AN ANALYSIS OF MEXICAN VEGETABLE-PRODUCTION AND MARKETING POTENTIAL TO SUPPLY U.S. MARKETS

by

Victor Arturo Verlage

Soil and Crop Sciences Department

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Approved by:

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Craig R. Andersen
(Faculty Advisor)

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ABSTRACT

An Analysis of Mexican Vegetable-Production and Marketing Potential to Supply U.S. Markets

(April 1984)

Victor A. Verlage, Senior Student, Texas A&M University

Faculty Advisor, Dr. Craig R. Andersen

Department of Horticultural Sciences

Mexican vegetable production and vegetable exports to the United States are affected by climate, hand-labor costs, transportation capabilities and economic factors. Low-temperature-induced seasonality of vegetable supply in the United States increases the price of warm-season vegetables during the winter. This results in the formation of "marketing windows" with optimum prices for these vegetables. Mexico exports the most vegetables during these "marketing windows". This is the basis for Mexico's success as a major fresh vegetable supplier to U.S. markets. Mexico is also affected by low temperature but to a lesser extent than the United States. Genetic resistance to chilling injury in vegetable cultivars could be helpful for early-winter Mexican production. Inexpensive and plentiful hand labor decreases the cost of production and contributes to Mexico's competitive strength in the U.S. markets. Transportation feasibility favors Mexican vegetable exports over other production areas in Central or South America. Economic factors affect the trends of Mexican vegetable exports by affecting the profitability of exports and creating an atmosphere of price uncertainty among Mexican vegetable producers.

The cantaloupe's unique trend in the U.S. markets provides one of the highest potentials of profit for a Mexican export.

A laboratory method to quantify chilling tolerance in cantaloupe cultivars was tested. The limiting factor for cantaloupe production in the United States and Mexico is chilling injury caused by cool temperatures. The cantaloupe cultivar "Gusto 45" had the highest resistance to low temperatures and is recommended for early Mexican cantaloupe production.

ACKNOWLEDGEMENTS

I would like to express my sincerest appreciation to those persons who helped me in the development of this Senior Honors Thesis.

Special recognition is given to the following people:

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My parents, brother Bruno, sister Abigail and girlfriend Nancy for their support, understanding and concern for my academic education.

DEDICATION

This Senior Honor Thesis is in honor of my friend,

Bruno T. Verlage

who has been everything I have always wanted to be.

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CHAPTER I

INTRODUCTION

Mexico is the most important foreign supplier of fresh vegetables to U.S. markets.[1] For more than 50 years Mexico has supplied large quantities of fresh vegetables to the United States. In recent years Mexico has supplied over 70 percent of the total U.S. fresh vegetable imports (9). More than 40 different Mexican vegetable commodities reach the U.S. markets every year. However, only 5 warm-season vegetables: tomatoes, cucumbers, peppers, eggplant and squash, have traditionally been considered the key for the Mexican share in the U.S. vegetable market. Mexican supply of these vegetables, sometimes refered to as "winter vegetables", usually increases and reaches a peak sometime between the months of December to May. Cantaloupes are not usually considered one of the key Mexican vegetable exports. In recent years increased cantaloupe market value has expanded the potential of cantaloupes for becoming a key Mexican vegetable export. Climate, transportation and production-related factors contribute to Mexico's potential to supply the U.S. vegetable markets. The interaction of these factors is reflected in the formation of "marketing windows" for the "winter vegetables" that have favored Mexican exports with high prices for many years.

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[1] Format and style of this Senior Honors Thesis follows those found in the Journal of the American Society for Horticultural Science.

This situation has resulted in a steadily increasing Mexican-vegetable supply to the United States. In the past 4 years a series of economic factors and a major economic crisis in Mexico affected the profitability of Mexican exports resulting in alterations of the previously stable trade trends. This situation makes it particularly difficult for Mexican producers to decide which vegetable crop has highest potential for profitable exports to the United States. This also affects the trends of Mexican exports to U.S. markets. Therefore, it affects American as well as Mexican producers when the respective competitive capacity for both production areas changes as the Mexican economy deteriorates. The purpose of this thesis is to provide a general understanding of the main factors that affect Mexico's potential to supply fresh vegetables to the United States and to identify profitable alternatives in producing and marketing Mexican vegetables to U.S. markets.

CHAPTER II

LITERATURE REVIEW

INTERNATIONAL TRADE

Over the years, the Mexico-U.S. trade has increased and expanded in almost all areas. Petroleum, cotton, coffee, fruits and vegetables are among the most important Mexican exports. In 1982 Mexican exports reached a value of $21 billion, and the United States consumed 63.5% of the total 1982 Mexican exports. In turn Mexico imported $15 billion in machinery, equipment, industrial vehicles and others during 1982, and the United States supplied 74.5% of these imports (7). An important component of the Mexican exports are fruits and vegetables. In 1980 Mexico exported more than 500 million dollars in fruits and vegetables to the United States. Mexico supplies more than 70% of the total volume of U.S. fresh fruit and vegetable imports (bananas not included) (9). The bulk of Mexican vegetable exports are shipped to the United States during the winter when only Florida is in production. This places Mexico and Florida as the only two significant suppliers of warm-season vegetables to U.S. markets during the winter.

PRODUCTION FACTORS

United States Department of Agriculture studies in 1969 showed that several production-related factors give Mexico a large potential for producing fresh vegetables during the winter (13). Soon after transportation capabilities were improved in the 60's with new Mexican highways, Mexico became one of the most important vegetable suppliers to U.S. markets. While low temperature in the United States is a limiting factor, Mexico's milder winter is ideal for producing fresh vegetables to take advantage of the cold-weather-induced seasonality in the United States. Large areas of fertile soils with good quality water for surface irrigation are used in Mexico for vegetable production every year. Hand labor is plentiful in Mexico and generally less expensive than in the United States. These, and other factors, contribute to a steady increase of Mexican vegetable-export potential to the United States as the American population and demand increase and more irrigation systems are built in Mexico (11).

ECONOMIC FACTORS

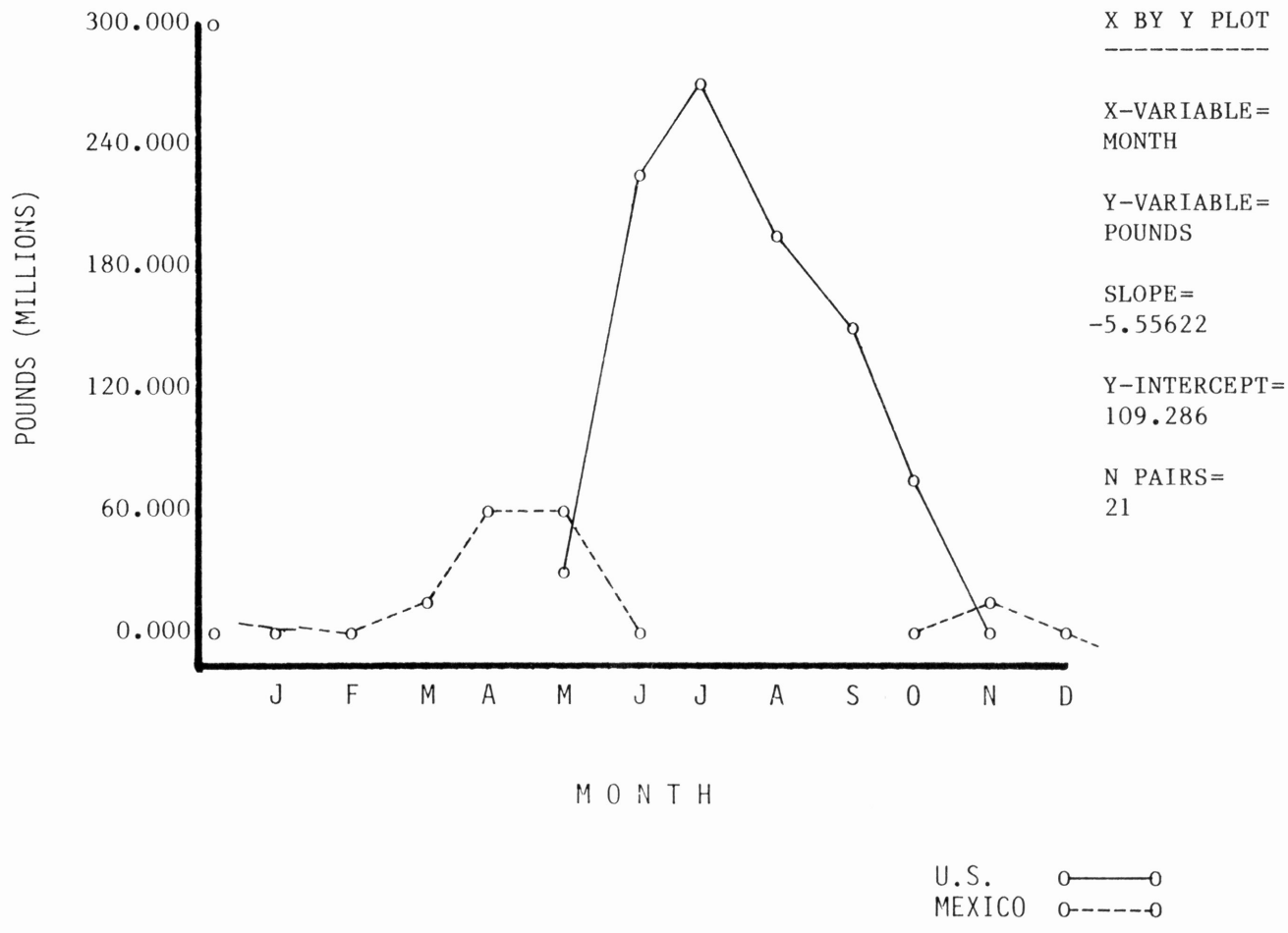
Mexican vegetable exports have increased steadily over the years due to favorable production factors. However, in the past 4 years a series of economic events, including a major economic crisis, forced Mexico to devaluate its peso several times. Associated with the peso devaluation, inflation increased to 98.85% annual in December 1982 (7). These economic factors affect the profitability of Mexican exports and therefore the trends of Mexican supply of fresh vegetables to the United States.

