

ducive to harmonious working relationships between growers and shippers. These are by-products of a program, but they may well emerge as major benefits to the industry concerned.

Everybody has an antipathy toward control these days, and Florida farmers are conspicuous in this respect. There is nothing magic about a marketing agreement. It is not a

panacea for the ills of an industry. Indeed, improperly used, it might well contribute further to the woes of the ones who seek relief through the assistance it provides. It simply affords growers and shippers with an opportunity to work out a cure of their own. This is usually a most difficult task. However, it is one that can be accomplished if the need and the collective will is great enough.

VEGETABLE TRADE IN THE CARIBBEAN AREA

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Imports of vegetables from the Caribbean Area enter the United States largely during the period in which similar vegetables are marketed in Florida. Much of the responsibility for last season's unprofitable tomato deal has been attributed to increased imports of Mexican tomatoes. Various actions have been taken by Florida producers to limit the volume of these competitive imports, but efforts to date have not been marked with success. Rather than review the attempts by the Florida vegetable industry to bring about a curtailment of imports, most of this paper will be devoted to a discussion of recent trends in vegetable imports, as well as in domestic production. Since the patterns of vegetable trade and overall world trade have both changed and any governmental decisions regarding trade policy will take these into account, our overall world trade position will be briefly reviewed.

SHIFTS IN WORLD TRADE

World trade patterns have shifted greatly as a result of the economic changes which occurred during and since the first World War. In its international economic transactions the United States evolved from a debtor to a creditor nation, but continued to act like a debtor nation. We sold our goods abroad, but set up barriers which made it difficult for other countries to send us goods and services in payment for those they obtained from us. Before World War I the United States, as a debtor nation, needed to—and did—have an export surplus. It was necessary that the goods and services it exported be of greater value than those it imported so that it could

make payments of interest and principal on the capital which had been invested in our railroads and other industries by foreign lenders.

Its new status as a creditor nation called for the United States to have an import surplus if it were to receive payment for its exports of goods and services plus interest and principal on its foreign investments. Adjusting to its international economic position would have meant lowering tariffs and other trade barriers to encourage the importation of more goods and services into this country. Instead, the opposite course was followed. Tariffs were raised, and we had an export rather than an import surplus. Although our tariffs have been decreased during the past 20 years, it is nevertheless a fact that each year since 1914 the United States has exported more than she has imported. This export surplus since the first World War has exceeded \$120 billion and has largely been financed by government grants and subsidies. Much of it was occasioned by the disruptions of war, but a large part was brought about by our trade policies. The burden of the cost has fallen on the shoulders of American taxpayers.

VEGETABLE IMPORTS COMPETITIVE

In 1952, total imports into the United States were valued at nearly 11 billion dollars. Forty-three percent of these imports, or about 4.5 billion dollars worth, were agricultural commodities (11). Some 2.6 billion dollars worth, or 58 percent, of these agricultural imports were competitive with the same or similar commodities produced in this country.

Some of these competitive agricultural imports consist of tomatoes, peppers, cucumbers, and other vegetable products which are important in Florida agriculture. Although fresh vegetable imports are the equivalent of only one percent of all vegetable production for the

fresh market in the United States, they account for a much higher proportion of the value of certain commodities. For instance, in 1952 imports of tomatoes were valued at 11 percent of that of the entire fresh market crop in the United States; the proportions for peppers and cucumbers were seven and three percent, respectively. Tomato imports in 1952 were valued at nearly 15 million dollars, peppers at 1.7 million and cucumbers at 659 thousand. Since most of these imports entered the country during the Florida marketing season, commodities produced abroad compete with Florida crops to a much greater extent than with those of most other states.

The United States has also exported considerable quantities of the vegetables which it produced. Fresh vegetable exports during 1952 were valued at almost 43 million dollars. Potatoes led in value, followed by tomatoes, lettuce and celery. Potato exports in 1952 were valued at almost 14 million dollars, tomatoes at 6 million, lettuce at 5 million and celery at 4.5 million. During 1952 vegetable exports exceeded imports in value. All agri-

cultural exports in 1952 were equivalent to 10 percent of United States farm income.

