harvest costs	0.0	0.0	0.0	0.0	0.0	7,500.0	13,350.0	20,000.0
Total Operating Costs	0.0	23,583.8	10,165.9	9,831.5	11,699.8	24,600.9	33,202.1	38,566.9
FIXED COSTS ($)								
Insurance	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0
Depreciation	0.0	8,492.1	8,492.1	8,492.1	8,492.1	8,492.1	8,492.1	8,492.1
General farm maintenance	0.0	850.0	850.0	850.0	850.0	850.0	850.0	850.0
BIA water assessment	670.0	670.0	670.0	670.0	670.0	670.0	670.0	670.0
Total Fixed Costs	1,170.0	10,512.1	10,512.1	10,512.1	10,512.1	10,512.1	10,512.1	10,512.1
CAPITAL INVESTMENT ($)								
Equipment purchases	110,600.0					10,000.0		
Orchard development	34,750.0	174.0	0.0	0.0	0.0	0.0	0.0	0.0
Fixed assets	10,000.0							
Total Capital	155,350.0	174.0	0.0	0.0	0.0	10,000.0	0.0	0.0
FLOW OF FUNDS SUMMARY ($)								
Cash inflows	0.0	0.0	0.0	0.0	0.0	27,625.0	49,722.5	74,500.0
Cash outflows	156,520.0	34,269.6	20,678.0	20,343.6	22,211.9	45,113.0	43,714.2	49,078.9
Cash differences	-156,520.0	-34,269.6	-20,678.0	-20,343.6	-22,211.9	-17,488.0	6,008.3	25,421.1
OPERATING CREDIT TRANSACTIONS ($)								
Operating credit payments		3,301.7	1,423.2	1,376.4	1,638.0	3,444.1	4,648.3	5,399.4
DEVELOPMENT LOAN ($)								
Needed credit additions	155,350.0	23,757.5	10,165.9	9,831.5	11,699.8	10,000.0	0.0	0.0
Margin, additional req'd	54,372.5	8,315.1	3,558.1	3,441.0	4,094.9	3,500.0	0.0	0.0
Net new credit	100,977.5	15,442.4	6,607.8	6,390.5	7,604.9	6,500.0	0.0	0.0
Interest payment		11,612.4	13,388.3	14,148.2	14,883.1	15,757.7	16,505.2	15,541.6
Principle payment							8,378.5	9,342.0
DEBT OUTSTANDING ($)								
Margin balance	54,372.5	62,687.6	66,245.7	69,686.7	73,781.7	77,281.7	77,281.7	77,281.7
Development loan balance	100,977.5	116,419.9	123,027.7	129,418.2	137,023.1	143,523.1	135,144.6	125,802.6
RET. TO LAND & MGT. ($)	-210,892.5	-54,197.2	-37,624.4	-37,932.8	-41,189.9	-36,745.6	-10,496.9	9,879.4
RET. TO MGT. ($)	-214,642.5	-57,947.2	-41,374.4	-41,682.8	-44,939.9	-40,495.6	-14,246.9	6,129.4