ALTERNATIVES

High "record prices" for winter cantaloupes in the past 4 years have increased the opportunity for cantaloupe growers to make more profits. To Mexican producers, this is particularly important because only Mexico supplies cantaloupes during the winter (Fig. 1). Therefore, the cantaloupe price during the winter is dependent only on Mexican cantaloupe exports to U.S. markets. This could be a significant factor affecting vegetable crop choice during this period of economic instablity in Mexico.

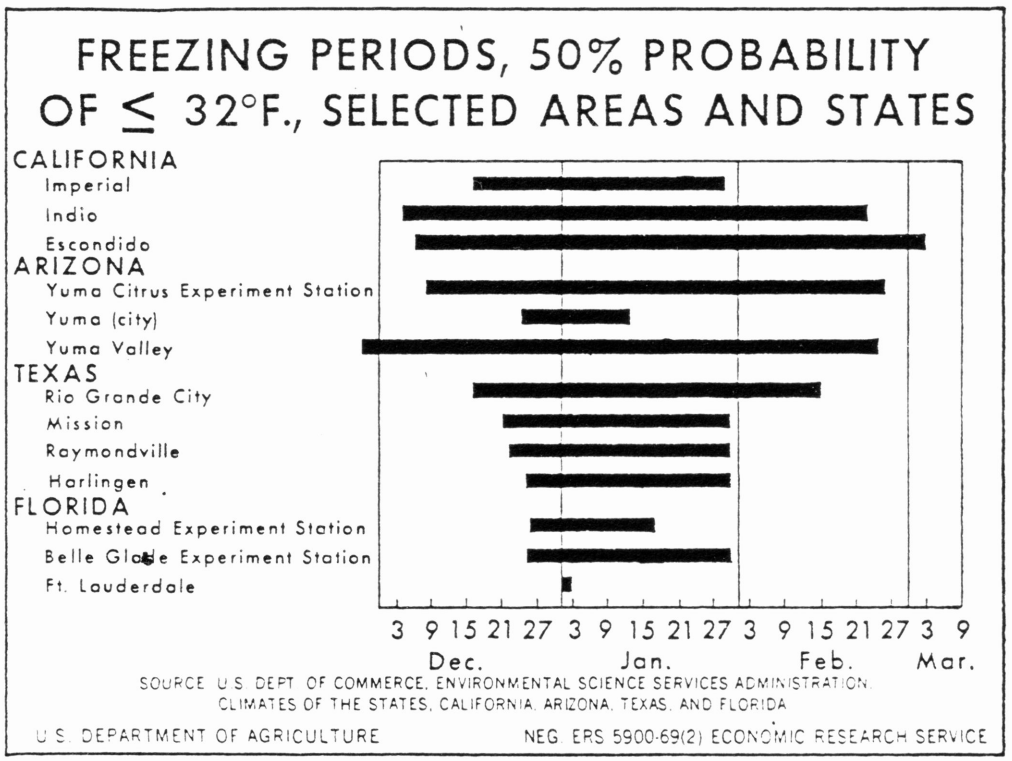
Low temperatures are the critical factor affecting winter production of warm season vegetables. In most areas of the United States low temperatures prohibit production of these low temperature-sensitive vegetables (9). Florida and Mexico, the main fresh vegetable suppliers during the winter, also face low temperatures but in general these are above $0^{o}C$ and the probability of a freeze is relatively low (Fig. 2). However, these low temperatures (0^{o}- $10^{o}C$) also affect production and over time cause chilling injury. Chilling injury is a physiological disease that decreases yields and delays production (2). The impact of chilling injury on the Mexican production results in decreased exports from December to February for the most chilling sensitive vegetables like cantaloupes (Fig. 1) (9). This limits Mexico to fully take advantage of the winter season especially in Janauary when the cantaloupe prices peak.

Figure 1. Cantaloupes Shipments to U.S. Markets.



Source: U.S. Department of Agriculture, Agricultural Marketing Service.

Figure. 2



Source: U.S. Department of Agriculture,

Agricultural Economic Report No. 154

GENETIC RESISTANCE. Patterson, Graham and Paull (1979) suggested that genetic tolerance to low temperatures is possible in some vegetables. They tested the response of different tomato cultivars to chilling. They found that some cultivars native to the mountains in Ecuador can produce acceptable yields even when temperature is not optimum for other tomato cultivars to grow (4). Tatsumi and Murata (1979) tested a method to quantify the degree of damage from exposure of cucurbits to chilling tempreatures. They measured the rate of ion leakage from chilled cucumber and cantaloupe tissues and correlated an increased rate of ion leakage with greater membrane damage from longer time of exposure to low temperatures (3).

CHAPTER III

MATERIALS AND METHODS

STATISTICS RESEARCH. The trends of Mexican exports of fresh vegetables to the United States were studied from USDA statistical reports. Mexico's supply of fresh vegetables was traced back to 1964. From this information, 5 of the most important vegetables exported from Mexico were determined. Correlations between these vegetables were used to determine the endogenous factors that made these vegetables so important. The F.O.B. (Free on Board) seasonal prices for these 5 vegetables were collected from USDA pricing statistics from 1976 to 1982. Production, economic and other factors that contribute to Mexico's vegetable exporting potentials were determined and studied using USDA reports and production and climatologic reports from the "Secretaria de Agricultura y Recursos Hydraulicos" (SARH), in Mexico. These factors were studied to present a basic understanding of Mexico's potential to supply the U.S. vegetable markets. The effect of major economic factors on Mexican vegetable exports were used to make rough predictions of short term changes in the trends of Mexican exports. The implications and effect of such changes on the "winter vegetables" prices and the effect on Mexican-production profits were outlined. Considering all the data collected, one vegetable crop with a promising potential for profitable Mexican export to U.S. markets was selected for study.

A search for alternatives to improve or expand the supply of the selected vegetable crop was done after determining the limiting factors affecting its marketing trends.

LABORATORY RESEARCH. Low temperatures and chilling injury were found to be the limiting factors which delayed Mexican production. Four commercial cantaloupe cultivars recommended for tropical production were tested for tolerance to chilling temperatures. Effects of low temperature exposure on membrane permeability of "Gusto 45", "Top Mark", "45-SJ" and "Perlita" cantaloupe cultivars were measured in the laboratory. The experimental design was four replications and five treatments. Seed was germinated on vermiculite in pots. Twelve cotyledon pairs were harvested from each cultivar for every replication. These harvested tissues were transfered to petri-dishes containing No.1 filter paper. A 2 mM Potassium Phosphate solution was used as a stabilizing media at a rate of 5 ml. per petri-dish to prevent dehydration during the treatment. The pH in the solution was set at 6.1 by mixing 2mM solutions of KH_2PO_4 (pH 4.1) and K_2HPO_4 (pH 8.5). The pH in the solutions was measured using the Corning "PH METER 125". Four replications from every cultivar were exposed to five different time treatments at $2^{o}C$ under fluorescent light. The 5 low-temperature exposure time treatments were: 0, 2, 4, 6 and 8 days. Radish cultivar "Champion" was used as a standard with only three time-treatments. The 4 radish replications per treatment were chilled for 0, 4 and 8 days.

After the treatments, the chilled radish and cantaloupe cotyledons were tranferred to 50 ml-beakers with a 40 ml de-ionized water solution. Corning "PC-353" stirrers were used to stir the samples and the rate of ion leakage from the tissues was measured in micromhos using the Kernco "LM-400" conductivity meter. The samples were then frozen at $0^{o}C$ for 24 hours. After freezing, the samples were transfered to room temperature, and after thawing, the total ion content in the cotyledons was measured after 2 minutes of stirring. The data collected was normalized for sample weight, variation between replications and total ion-content in the samples. A computer program was used to obtain the rate of ion leakage in micromhos per minute gram for the different treatments.