MEXICO AND CUBA LEADING EXPORTERS

Mexico and Cuba are the leading exporters of vegetables to the United States during the season in which most of Florida's vegetable crops are produced. Additional shipments originate in Jamaica, the Bahamas, and other Caribbean points, but the volume from these sources is usually very small. Canada—the customer for some two-thirds of our vegetable exports—has sent small quantities of hot-house tomatoes to the United States during the winter season.

Imports of fresh vegetables from Mexico into the United States began prior to World War I. The volume of all vegetable imports from the West Coast of Mexico rose to more than a thousand carlots in 1920-21 and continued to increase until 1930-31, when more than eight thousand carlots were imported (6). During the thirties Mexican vegetable imports dropped to 1,200 carlots annually, but large scale shipments were resumed during World

TABLE 1.--TOTAL SUPPLY OF TOMATOES IN THE UNITED STATES DURING THE FLORIDA PRODUCTION SEASON, 1943-44 TO 1952-53.

Domestic Commercial Production for Fresh Market in Late Fall, Winter, and Early Spring and Imports^{1/} from November to June.

| Season | Producing State and Exporting Country | | | | | | | | |
|---|---------------------------------------|-------|------------|----------------|--------|------|-------|---------------|--------------|
| | Florida | Texas | California | Total Domestic | Mexico | Cuba | Other | Total Imports | Total Supply |
| | ----- 1,000 bushels ----- | | | | | | | | |
| 1943-44 | 3,394 | 4,788 | 851 | 9,033 | 2,813 | 359 | 196 | 3,368 | 12,401 |
| 1944-45 | 4,168 ^{2/} | 5,725 | 756 | 10,649 | 3,637 | 300 | 21 | 3,958 | 14,607 |
| 1945-46 | 4,454 ^{2/} | 5,624 | 828 | 10,906 | 3,167 | 617 | 66 | 3,850 | 14,756 |
| 1946-47 | 3,086 | 4,243 | 1,170 | 8,499 | 4,440 | 465 | 97 | 5,002 | 13,501 |
| 1947-48 | 3,854 | 3,125 | 968 | 7,947 | 4,408 | 502 | 102 | 5,012 | 12,959 |
| 1943-48 Average | 3,791 | 4,701 | 915 | 9,407 | 3,693 | 449 | 96 | 4,238 | 13,645 |
| 1948-49 | 6,753 | 3,030 | 665 | 10,448 | 3,187 | 578 | 41 | 3,806 | 14,254 |
| 1949-50 | 7,395 | 3,128 | 990 | 11,513 | 2,668 | 442 | 83 | 3,193 | 14,706 |
| 1950-51 | 7,420 | 1,950 | 1,363 | 10,733 | 2,642 | 508 | 88 | 3,238 | 13,971 |
| 1951-52 | 8,917 | 1,878 | 988 | 11,783 | 3,202 | 339 | 43 | 3,584 | 15,367 |
| 1952-53 | 7,648 | 2,825 | 1,050 | 11,523 | 3,572 | 297 | 93 | 3,962 | 15,485 |
| 1948-53 Average | 7,627 | 2,562 | 1,011 | 11,200 | 3,054 | 433 | 70 | 3,557 | 14,757 |
| | ----- Percent ----- | | | | | | | | |
| Proportion of Total Supply from Each Area 1943-48 Average | 27.8 | 34.4 | 6.7 | 68.9 | 27.1 | 3.3 | 0.7 | 31.1 | 100.0 |
| Proportion of Total Supply from Each Area 1948-53 Average | 51.7 | 17.4 | 6.8 | 75.9 | 20.7 | 2.9 | 0.5 | 24.1 | 100.0 |
| Percent Increase 1943-48 Average to 1948-53 Average | 101.2 | -45.5 | 10.5 | 19.1 | -17.3 | -3.6 | -27.1 | -16.1 | 8.1 |

^{1/} Converted from pounds to bushels at the rate of 53 pounds per bushel.

^{2/} Includes 293,000 bu. of winter and 49,000 bu. of early spring crops not marketed.

^{3/} Includes 129,000 bu. of winter and 80,000 bu. of early spring crops not marketed.