TABLE C11
COSTS AND RETURNS FOR A FIFTY ACRE CITRUS ORCHARD PRODUCING NAVEL ORANGES AND TANGELOS, YEARS 8 - 15

	YEAR							
	8	9	10	11	12	13	14	15
YIELD AND GROSS REVENUES								
Navel orange yield (field boxes/25ac)	3,750.0	6,250.0	7,500.0	15,000.0	15,000.0	15,000.0	15,000.0	15,000.0
Navel orange revenue ($6.70/box)	25,125.0	41,875.0	50,250.0	100,500.0	100,500.0	100,500.0	100,500.0	100,500.0
Tangelo yield (field boxes/25ac)	10,000.0	12,500.0	15,000.0	15,000.0	15,000.0	15,000.0	15,000.0	15,000.0
Tangelo revenue ($7.70/box)	77,000.0	96,250.0	115,500.0	115,500.0	115,500.0	115,500.0	115,500.0	115,500.0
Gross revenue ($)	102,125.0	138,125.0	165,750.0	216,000.0	216,000.0	216,000.0	216,000.0	216,000.0
OPERATING COSTS ($)								
Preharvest:								
Navel Operating Cost								
-Prepar. and planting	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5
-Cultivation and prep.	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5
-Chemical and applic.	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5
-Irrigation costs	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5
Tangelo Operating Cost								
-Prepar. and planting	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5
-Cultivation and prep.	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5
-Chemical and applic.	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5
-Irrigation costs	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5	3,094.5
Harvest costs	27,500.0	37,500.0	45,000.0	60,000.0	60,000.0	60,000.0	60,000.0	60,000.0
Total Operating Costs	46,066.9	56,066.9	63,566.9	78,566.9	78,566.9	78,566.9	78,566.9	78,566.9
FIXED COSTS ($)								
Insurance	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0
Depreciation	8,492.1	8,492.1	8,492.1	8,492.1	8,492.1	8,492.1	8,492.1	8,492.1
General farm maintenance	850.0	850.0	850.0	850.0	850.0	850.0	850.0	850.0
BIA water assessment	670.0	670.0	670.0	670.0	670.0	670.0	670.0	670.0
Total Fixed Costs	10,512.1	10,512.1	10,512.1	10,512.1	10,512.1	10,512.1	10,512.1	10,512.1
CAPITAL INVESTMENT ($)								
Equipment purchases	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Orchard development	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fixed assets	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Capital	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FLOW OF FUNDS SUMMARY ($)								
Cash inflows	102,125.0	138,125.0	165,750.0	216,000.0	216,000.0	216,000.0	216,000.0	216,000.0
Cash outflows	56,578.9	66,578.9	74,078.9	89,078.9	89,078.9	89,078.9	89,078.9	89,078.9
Cash differences	45,546.1	71,546.1	91,671.1	126,921.1	126,921.1	126,921.1	126,921.1	126,921.1
OPERATING CREDIT TRANSACTIONS ($)								
Operating credit payments	6,449.4	7,849.4	8,899.4	10,999.4	10,999.4	10,999.4	10,999.4	10,999.4
DEVELOPMENT LOAN ($)								
Needed credit additions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Margin, additional req'd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net new credit	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interest payment	14,467.3	13,269.4	11,933.8	10,444.6	8,784.1	6,932.6	4,868.2	2,566.5
Principle payment	10,416.3	11,614.2	12,949.8	14,439.1	16,099.6	17,951.0	20,015.4	22,317.2
DEBT OUTSTANDING ($)								
Margin balance	77,281.7	77,281.7	77,281.7	77,281.7	77,281.7	77,281.7	77,281.7	77,281.7
Development loan balance	115,386.3	103,772.1	90,822.2	76,383.1	60,283.6	42,332.6	22,317.2	0.0
RET. TO LAND & MGT.($)	31,078.8	58,276.6	79,737.3	116,476.5	118,137.0	119,988.4	122,052.8	124,354.6
RET. TO MGT. ($)	27,328.8	54,526.6	75,987.3	112,726.5	114,387.0	116,238.4	118,302.8	120,604.6

APPENDIX D

FEASIBILITY STUDY OF A SMALL RETAIL NURSERY-2.5 ACRES

TABLE D1

CAPITAL EXPENDITURES FOR A SMALL RETAIL NURSERY

EQUIPMENT	EXPENDITURE
20 PTO hp tractor	$15,000
3/4 ton pickup	7,000
Four wheel tracing wagon	340
Two metal garden carts	280
Shade Housing	2,913
Backpack sprayer	250
Containers and depots	1,500
irrigation system	10,000
fertilizer injector	500
water filter	750
Office, Greenhouse, retail center	20,000
gravel and surface construction	11,173
reservoir	1,200
pump	800

Because of the low cost source of water available to the community, the nursery is equipped to take surface water from the Salt River Project. This requires a small reservoir for holding water and a filter system.

TABLE D2

MEAN PRICE AND STANDARD DEVIATION FOR EACH PLANT CATEGORY OF NURSERY PLANTS

	Mean	Standard deviation
<u>Desert Plants</u>		
Trees		
-15 gallon:	$29	$9.40
-5 gallon:	9.78	4.14
Shrubs		
-1 gallon:	2.65	1.70
<u>Other Plants</u>		
Trees		
-15 gallon:	30.98	10.98
-5 gallon:	10.48	3.65
Shrubs		
-1 gallon:	2.82	1.53

Source: Arizona Republic March 1987 - June 1987

TABLE D3
10 YEAR CASH FLOW BUDGET FOR A SMALL RETAIL NURSERY
Costs of Production and Operation and Revenues