CHAPTER IV

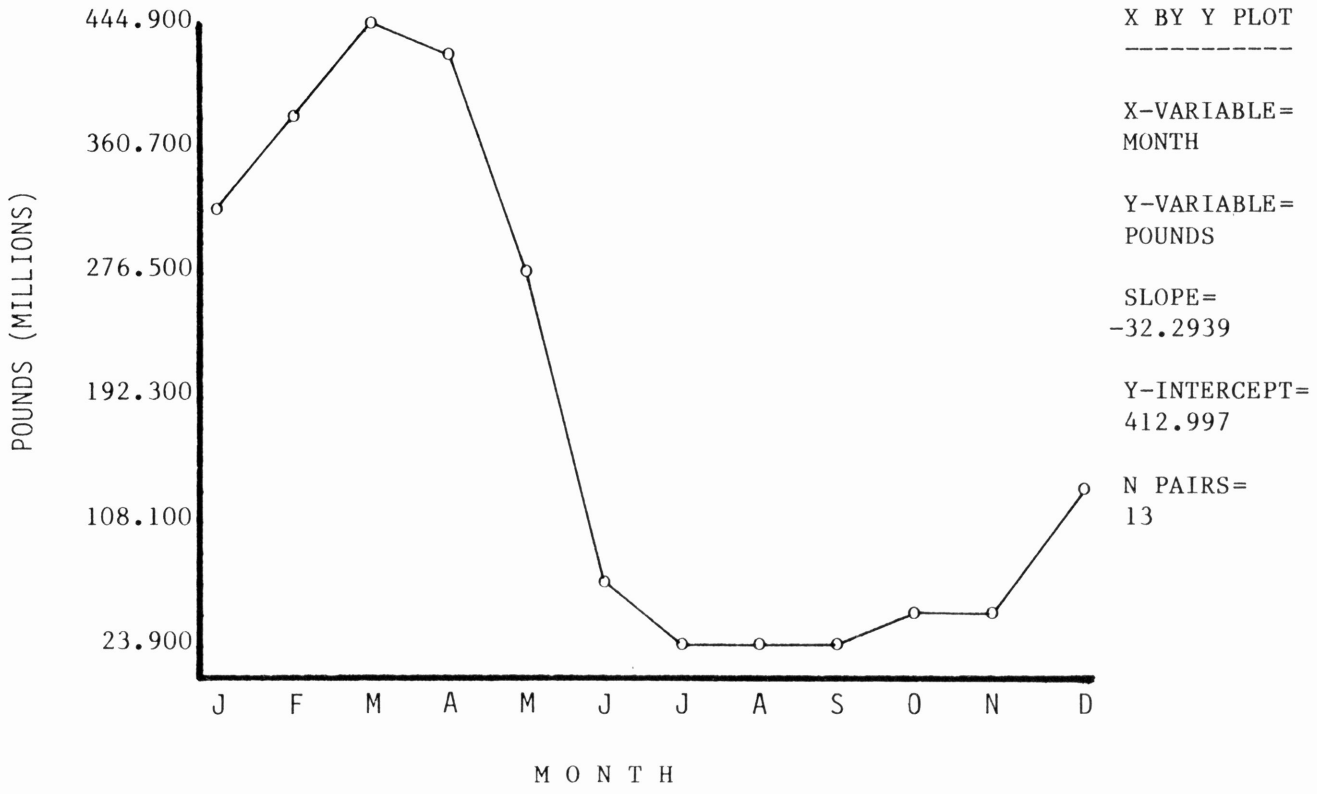
RESULTS AND DISCUSSION

MEXICAN VEGETABLE EXPORTS

Mexico exports more vegetables to the United States than any other foreign vegetable supplier to U.S. markets. From 1978-1980, Mexican fresh vegetable exports averaged more than 2300 million pounds per year. These amounts are comparable to the average total volume produced in Texas for the same period (9). Mexican vegetable exports begin in October, (January for cantaloupes), rise slowly and reach a peak late in the winter or early in the spring (February-April). Vegetable shipments from Mexico drop rapidly late in the spring (May-June) when production of warm-season vegetables starts in the United States (Fig. 3).

PLACE IN U.S. MARKETS. Mexico's vegetable supply competes with U.S. prodution areas for the highest places in total volume supplied and market shares of the U.S. vegetable market. Together with Texas, Mexico ranked fourth in total fresh vegetable supply to U.S. markets from 1978-1980 (9). In winter supply and market shares for fresh warm-season vegetables Mexico ranks No.1 followed by Florida (Tables 1-5).

Figure 3. Total Fresh Vegetable Mexican Exports to U.S. Markets, 1980.



Souree: U.S. Department of Agriculture, Agricultural Marketing Service.

MEXICAN VEGETABLE PRODUCTION

Production of fresh vegetables in Mexico is generally scheduled and aimed to supply the winter markets in the United States. There is some production of regional crops like "Serrano Peppers" for the domestic Mexican markets that also contribute to the value of the Mexican vegetable industry, but in general export crops are more important. Except for production areas in South Mexico with a transportation disadvantage, most Mexican production areas export vegetables to U.S. markets. Fertile soils with irrigation are usually used for vegetable production because of the increased returns from vegetable exports. The Pacific coast and the East coast in the Gulf of Mexico are particularly important vegetable production areas beacuse the fertile valleys along these coasts experience milder winters than the mountains in central Mexico.

PRODUCTION AREAS. On the Pacific coast, Sinaloa, Sonora and Baja California are the most important areas. Tamaulipas, Veracruz and San Luis Potosi share an important vegetable production area on the Gulf coast called "La Huasteca". Other important production areas are Chihuahua (peppers), Guanajuato (peppers and tomatoes), Morelos (tomatoes), Jalisco, Nayarit and Michoacan (Fig 4). Sinaloa is by far the most important Mexican vegetable production area.

Every year Sinaloa produces 30 percent of the total Mexican production of "winter vegetables". The center of Mexico's vegetable industry and headquarters of important farm organizations like, the "Union Nacional de Productores de Hotalizas" (UNPH), is Sinaloa (11).

Figure 4.

Source: U.S. Department of Agriculture,

Agricultural Economic Report No. 154

FACTORS AFFECTING TRADE

A whole set of climatic, economic and production-related factors regulate the flow of vegetables from Mexico to the United States. Transportation is an important factor that contributes to Mexico's potential to export vegetables. This factor does not affect the seasonal variation of Mexican vegetable shipments to the United States. The interaction of these factors creates an ideal environment for Mexican vegetable exports and this is reflected in the trends of Mexico-U.S. trade.

CLIMATE. Low temperatures in the United States and their impact on the U.S. vegetable markets are the basis of Mexico's success in exporting vegetables (Figs. 5,6). Climatic uncertainties among American vegetable producers result in decreased warm-season vegetable plantings in the United States during the winter. This reduces the U.S. winter production and the warm-season vegetable prices substantially increase from December to April (8). Mexican production areas experience milder winters that permit winter production of these chilling sensitive crops (Table 6). The climate induced seasonality in the U.S. markets is the factor that in the long run favors Mexican vegetable exports. In the short run, occasional frosts or late rains in both, Florida and Mexico, will determine the variation of in-season supply and net returns from "winter vegetables" (Fig. 2). Mexican producers benefit from late frosts in Florida because this results in higher prices for the winter peppers and the same is true for Florida producers when heavy rains in the fall delay Mexican plantings.

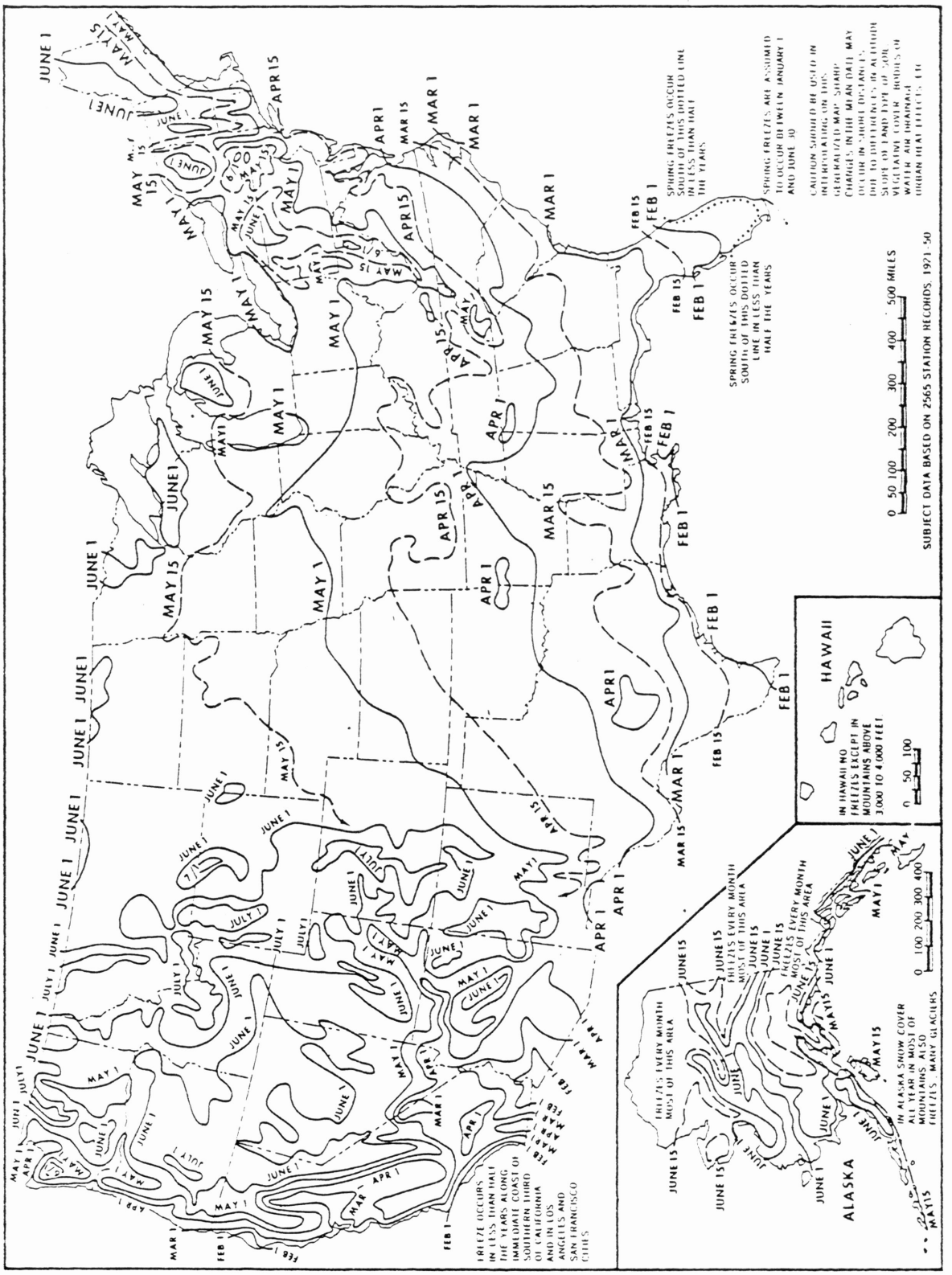


Figure. 5.