Source: (1) Domestic - USDA, BAE; (2) Imports - U.S. Department of Commerce, Bureau of the Census.

War II. Although these vegetable imports are of relatively little interest to vegetable growers in the rest of the country, they are of great concern to Florida producers.

During the past two November-to-June seasons, imports of tomatoes and cucumbers have risen to higher levels than those in the three preceding seasons. All tomato imports increased from 3,193,000 bushels in 1949-50 to 3,962,000 bushels in 1952-53. However, this was less than the 1943-48 average level of 4,238,000 bushels. In the five seasons beginning with 1948-49, imports of cucumbers have risen from less than 200,000 bushels to almost 450,000 bushels. Importation of peppers over the past four seasons ranged between 700,000 and 800,000 bushels, which was almost the equivalent of a fourth of the November-to-June 1952-53 domestic crop. Mexico is Florida's leading competitor in selling tomatoes and peppers in the United States. Cuba is in this position with respect to cucumbers. Eggplant, fresh beans, fresh peas, okra and cabbage are other commodities which are often imported into the United States during the Florida marketing season.

TOMATO COMPETITION DURING THE PAST TEN YEARS

Because tomatoes are the major vegetable import, most of the remainder of this paper will be devoted to a discussion of some trends in the tomato industry during Florida's November-June marketing season.¹ The total supply of domestically produced tomatoes during these months increased 19 percent from the five-year period 1943-48 to 1948-53 (Table 1). During the last 10 years, domestic production has ranged from less than 8 to nearly 12 million bushels.

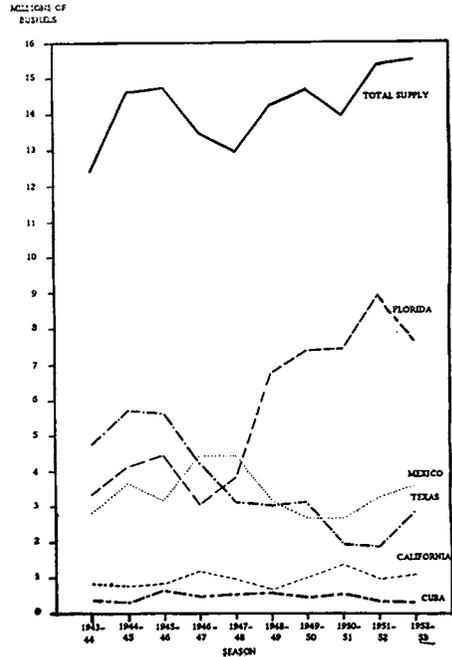
The total tomato supply (domestic production plus imports) over the past 10 year period has varied from 12 to more than 15 million bushels, averaging 13.6 million bushels in the 1943-48 period and 14.8 million in 1948-53 (Fig. 1). The overall supply in the latter five-year period was eight percent greater than that in the previous one.

Twenty-eight percent of the total supply of tomatoes was produced in Florida during the 1943-48 seasons. In 1948-53 Florida's tomato

¹This includes the marketing of the late fall, winter and early spring crops. Unless otherwise noted, the supply and/or production of tomatoes refers to those which are normally marketed from November through June.

Fig. 1. - TOTAL SUPPLY OF TOMATOES DURING THE FLORIDA PRODUCTION SEASON, 1943-44 to 1952-53

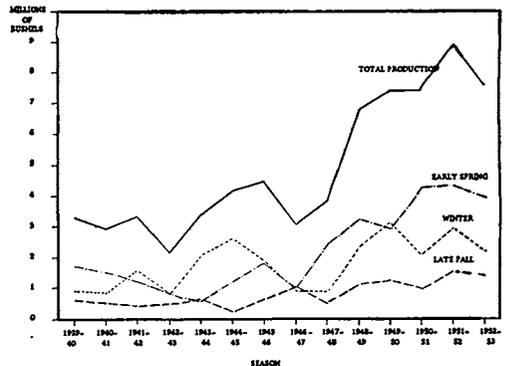
Late Fall, Winter and Early Spring Domestic Production and Imports from November to June



crop accounted for more than half the total supply during the late fall, winter and early spring periods. Florida's 7.6 million bushel average tomato harvest in 1948-53 was double that in the first five-year period (Fig. 2).