SALES ($)	PRICE PER UNIT	YEAR 0	1	2	3	4	5	6	7	8	9	10
Desert trees												
-15 gallon size	$29.00					$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320
-5 gallon size	9.78			$10,565	$10,565	10,565	10,565	10,565	10,565	10,565	10,565	10,565
-Shrubs	2.66		$2,878	2,878	2,878	2,878	2,878	2,878	2,878	2,878	2,878	2,878
Other trees												
-15 gallon size	30.99					33,464	33,464	33,464	33,464	33,464	33,464	33,464
-5 gallon size	10.48			11,322	11,322	11,322	11,322	11,322	11,322	11,322	11,322	11,322
-Shrubs (1 gal.)	2.83		3,055	3,055	3,055	3,055	3,055	3,055	3,055	3,055	3,055	3,055
TOTAL SALES ($)		$ 0	5,933	27,820	27,820	92,604	92,604	92,604	92,604	92,604	92,604	92,604
PROPAGATION COSTS ($)												
Prepare prop. area & plant			400	400	400	400	400	400	400	400	400	400
-Irrigate			100	100	100	100	100	100	100	100	100	100
-Cooling costs			305	305	305	305	305	305	305	305	305	305
-Heating costs			864	864	864	864	864	864	864	864	864	864
CONTAINER PRODUCTION COSTS ($)												
Transplant (10% mort.)												
-Depots to one gallon			80	80	80	80	80	80	80	80	80	80
-One gallon to five gallon				298	298	298	298	298	298	298	298	298
-One gallon to 15 gallon						516	516	516	516	516	516	516
Irrigate		0	0	86	225	330	330	330	330	330	330	330
Insecticide appl.			153	153	153	153	153	153	153	153	153	153
Hand weeding & pruning			153	153	153	153	153	153	153	153	153	153
MATERIALS ($)												
-Soil mix		698	2,206	15,265	15,265	15,265	15,265	15,265	15,265	15,265	15,265	15,265
-Algicide		1	6	25	54	54	54	54	54	54	54	54
Fertilizer		27	10	38	38	82	82	82	82	82	82	52
-Insecticide			420	420	420	420	420	420	420	420	420	420
-One gallon containers			333	333	333	333	333	333	333	333	333	333
-5 gallon containers				1,910	1,910	1,910	1,910	1,910	1,910	1,910	1,910	1,910
-15 gallon containers						5,552	5,552	5,552	5,552	5,552	5,552	5,552
TOTAL PRODUCTION COSTS ($)		725	5,029	20,430	20,569	26,814	26,814	26,814	26,814	26,814	26,814	26,814
MARKETING COSTS ($)												
Sales personnel			5,594	5,594	5,594	5,594	5,594	5,594	5,594	5,594	5,594	5,594
Advertising			8,851	8,851	8,851	8,851	8,851	8,851	8,851	8,851	8,851	8,851
TOTAL OPERATING COSTS ($)		725	19,475	34,876	35,015	41,259	41,259	41,259	41,259	41,259	41,259	41,259
RETURNS OVER COSTS OF OPERATIONS ($)		(725)	(13,542)	(7,055)	(7,194)	51,345	51,345	51,345	51,345	51,345	51,345	51,345

TABLE D4
10 YEAR CASH FLOW BUDGET FOR A SMALL RETAIL NURSERY
Overhead, Financing Costs, and Opportunity Cost of Land

	0	1	2	3	4	5	6	7	8	9	10
RETURNS OVER COSTS OF OPERATIONS OVERHEAD ($)	(725)	(13,542)	(7,055)	(7,194)	51,345	51,345	51,345	51,345	51,345	51,345	51,345
Insurance	430	430	430	430	430	430	430	430	430	430	430
Water assessment	27	27	27	27	27	27	27	27	27	27	27
INVESTMENT COSTS ($)											
Initial Equity (25%)	17,931										
Interest on debt	5,997	7,487	8,263	9,054	9,054	9,054	9,054	9,054	9,054	9,054	9,054
Interest on fixed structures		2,488	2,473	2,456	2,438	2,418	2,396	2,371	2,344	2,315	2,283
TOTAL FIXED COSTS ($)	24,386	10,432	11,193	11,968	11,949	11,929	11,907	11,883	11,856	11,826	11,794
NET CASH RETURNS ($)	(25,111)	(23,974)	(18,248)	(19,162)	39,396	39,416	39,438	39,463	39,489	39,519	39,551
Depreciation	4,961	4,961	4,961	4,961	4,961	4,961	4,961	4,961	4,961	4,961	4,961
Opportunity Cost of Land	150	225	225	225	225	225	225	225	225	225	225
NET BEFORE-TAX BENEFITS TO OWNER AND MGT. ($)	(30,222)	(29,160)	(23,434)	24,348)	34,210	34,230	34,252	34,277	34,303	34,333	34,365