Source: U.S. Department of Agriculture,

Agricultural Economic Report No. 154

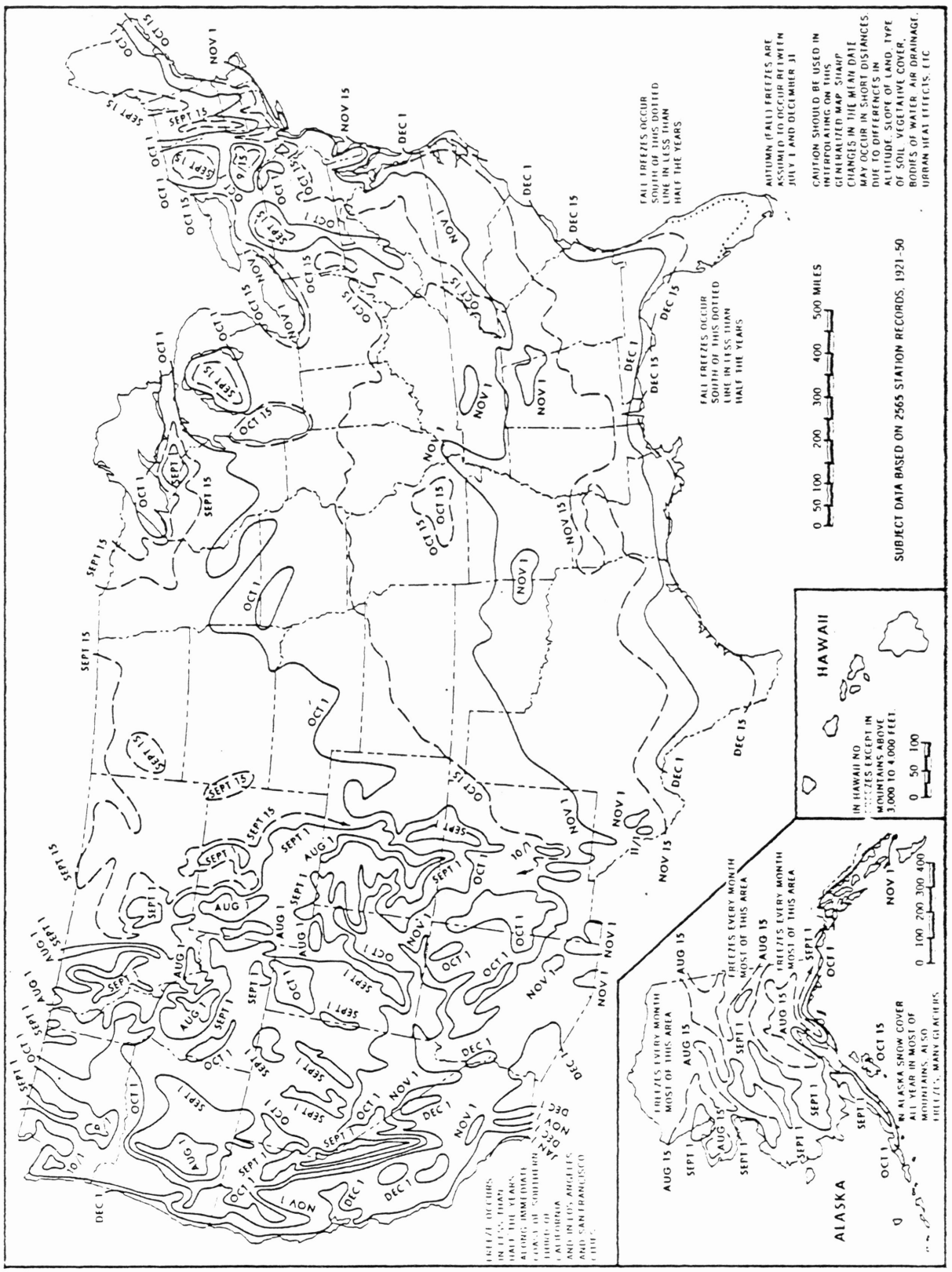


Figure. 6

Source: U.S. Department of Agriculture,

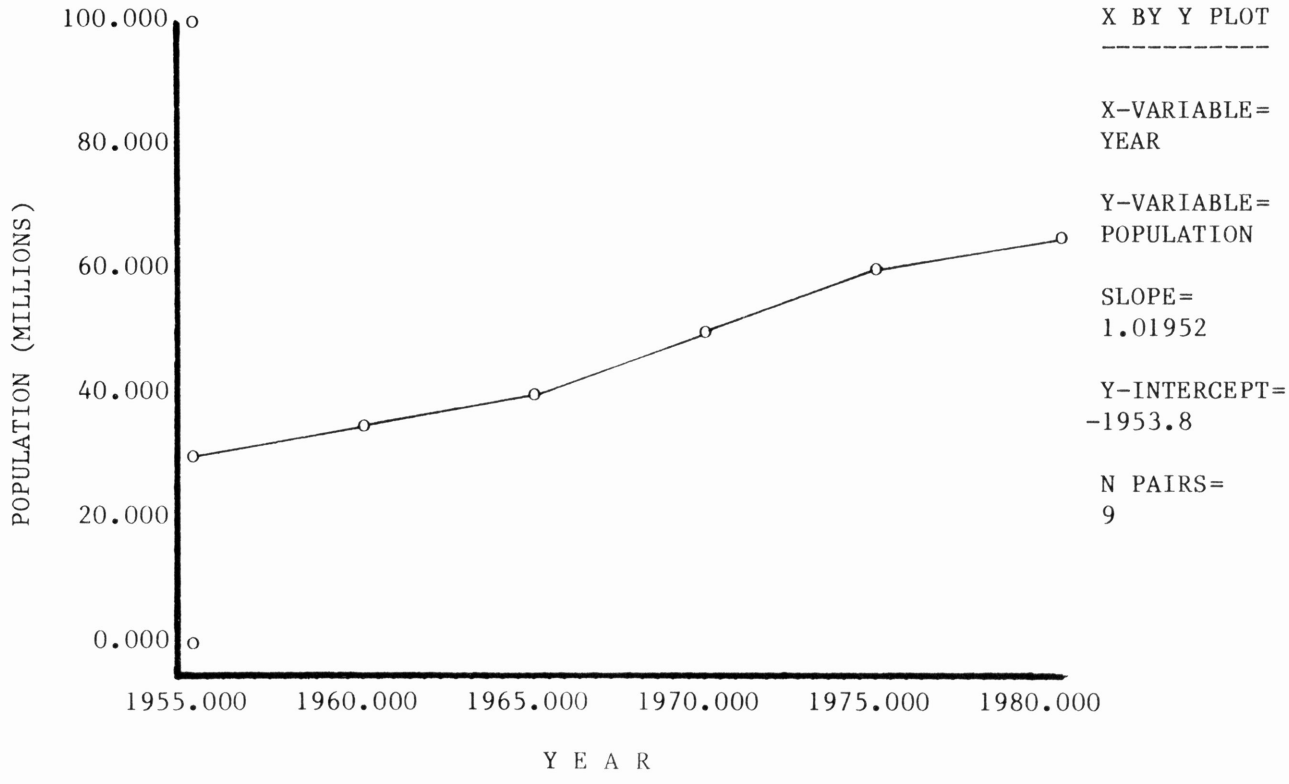
Agricultural Economic Report No. 154

TRANSPORTATION. This factor plays an impotant role in Mexican vegetable exports because the "winter vegetables" are highly perishable. Time of transportation will determine the quality of the produce that reaches the markets. This is the critical factor that prevents other production areas in Central and South America from supplying fresh vegetables to U.S. markets. These areas in the south have large potentials for winter vegetable production but only if expensive air transportation or prompt sea transportation are available. This is the major limiting factor in establishing the foreign trade of fresh vegetables between Central and South America and the United States. Most of the Mexican vegetables are shipped by truck, and some rail transportation is used to ship produce from Culiacan, Sinaloa. Most shipments are by refrigerated trucks. Top icing is sometimes used to allow melon shipment in non-refrigerated trucks (11). Mexican production areas in the Gulf coast (Huasteca) are 300 to 400 miles away from South Texas the main fesh-vegetable point of entry to the United States on the east coast. On the Pacific coast, the Mexican production areas are within a range of 200 to 900 miles away from the U.S. fresh-vegetable points of entry: El Paso, Texas; Nogales, Arizona; and San Ysidro, California. Most Mexican vegetable shipments reach the U.S. points of entry in 14 to 20 hours (11). This relative short time of transportation represents a desicive factor contributing to Mexican vegetable exports. Transportation is expected to improve in the future as Mexican highways are expanded in the next decade.

HAND LABOR. Mexico has always been known for its readily available, inexpensive hand labor. The rapidly growing massive population and a high rate of unemployment in Mexico reduce the cost of hand labor substantially (Fig. 7). In 1982, a population of 76 million was estimated in Mexico (7). With an estimated annual growth of 3.1%, Mexico's population is predicted to reach 131 million by the year 2000. This would constitute 2% of the predicted 6,531 million total world population by the end of this century (5). In 1983, 21.5 million people composed the Mexican working force. Agriculture, forestry and fishing provided 26% of the jobs. The rate of unemployment in Mexico increased to 25% in 1976 (11). High unemployment rate and a rapid annual population growth have resulted in a large surplus of hand labor in Mexico over the years. This surplus of hand labor has traditionally lowered the Mexican hand-labor costs. In Janauary 1984 the Mexican hand labor cost (0.42 dollars per hour) was significantly below the 3.64-dollars-per-hour minimum wage in the United States. This is particularly important for vegetable production where massive and intensive hand labor is required. Hand labor seems to be a factor that will strengthen Mexico's potential to export vegetables in the future.

ECONOMIC FACTORS. The most dramatic factor that affects Mexican vegetable exports is the Mexican economy. In the last 4 years the traditionally increasing Mexican supply of fresh vegetables to U.S. markets has been affected by two main economic factors: the peso devaluation and inflation (15).

Figure 7. Population in Mexico



SOURCE: United States Department of Agriculture, Economic Research Service.