Florida has largely taken the place of Texas in the off-season tomato deal. The 4.7 million bushel average crop in Texas during 1943-

Fig. 2. - TOTAL, LATE FALL, WINTER, AND EARLY SPRING COMMERCIAL TOMATO PRODUCTION FOR THE FRESH MARKET IN FLORIDA, 1939-40 to 1952-53



48 dropped to 2.6 million bushels in the more recent five-year period. In the earlier period Texas accounted for over a third of the United States tomato supply, but in the more recent one it supplied only 17 percent. If weather conditions are favorable and the market continues profitable, Texas tomato production may return to earlier levels. Although this fall's plantings in Texas did not increase, they may be expected to do so in the future if allotments continue to restrict cotton acreage. The 2.8 million bushel tomato harvest of 1952-53 was a million bushels higher than that of the previous season and close to the three million bushel crops of 1947-48, 1948-49 and 1949-50.

California's late fall tomato production has expanded at a slightly faster rate than the total supply. It accounted for nearly seven percent of the total supply in both five-year periods.

Tomato imports as a proportion of the total November-June supply ranged from 26 to 39 percent, and averaged over 30 percent in the 1943-48 period. Imports from Cuba and Mexico varied from three to five million bushels per season during this period and averaged 4.1 million. Only once—in 1948-49—during

the past five seasons have imports accounted for more than a fourth of the total United States November-June tomato supply. Imports over this five-year period have provided from 22 to 27 percent of the total November-June supply of tomatoes in the United States. The average for 1948-53 was 24 percent. In that period tomato imports averaged 3.6 million bushels annually.

NOVEMBER TO MARCH COMPETITION

Of the imported tomatoes competing with Florida's production during the period 1948-53, over 80 percent arrived during the months from November to March and were competitive with the harvest of the late fall and winter domestic crops. In the 1943-48 period the proportion entering during these months was more than 70 percent.

The total November-March supply of tomatoes from the first five-year period to the second increased by 18 percent (Table 2). Florida's late fall production in the second period was 97 percent greater than that in the first. Winter production increased 51 percent and total production (late fall and winter) 63

TABLE 2.—TOTAL SUPPLY OF TOMATOES IN THE UNITED STATES DURING THE NOVEMBER - MARCH SEASON, 1943-44 TO 1952-53.
Domestic Commercial Production for Fresh Market in the Late Fall and Winter Periods and Imports^{1/}
from November to March.

| Season | Producing State and Exporting Country | | | | | | | | | |
|---|---------------------------------------|---------------------|-------|-----------|----------|-------|---------|-------|---------|--------|
| | Florida | | Texas | Total | Mexico | Cuba | Other | Total | Imports | Supply |
| | Late Fall | Winter | Total | Late Fall | Domestic | | Foreign | | | |
| | 1,000 bushels | | | | | | | | | |
| 1943-44 | 666 | 2,112 | 2,778 | 468 | 3,246 | 1,477 | 346 | 196 | 2,019 | 5,265 |
| 1944-45 | 252 | 2,652 ^{2/} | 2,907 | 525 | 3,432 | 2,569 | 286 | 19 | 2,974 | 6,406 |
| 1945-46 | 682 | 1,952 ^{2/} | 2,634 | 824 | 3,458 | 2,151 | 594 | 63 | 2,808 | 6,266 |
| 1946-47 | 1,092 | 960 | 2,052 | 862 | 2,914 | 3,595 | 451 | 93 | 4,129 | 7,043 |
| 1947-48 | 538 | 890 | 1,428 | 885 | 2,313 | 2,092 | 460 | 93 | 3,465 | 5,778 |
| 1943-48 Average | 646 | 1,714 | 2,360 | 713 | 3,073 | 2,555 | 431 | 93 | 3,079 | 6,152 |
| 1948-49 | 1,102 | 2,375 | 3,477 | 630 | 4,107 | 2,016 | 546 | 39 | 2,601 | 6,708 |
| 1949-50 | 1,260 | 3,160 | 4,420 | 608 | 5,028 | 2,305 | 439 | 82 | 2,826 | 7,854 |
| 1950-51 | 1,000 | 2,128 | 3,128 | 550 | 3,678 | 1,968 | 483 | 86 | 2,537 | 6,215 |
| 1951-52 | 1,572 | 2,997 | 4,569 | 240 | 4,809 | 2,520 | 329 | 40 | 2,889 | 7,698 |
| 1952-53 | 1,440 | 2,248 | 3,688 | 550 | 4,238 | 3,146 | 292 | 94 | 3,532 | 7,770 |
| 1948-53 Average | 1,275 | 2,581 | 3,856 | 516 | 4,372 | 2,391 | 418 | 68 | 2,877 | 7,249 |
| | ----- Percent ----- | | | | | | | | | |
| Proportion of Total Supply from Each Area 1943-48 Average | 10.5 | 27.9 | 38.4 | 11.6 | 50.0 | 41.5 | 7.0 | 1.5 | 50.0 | 100.0 |
| Proportion of Total Supply from Each Area 1948-53 Average | 17.6 | 35.6 | 53.2 | 7.1 | 60.3 | 33.0 | 5.8 | 0.9 | 39.7 | 100.0 |
| Percent Increase 1943-48 Average to 1948-53 Average | 97.4 | 50.6 | 63.4 | -27.6 | 42.3 | -6.4 | -3.0 | -26.9 | -6.6 | 17.8 |

^{1/} Converted from pounds to bushels at the rate of 53 pounds per bushel.

^{2/} Includes 293,000 bu. not marketed.

^{3/} Includes 129,000 bu. not marketed.

Source: (1) Domestic - U.S. Department of Agriculture, Bureau of Agricultural Economics.

(2) Imports - U.S. Department of Commerce, Bureau of the Census.

percent. Texas' late fall tomato production was down 28 percent, but total domestic supplies increased 42 percent from 1943-48 to 1948-53.

Imports from the first period to the second decreased seven percent. Imports during the 1943-48 period accounted for half the November-March supply, but the proportion had decreased to 40 percent in the last five-year period. Imports from Cuba have dropped during each of the past five seasons but those from Mexico have increased in the past two seasons.

CHANGES IN SHIPPING PATTERN

An analysis of weekly tomato carlot (and carlot equivalent) shipment data for the past

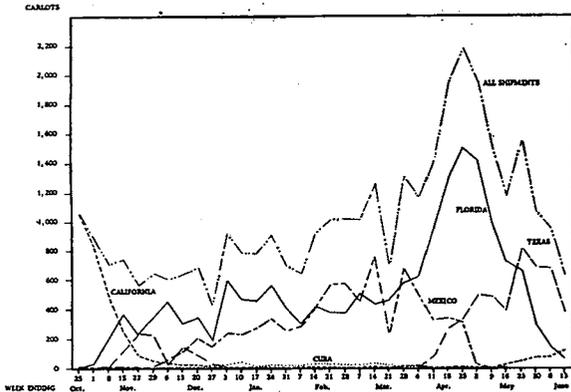
Weekly imports from Mexico during the past two seasons have been at higher levels from December to March but have fallen off in April and May.³ Mexican imports have begun about the end of November and increased to a peak in March, tapering off in April and May. During the past season, when the volume of imports was greater than in any of the previous five years, imports were considerably larger in February and March. Mexican weekly shipments have sometimes exceeded those from Florida during these two months.

On a monthly basis,⁴ Mexican imports have been increasing in December, February and March, and decreasing in April (Fig. 5, 6 and 7). Florida's tomato volume in January of the past two seasons was more than double the volume in any previous season. However, May movement, which had a large rise in 1951, has dropped in the past two years. Indications are that, in general, Mexican shipments vary somewhat inversely with those from Florida.

³The season total of weekly shipment data from Mexico is less than that for monthly Census import figures converted to 21,000 lb. carlot equivalents. It is believed that weekly data recorded in (1) includes only rail shipments from Mexico. The proportion of total carlots equivalent (Census converted data) constituted by totals of weekly shipment data for the past five seasons are as follows: 1952-53, 83 percent; 1951-52, 83 percent; 1950-51, 99 percent; 1949-50, 98 percent; and 1948-49, 79 percent.