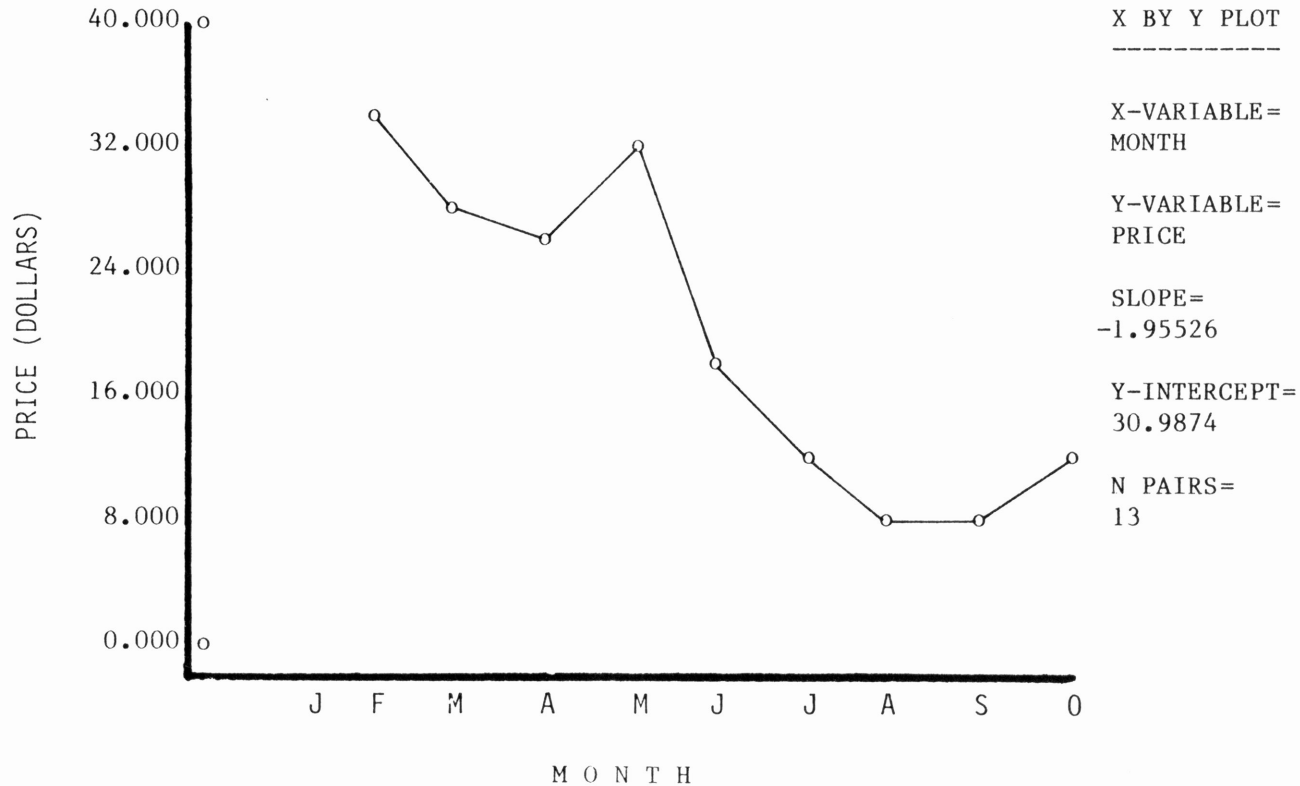
The peso has suffered several devaluations in the past 14 years, but the devaluations of the past 4 years have been particulaly dramatic (Table 7). The inflation rate in Mexico reached 98.85% annual in December 1982 (7). A devaluation of the peso increases the profitability of Mexican exports. After a devaluation, the Mexican producer receives more pesos for every dollar he gets for his products. This means more pesos to pay costs of production and make more profits. On the other hand, inflation increases the cost of production and evetually offsets the increased returns from the previous devaluation. This results in increased Mexican exports for two or three seasons following a devaluation. After the second or third season, inflation increases cost of production, decreases profitability from exports and the devaluation-increased exports drop to levels below those in the original trend (15). These economic events create a "price uncertainty" from vegetable exports among Mexican producers because of the large price fluctuation after the peso-dollar conversion. The Mexican economy is the most important factor affecting short-run Mexican vegetable exports and making the Mexican vegetable exporting trends less predictable in the long run.

ALTERNATIVES

The price uncertainty from exports caused by economic events in Mexico makes profitable vegetable exports less predictable. The Mexican vegetable producer must search for alternatives to reduce the risk from exports price uncertainty.

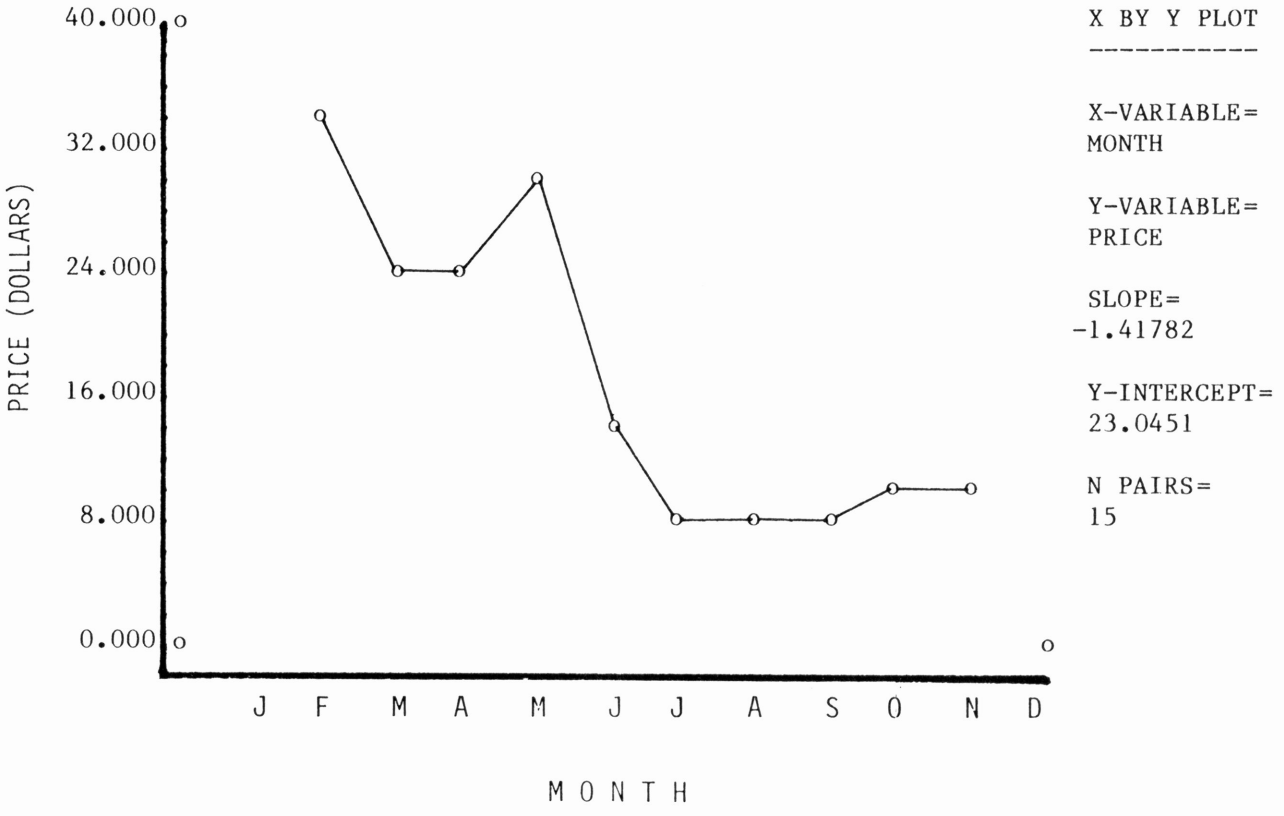
CROP CHOICE. Selection of the proper vegetable crops is an important factor for Mexican producers to profits. Depending on the production area, all warm-season vegetables have a good potential for profitable Mexican exports. Cantaloupe was chosen as the alternative crop with a high potential for profitable Mexican exports because of its unique trend in the U.S. markets. Winter production of most warm-season vegetables takes place in both Mexico and Florida; however, only Mexico produces and ships considerable volumes cantaloupes to the U.S. markets from January to April (9). Thus, the winter cantaloupe price is solely determined by the Mexican supply. This results in exceptionally low price risk for winter produced cantaloupes. The Mexican production is not able to fully supply the U.S. markets and the price for winter cantaloupes increases substantially over the summer price (Fig. 8,9). The over-all price for cantaloupes has increased rapidly in the past few years (Table 8), making this crop even more attractive for Mexican production and exports. This situation creates an excellent "marketing window" that begins in December when California's season ends and continues until May when Texas production starts. This is a six-month long "marketing window". Mexico's cantaloupe supply is low in December and January, increases rapidly in February, peaks in May and drops suddenly in June (Fig. 1). Mexican cantaloupe production is low early in the winter. The limiting factor for early Mexican cantaloupe production is low temperatures.

Figure 8. Cantaloupe Average Monthly (F.O.B.) Prices, 1981.
Dollars/Jumbo Crate (36s).



Source: U.S. Department of Agriculture, Agricultural Marketing Service.

Figure 9. Cantaloupe Average Monthly (F.O.B.) Prices, 1982.
Dollars/Jumbo Crate (36s).



Source: U.S. Department of Agriculture, Agricultural Marketing Service.

Although many Mexican production areas are relatively frost-free, most of these areas experience temperatures below $10^{o}C$ for different periods of time. This induces chilling injury that delays and decreases production and prevents Mexico to fully take advantage of the cantaloupe "marketing window".

GENETIC RESISTANCE. To address the problem of cantaloupe chilling injury, genetic resistance to low temperatures in 4 cantaloupe cultivars was tested. Radish was used as a standard for a non-chilling sensitive plant. The rate of ion leakage (micromhos/minute gram) from treated tissues into deionized water was measured and correlated with cultivar tolerance to low temperatures. As expected, the chilling tolerant Radish tissues did not show large variation in the rate of ion leakage over the time of treatment (Fig. 10). The cantaloupe cultivar "Perlita" was the most sensitive of the 4 cultivars. Figure 11 shows a 2-fold increase in the rate of ion leakage from "Perlita" chilled cotyledons over 8 days of treatment. Both cultivars, "45-SJ" and "Top Mark", showed an intermediate response in rate of ion leakage during the time treatments. The rate of ion leakage from "Gusto 45" treated samples did not show significant variation over the time treatments (Fig. 12). Cultivar "Gusto 45" showed the highest resistance to low temperature exposure. This cultivar could be used to increase early Mexican cantaloupe production to take advantage of the high prices early in the winter.

Figure 10. Ion Leakage from Radish Cotyledons Exposed at 2°C.

Radish cv. Champion.