⁴Mexico data converted to 21,000 pound carlot equivalents.

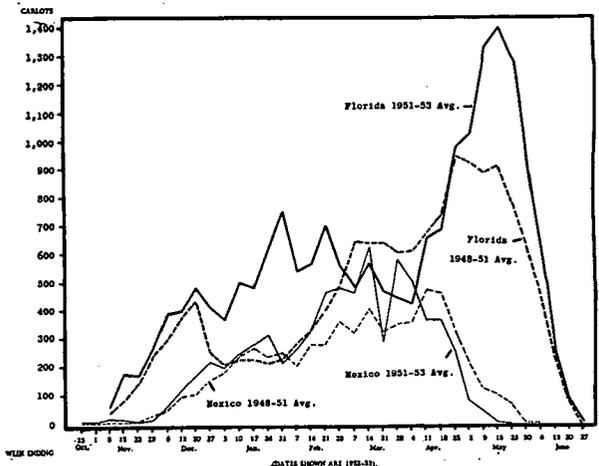
FIG. 3. - WEEKLY CARLOT (AND CARLOT EQUIVALENT) SHIPMENTS OF TOMATOES DURING THE FLORIDA SHIPPING SEASON, 1952-53



five seasons indicates a number of changes in Florida's seasonal pattern of movement.² (The magnitude of weekly shipments from various sources during the 1952-53 season is shown in Figure 3.) In the last two seasons total tomato shipments in January were 50 percent or more larger than those of the previous three years (Fig. 4). Substantial increases were also noted in May but the level of shipments in March was smaller. A higher peak in shipments was reached about the middle of May rather than a smaller one earlier in that month.

²Weekly data used in this part of the analysis are those reported in (1) for Florida rail shipments and all Mexican shipments and (5) for Florida truck shipments in carlot equivalent terms.

FIG. 4. - AVERAGE WEEKLY CARLOT (AND CARLOT EQUIVALENT) SHIPMENTS OF TOMATOES FROM FLORIDA AND MEXICO DURING THE PAST TWO (1951-53) AND PREVIOUS THREE (1948-51) SEASONS



TRENDS SUMMARIZED

Although the total supply of tomatoes in the United States during Florida's November-June marketing season has increased only eight percent from the five-year period 1943-48 to that of 1948-53, a large number of shifts have occurred among producing states and importing countries. Domestic tomato production increased 19 percent while imports were down 16 percent. Florida's production doubled, but Texas' decreased almost a half. These same general trends also held—but to a lesser degree—in the November-March period. In each period Florida's share of the market increased from about a third to more than half. From November to March the proportion of the supply furnished by imports decreased from 50 to 40 percent.

Even though foreign sources have supplied smaller proportions of the total supply of tomatoes in recent seasons, the threat of additional imports and somewhat erratic shipping schedules⁵ have made for considerable uncer-

⁵An incomplete examination of shipping-point data for Floridian and Mexican tomatoes indicated relatively more variation in day-to-day shipments of Mexican tomatoes.

Fig. 5. - TOTAL CARLOT (AND CARLOT EQUIVALENT) SHIPMENTS OF TOMATOES FROM FLORIDA AND MEXICO DURING THE NOVEMBER-JUNE PERIOD, 1943-44 to 1952-53 SEASONS

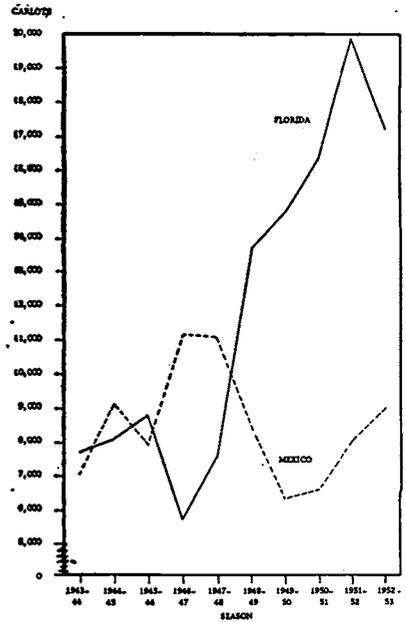
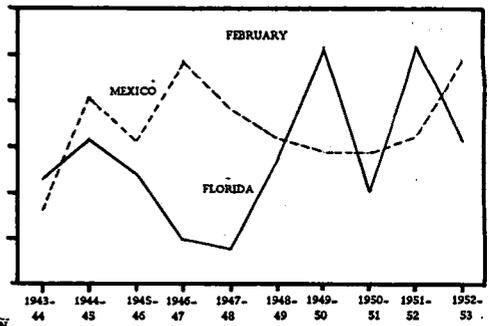
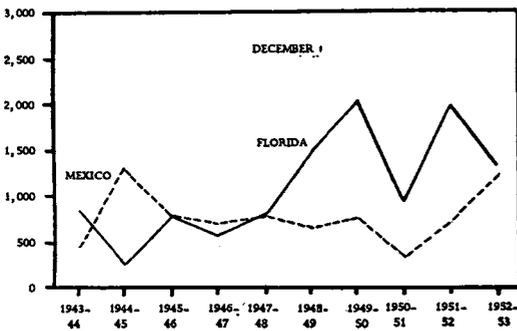
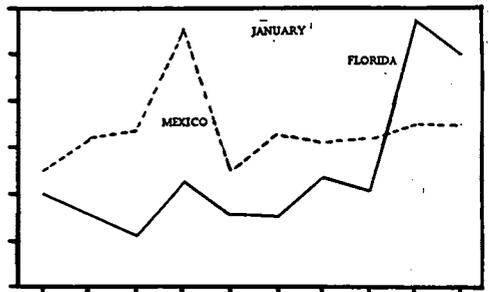
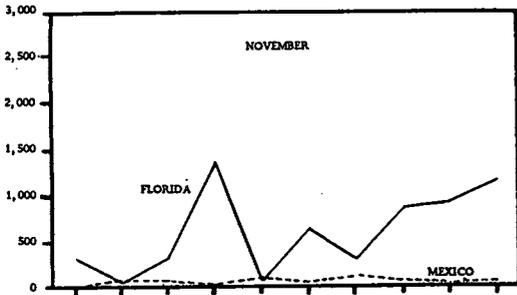


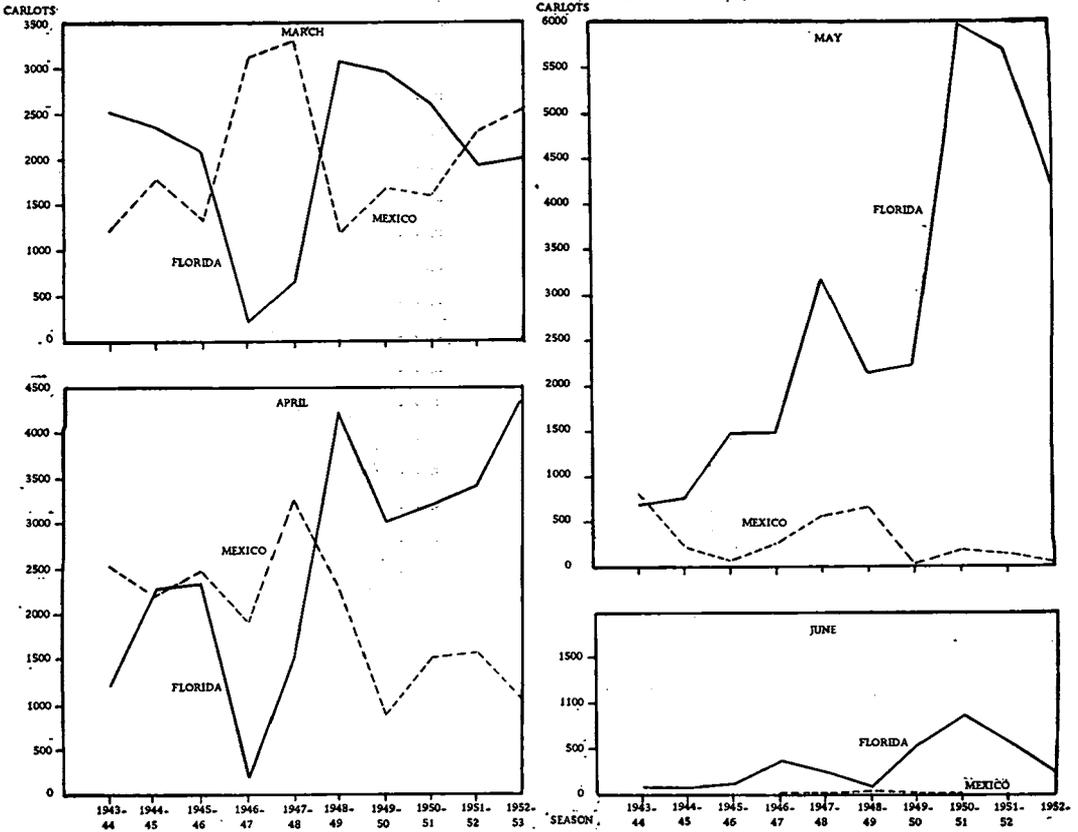
Fig. 6. - MONTHLY CARLOT (AND CARLOT EQUIVALENT) SHIPMENTS OF TOMATOES FROM FLORIDA AND MEXICO DURING NOVEMBER, DECEMBER, JANUARY AND FEBRUARY 1943-44 to 1952-53 SEASONS