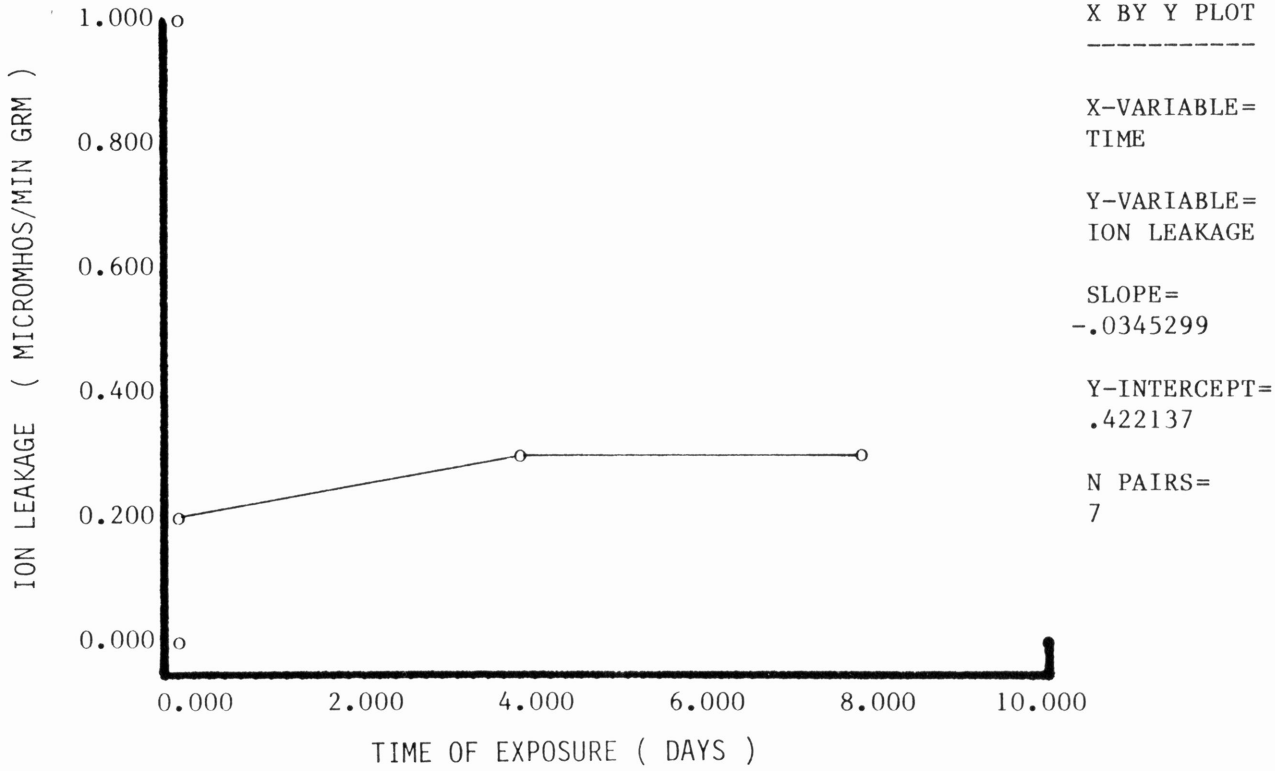


Figure 11. Ion Leakage from Cantaloupe Cotyledons Exposed at 2°C.

Cantaloupe cv. Perlita.

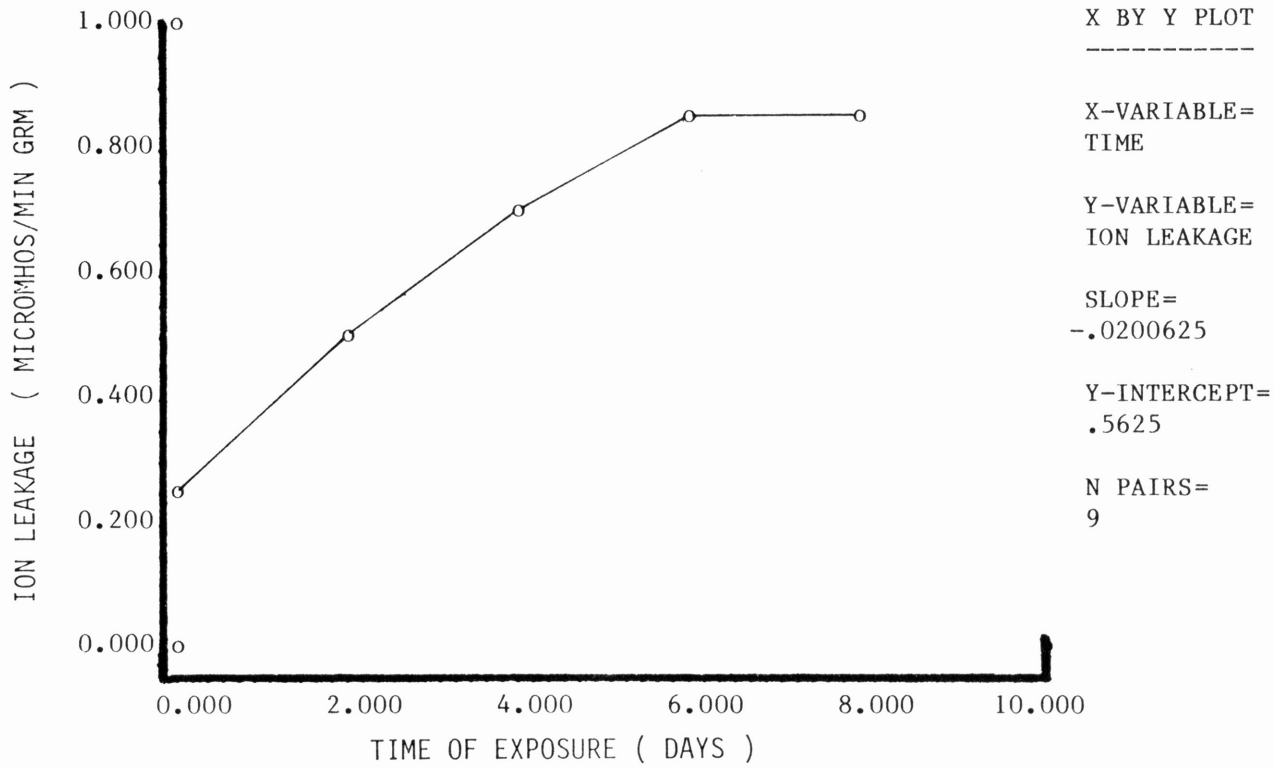
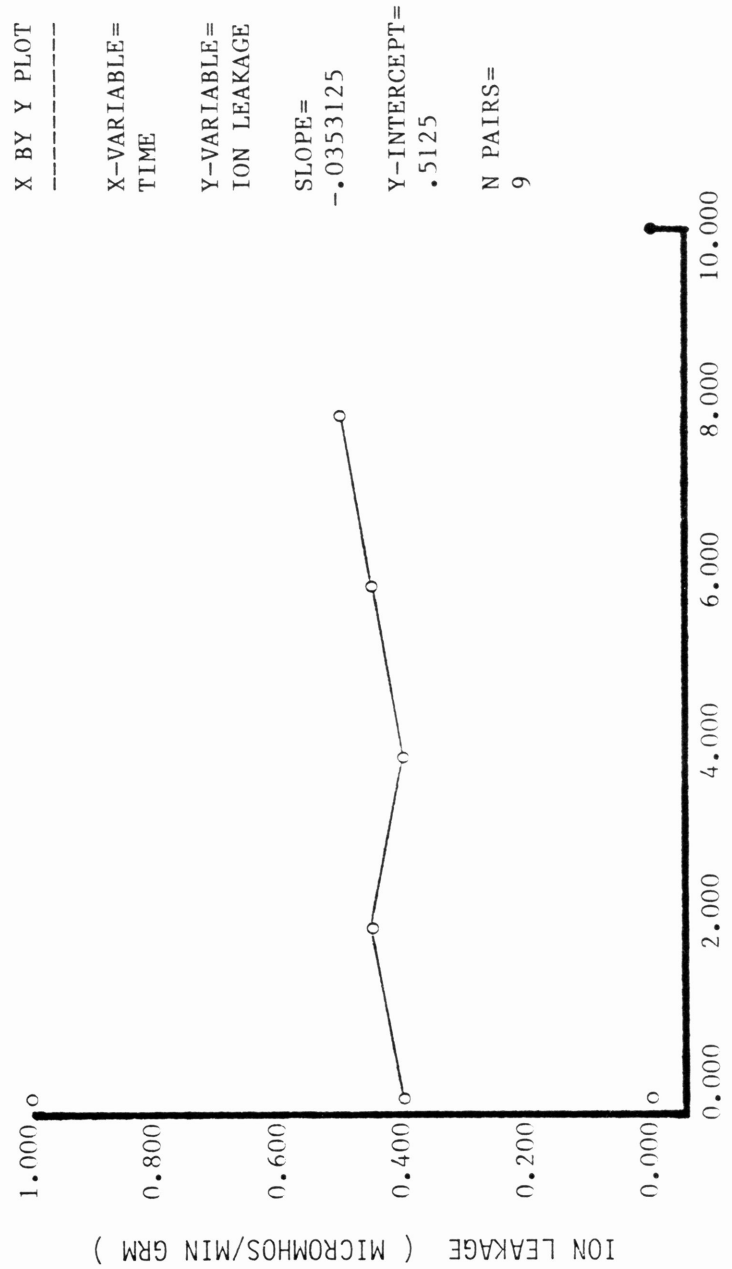


Figure 12. Ion Leakage from Cantaloupe Cotyledons Exposed at 2°C.
Cantaloupe cv. Gusto 45.



CHAPTER V

CONCLUSIONS

OUTLOOK FOR FUTURE TRADE

Most of the major factors affecting Mexican vegetable exports are cosidered to be stable. Climate, transportation feasibility, and inexpensive hand labor will continue to favor Mexican vegetable exports to the United States in the future. In contrast, economic factors are less stable and less predictable. The interaction of peso devaluations and the rate of Mexican inflation in the future will a be a critical factor regulating the flow of Mexican vegetables to the United States. In the long term, the stable factors should overcome the short term conditions from economic events and continue to favor the growth of Mexico's fresh vegetable supply to U.S. markets.

SHORT-TERM PREDICTIONS

In the close future the trends of Mexican vegetable exports will continue to fluctuate as a result of peso devaluations and inflation until Mexico overcomes the present economic crisis. A steady increase of Mexican vegetable exports is expected when Mexico's economy recovers.

PROFITABLE DECISIONS

This thesis proposes that cantaloupes will give some price security and a high potential of profits for Mexican vegetable exports. The cantaloupe cultivar "Gusto 45" was found to be somewhat tolerant to low temperatures and is recommended for early winter production to take advantage of the high cantaloupe prices in the U.S. markets during December and January.

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APPENDIX

TABLES

Table 1.
.–Fresh Tomatoes: U.S. shipments and market shares by seasonal groups, California, Florida, and Mexico, November-May, 1974/75-1979/80

Season and year	U.S. shipments[1]					Market shares[2]				
	California	Florida	Mexico	Other[3]	Total	California	Florida	Mexico	Other[3]	Total
	1,000 cwt.					*Percent*				
Fall: Nov.-Dec.										
1974	759	1,658	260	91	2,768	27.4	59.9	9.4	3.3	100.0
1975	806	1,663	254	102	2,825	28.5	58.9	9.0	3.6	100.0
1976	575	2,179	497	29	3,280	17.5	66.4	15.2	.9	100.0
1977	810	1,935	429	12	3,186	25.4	60.7	13.5	.4	100.0
1978	660	2,573	333	13	3,579	18.4	71.9	9.3	.4	100.0
1979[4]	610	2,482	371	45	3,508	17.4	70.8	10.6	1.2	100.0
Winter: Jan.-March										
1975	22	2,716	1,926	54	4,718	.5	57.6	40.8	1.1	100.0
1976	32	2,435	2,909	30	5,406	.6	45.0	53.8	.6	100.0
1977	51	991	3,399	36	4,477	1.1	22.1	75.9	.9	100.0
1978	7	1,945	4,370	14	6,336	.1	30.7	69.0	.2	100.0
1979[4]	10	2,220	3,461	12	5,703	.2	38.9	60.7	.2	100.0
1980[4]	17	3,268	–	–	–	–	–	–	–	–
Spring: April-May										
1975	13	2,542	2,232	145	4,932	.3	51.5	45.3	2.9	100.0
1976	38	3,143	1,227	131	4,539	.8	69.3	27.0	2.9	100.0
1977	71	2,408	3,054	128	5,661	1.3	42.5	53.9	2.3	100.0
1978	106	2,408	2,626	68	5,208	2.0	46.2	50.4	1.4	100.0
1979[4]	77	3,233	2,515	57	5,882	1.3	55.0	42.7	1.0	100.0
Combined seasons										
1974/75	794	6,916	4,418	290	12,418	6.4	55.7	35.6	2.3	100.0
1975/76	876	7,241	4,390	263	12,770	6.9	56.7	34.4	2.0	100.0
1976/77	697	5,578	6,950	193	13,418	5.2	41.6	51.8	1.4	100.0
1977/78	923	6,288	7,425	94	14,730	6.3	42.7	50.4	.6	100.0
1978/79[4]	727	8,026	6,309	82	15,144	4.8	53.0	41.7	.5	100.0

– Denotes not available, unknown, or not applicable.
[1] Including imports. [2] Percentage of total U.S. shipments, including imports. [3] Includes other States and foreign countries. [4] Preliminary.

Source: Data compiled by Vegetable Branch, F & V Div., AMS from annual reports of the Market News Branch, F & V Div., AMS.

April 1980

Commodity Programs, FAS, USDA

Source: U.S. Department of Agriculture, Foreign Agricultural Service. "Preview of Mexico's Production for Export.". FAS M-297.

Table 2.
.–Fresh Green Peppers: U.S. Shipments and Market Shares by Seasonal Groups, Florida and Mexico, November-May, 1974/75-1979/80

Season and year	U.S. shipments[1]				Market shares[2]			
	Florida	Mexico	Other[3]	Total	Florida	Mexico	Other[3]	Total
	1,000 cwt.				*Percent*			
Fall: Nov.-Dec.								
1974	377	29	270	676	55.8	4.3	39.9	100.0
1975	359	35	244	638	56.3	5.5	38.2	100.0
1976	457	54	223	734	62.3	7.4	30.3	100.0
1977	520	69	317	906	57.4	7.6	35.0	100.0
1978	372	161	337	870	42.8	18.5	38.7	100.0
1979[4]	251	132	416	799	31.4	16.5	52.1	100.0
Winter: Jan.-March								
1975	822	283	19	1,124	73.1	25.2	1.7	100.0
1976	633	513	21	1,167	54.2	44.0	1.8	100.0
1977	296	614	34	944	31.4	65.0	3.6	100.0
1978	566	920	44	1,530	37.0	60.1	2.9	100.0
1979[4]	634	790	41	1,465	43.3	53.9	2.8	100.0
1980[4]	508	–	–	–	–	–	–	–
Spring: April-May								
1975	821	130	104	1,055	77.8	12.3	9.9	100.0
1976	799	121	164	1,084	73.7	11.2	15.1	100.0
1977	874	207	86	1,167	74.9	17.7	7.4	100.0
1978	575	266	73	914	62.9	29.1	8.0	100.0
1979[4]	642	325	85	1,052	61.0	30.9	8.1	100.0
Combined seasons								
1974/75	2,020	442	393	2,855	70.8	15.5	13.7	100.0
1975/76	1,791	669	429	2,889	62.0	23.2	14.8	100.0
1976/77	1,627	875	343	2,845	57.2	30.8	12.0	100.0
1977/78	1,661	1,255	434	3,350	49.6	37.5	12.9	100.0
1978/79[4]	1,648	1,276	463	3,387	48.7	37.7	13.6	100.0

– Denotes not available, unknown, or not applicable.

[1] Including imports. [2] Percentage of total U.S. shipments, including imports. [3] Includes other States and foreign countries. [4] Preliminary.

Source: Data compiled by Vegetable Branch, F & V Div., AMS from annual reports of the Market News Branch, F & V Div., AMS

April 1980 Commodity Programs, FAS, USDA

Source: U.S. Department of Agriculture, Foreign Agricultural Service. "Preview of Mexico's Production for Export.". FAS M-297.

Table 3.

.–Fresh Cucumbers: U.S. Shipments and Market Shares by Seasonal Groups, Florida, Texas, and Mexico, November-May 1974/75-1979/80

Season and year	U.S. shipments[1]					Market shares[2]				
	Florida	Texas	Mexico	Other[3]	Total	Florida	Texas	Mexico	Other[3]	Total
	1,000 cwt.					Percent				
Fall: Nov.-Dec.										
1974	637	107	132	18	894	71.3	12.0	14.8	1.9	100.0
1975	511	87	182	29	809	63.2	10.8	22.5	3.5	100.0
1976	507	106	526	33	1,172	43.3	9.0	44.9	2.8	100.0
1977	641	206	466	68	1,381	46.4	14.9	33.7	5.0	100.0
1978	846	146	526	46	1,564	54.1	9.3	33.6	3.0	100.0
1979[4]	516	176	562	44	1,298	39.8	13.6	43.3	3.3	100.0
Winter: Jan.-March										
1975	275	2	805	73	1,155	23.8	.2	69.7	6.3	100.0
1976	243	–	1,542	142	1,927	12.6	–	80.0	7.4	100.0
1977	127	2	1,617	105	1,851	6.9	.1	87.3	5.7	100.0
1978	141	10	1,858	95	2,104	6.7	.5	88.3	4.5	100.0
1979[4]	214	–	1,844	128	2,186	9.8	–	84.4	5.8	100.0
1980[4]	191	–	–	–	–	–	–	–	–	–
Spring: April-May										
1975	955	144	275	77	1,451	65.8	9.9	19.0	5.3	100.0
1976	1,240	127	244	129	1,740	71.3	7.3	14.0	7.4	100.0
1977	1,188	279	425	219	2,111	56.3	13.2	20.1	10.4	100.0
1978	1,054	222	442	96	1,814	58.1	12.2	24.4	5.3	100.0
1979[4]	998	242	550	150	1,940	51.4	12.5	28.4	7.7	100.0
Combined seasons										
1974/75	1,867	253	1,212	168	3,500	53.3	7.2	34.6	4.9	100.0
1975/76	1,994	214	1,968	300	4,476	44.5	4.8	44.0	6.7	100.0
1976/77	1,822	387	2,568	357	5,134	35.5	7.5	50.0	7.0	100.0
1977/78	1,836	438	2,766	259	5,299	34.6	8.3	52.2	4.9	100.0
1978/79[4]	2,058	388	2,920	324	5,690	36.2	6.8	51.3	5.7	100.0

– Denotes not available, unknown, or not applicable.

[1] Including imports. [2] Percentage of total U.S. shipments, including imports. [3] Includes other States and foreign countries. [4] Preliminary.

Source: Data compiled by Vegetable Branch, F & V Div., AMS from annual reports of the Market News Branch, F & V Div., AMS.

April 1980 Commodity Programs, FAS, USDA

Source: U.S. Department of Agriculture, Foreign Agricultural Service. "Preview of Mexico's Production for Export.". FAS M-297.

Table 4.

Table 4.—Fresh Eggplant: Unloads in 41 U.S. cities and market shares by seasonal groups, Florida and Mexico, November-May, 1974/75-1979/80

Season and year	41 U.S. city unloads[1]				Market shares[2]			
	Florida	Mexico	Other[3]	Total	Florida	Mexico	Other[3]	Total
	1,000 cwt.				*Percent*			
Fall: Nov.-Dec.								
1974	81	32	16	129	62.8	24.8	12.4	100.0
1975	91	54	20	165	55.2	32.7	12.1	100.0
1976	87	40	21	148	58.8	27.0	14.2	100.0
1977	103	44	22	169	61.0	26.0	13.0	100.0
1978	84	35	20	139	60.4	25.2	14.4	100.0
1979[4]	78	50	23	151	51.7	33.1	15.2	100.0
Winter: Jan.-March								
1975	95	125	1	221	42.9	56.6	.5	100.0
1976	75	162	1	238	31.5	68.1	.4	100.0
1977	36	160	–	196	18.4	81.6	–	100.0
1978	59	175	–	234	25.2	74.8	–	100.0
1979[4]	77	146	4	227	33.9	64.3	1.8	100.0
1980[4]	87	166	3	256	34.0	64.8	1.2	100.0
Spring: April-May								
1975	112	57	1	170	65.9	33.5	.6	100.0
1976	100	59	1	160	62.5	36.9	.6	100.0
1977	85	70	1	156	54.5	44.9	.6	100.0
1978	56	87	4	147	38.1	59.2	2.7	100.0
1979[4]	59	70	4	133	44.4	52.6	3.0	100.0
Combined seasons								
1974/75	288	214	18	520	55.4	41.1	3.5	100.0
1975/76	266	275	22	563	47.2	48.9	3.9	100.0
1976/77	208	270	22	500	41.6	54.0	4.4	100.0
1977/78	218	306	26	550	39.6	55.7	4.7	100.0
1978/79[4]	220	251	28	499	44.1	50.3	5.6	100.0
1979/80[4]	–	–	–	–	–	–	–	–

– Denotes not available, unknown, or not applicable.

[1] Including imports. [2] Percentage of total unloads, including imports, in 41 U.S. cities. [3] Includes other States and foreign countries. [4] Preliminary.

Source: Data compiled by Vegetable Branch, F & V Div., AMS from annual reports of the Market News Branch, F & V Div., AMS.

April 1980 Commodity Programs, FAS, USDA

Source: U.S. Department of Agriculture, Foreign Agricultural Service. "Preview of Mexico's Production for Export.". FAS M-297.

Table 5.

.–Fresh Squash: Unloads in 41 U.S. cities and market shares by seasonal groups, California, Florida, and Mexico, November-May, 1974/75-1979/80

Season and year	41 U.S. city unloads[1]					Market shares[2]				
	California	Florida	Mexico	Other[3]	Total	California	Florida	Mexico	Other[3]	Total
	1,000 cwt.					Percent				
Fall: Nov.-Dec.										
1974	93	119	26	134	372	25.0	32.0	7.0	36.0	100.0
1975	99	105	48	146	398	24.9	26.4	12.1	36.6	100.0
1976	107	132	64	126	429	24.9	30.8	14.9	29.4	100.0
1977	99	124	86	158	467	21.2	26.6	18.4	33.8	100.0
1978	94	148	90	124	456	20.6	32.5	19.7	27.2	100.0
1979[4]	89	114	68	124	395	22.5	28.9	17.2	31.4	100.0
Winter: Jan.-March										
1975	35	172	197	68	472	7.4	36.4	41.7	14.5	100.0
1976	49	136	256	67	508	9.6	26.8	50.4	13.2	100.0
1977	57	98	292	60	507	11.2	19.3	57.6	11.9	100.0
1978	75	90	342	68	575	13.0	15.7	59.5	11.8	100.0
1979[4]	67	154	411	74	706	9.5	21.8	58.2	10.5	100.0
1980[4]	40	176	313	53	582	6.9	30.2	53.8	9.1	100.0
Spring: April-May										
1975	77	164	29	73	343	22.4	47.8	8.5	21.3	100.0
1976	92	180	28	93	393	23.4	45.8	7.1	23.7	100.0
1977	110	192	51	93	446	24.7	43.0	11.4	20.9	100.0
1978	137	175	38	94	444	30.9	39.4	8.6	21.1	100.0
1979[4]	217	173	77	106	573	37.9	30.2	13.4	18.5	100.0
1980										
Combined seasons										
1974/75	205	455	252	275	1,187	17.3	38.3	21.2	23.2	100.0
1975/76	240	421	332	306	1,299	18.5	32.4	25.6	23.5	100.0
1976/77	274	422	407	279	1,382	19.8	30.5	29.5	20.2	100.0
1977/78	311	389	466	320	1,486	20.9	26.2	31.4	21.5	100.0
1978/79	378	475	578	304	1,735	21.8	27.4	33.3	17.5	100.0

[1] Including imports. [2] Percentage of total unloads, including imports, in 41 U.S. cities. [3] Includes other States and foreign countries. [4] Preliminary.

Source: Data compiled by Vegetable Branch, F & V Div., AMS from annual reports of the Market News Branch, F & V Div., AMS.

April 1980

Commodity Programs, FAS, USDA

Source: U.S. Department of Agriculture, Foreign Agricultural Service. "Preview of Mexico's Production for Export.". FAS M-297.

Table 6.—Weather Conditions in Culiacán, Sinaloa,[1] 1941-70

Items/Parameters	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
TEMPERATURES													
Maximum extreme	35.8	37.3	37.9	41.1	41.4	41.2	41.7	40.4	40.7	39.4	39.2	38.4	41.7
Date (day/year)	25/46	17/48	27/53	05/48	14/58	21/65	03/69	01/42	19/60	–	12/67	–	03/07/69
Ave. maximum	28.2	29.5	31.1	33.6	35.5	36.1	35.8	35.1	34.8	34.4	32.2	29.0	32.9
Dry bulb (atmosphere)	19.6	20.5	21.7	24.5	27.3	29.5	29.4	28.9	28.7	27.4	23.7	20.6	25.1
Average minimum	12.3	12.5	13.1	15.7	19.1	23.7	24.3	23.8	23.8	21.3	16.2	13.5	18.2
Minimum extreme	3.8	1.6	5.5	8.8	12.6	15.8	20.0	19.0	19.0	14.1	6.6	3.8	1.6
Date (day/year)	–	04/56	24/52	–	01/70	05/53	–	13/65	–	31/69	23/57	24/53	04/02/56
Minimum in rough weather	0.7	0.0	3.5	7.5	9.7	13.7	18.5	17.0	17.0	10.1	4.1	1.6	0.0
Date (day/year)	18/49	04/56	24/52	12/45	01/70	05/53	18/64	13/65	28/70	01/68	27/66	24/53	04/02/56
Oscillation	15.9	17.0	18.0	17.9	16.4	12.4	11.5	11.3	11.0	13.1	16.0	15.5	14.7
HUMIDITY													
Average relative humidity	15.8	15.9	16.3	18.2	20.7	24.0	25.5	25.7	25.7	23.7	19.2	16.8	20.6
Total evaporation	71	65	61	57	57	64	74	79	79	74	68	71	68
Average vapor tension	112.5	135.1	193.9	229.0	269.8	247.1	195.9	169.6	156.3	165.4	140.8	113.8	2129.2
PRECIPITATION													
Average monthly total	24.9	8.6	7.0	2.8	0.4	25.0	163.7	228.8	146.5	41.2	11.2	38.9	699.0
Maximum in a month	132.2	82.8	71.0	33.3	5.3	124.0	375.0	600.5	349.8	130.9	125.4	241.8	600.5
Date (year)	60	68	58	59	43	58	70	66	43	48	44	63	08/66
Maximum in 24 hours	41.2	46.6	53.5	31.3	5.3	63.0	109.0	171.8	141.5	114.1	50.8	145.0	171.8
Date (day/year)	11/60	10/68	06/58	14/59	01/43	30/59	19/70	29/44	17/53	08/45	23/44	10/63	29/08/44
Minimum	0.5	0.8	0.8	1.3	4.0	0.8	69.7	109.2	31.0	2.1	1.0	0.5	0.5
Date (year)	48	53	45	42	56	61	44	41	52	68	41	62	–
Total hours of sunshine	189.5	186.7	230.0	211.8	246.6	221.0	191.6	198.2	195.4	228.4	213.2	183.6	2496.0
Average number of days with													
Appreciable rainfall	2.96	0.96	0.76	0.36	0.10	2.56	13.86	15.16	9.80	3.34	1.10	2.66	53.62
Inappreciable rainfall	2.13	1.63	1.33	0.76	0.90	4.73	8.13	6.43	5.40	2.41	1.60	2.90	38.35
Clear skies	13.56	12.46	15.86	15.00	20.31	14.46	1.86	2.89	8.06	19.23	16.83	13.26	153.78
Partly cloudy	8.80	8.63	10.20	10.46	7.72	11.00	15.83	16.86	12.53	7.90	8.70	9.43	128.06
Overcast	8.63	7.13	4.93	4.53	2.96	4.53	13.30	11.24	9.40	3.86	4.46	8.30	83.27
Dew	19.75	15.68	15.13	8.03	4.93	0.82	0.33	1.96	5.63	17.70	18.00	18.40	126.36
Hail	0.00	0.00	0.03	0.00	0.00	0.03	0.10	0.00	0.03	0.00	0.00	0.00	0.19
Freeze	0.16	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.32
Lightning	0.03	0.00	0.00	0.03	0.00	0.34	1.70	1.65	0.83	0.06	0.00	0.03	4.67
Fogs, mist	1.55	1.10	0.93	1.20	1.46	0.03	0.46	0.06	1.03	1.30	0.66	1.93	11.71
Snow	0.63	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33

Latitude (N) 24-49; longitude (W) 107-24; altitude; 84 meters above sea level. –Denotes not available.

Source: Dirección General de Geografía y Meteorología, Secretaría de Agricultura y Ganadería

Source: U.S. Department of Agriculture, Foreign Agricultural Service. "Preview of Mexico's Production for Export.". FAS M-297.

Table 7. MAJOR DEVALUATIONS OF THE MEXICAN PESO FROM 1970 TO 1984

Year	Foreign exchange peso/dollar
1970	12.50
1977	22.60
1981	24.50
1982	45.00
1982	90.00
1983	150.00
1984	169.50

Source: International Monetary Fund.

Table 8.

Cantaloupe average (f.o.b.) monthly prices per jumbo crate (36s), 1976 to 1982.

YEAR	MONTH											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1976	-	20.50	17.71	20.33	18.04	12.44	10.00	8.29	8.83	-	-	-
1977	-	-	22.17	19.17	20.87	9.86	10.79	10.63	8.86	-	-	-
1978	19.17	16.63	20.38	21.20	19.58	9.53	10.77	8.00	8.30	-	-	-
1979	-	23.06	22.30	21.76	22.61	10.27	9.75	9.04	11.38	-	-	-
1980	-	28.30	24.55	26.09	24.75	16.02	12.12	10.20	9.04	8.00	-	-
1981	-	35.00	28.79	26.03	32.60	18.50	12.84	9.38	8.16	13.20	-	-
1982	-	35.33	25.49	25.10	30.05	15.40	9.26	9.02	9.26	10.20	10.38	-

Source: United States Department of Agriculture, Agricutural Marketing Service.