CARLOTS



SEASON

Fig. 7. - MONTHLY CARLOT (AND CARLOT EQUIVALENT) SHIPMENTS OF TOMATOES FROM FLORIDA AND MEXICO DURING MARCH, APRIL, MAY AND JUNE, 1943-44 to 1952-53



tainty in the industry. During the past two seasons imports of Mexican tomatoes have been at levels considerably higher than those in the three preceding seasons. New irrigation developments may mean that additional land will be turned to tomato production for export.⁶

The influence of supply in determining the price of tomatoes is omitted from this analysis because it is a subject which would require more time and information than was available in preparing this paper. It is significant, however, that in recent years Florida tomatoes have commanded prices equivalent to or higher than those received for Mexican tomatoes. This indicates Florida tomatoes arrive at their destination in better condition. The shipment of higher quality tomatoes

should continue to improve Florida's competitive situation.

CONFLICTING INTERESTS IN NATIONAL POLICY

National policy in the field of international trade relationships is faced by a number of conflicting choices. At the national level, additional imports of many commodities are called for if the United States is to get its international trading account into balance. Overall levels of living rise as more of a product(s) rather than less is consumed. In an enterprise economy, the production of any commodity is for the purpose of consumption. Consumers want their products to be available in large and fairly consistent supplies at reasonable prices. Yet domestic producers of many products may be injured if imports are erratic or overly large. Policy makers concerned with such situations do not have easy choices to make.

⁶/Senator Barry Goldwater of Arizona stated his belief that much of the new acreage in Sonora and Sinaloa on the West Coast of Mexico would probably be planted in cotton (7), p. 785).

Fresh vegetables imported into the United States from Mexico, Cuba and other countries provide a source of dollars with which these countries can purchase goods and services in the United States. For instance, Cuba imported \$3,000,000 worth of potatoes from this nation during 1952. They were able to use the dollars earned by their sales of tomatoes to help pay for these imports. In a multilateral trading system, where trading accounts are not balanced by commodities or countries, a restriction on trade may be advantageous to one group but the system as a whole may be worse off.⁷ Some 80 percent of the total imports of both Mexico and Cuba are from the United States. High levels of employment and income throughout the domestic export industries as well as the entire United States economy are necessary if profitable domestic and foreign markets are to continue to exist for tomatoes and other winter vegetables.

Tariffs now prohibit the free entry into the United States of tomatoes⁸ and certain other vegetables. In addition, an import quota has been under consideration. One of the possible effects to be considered in inaugurating any type of restriction program is that it may affect markets in Canada to which the industry now sells.⁹ If, for example, Mexican tomato imports into the United States are restricted, Mexico may be able to sell a large share of her surplus production to Canada at prices lower than those United States shippers receive on the domestic market. In addition, if profits to domestic producers increase as a result of smaller supplies or from other factors, present growers will probably increase their production and new producers may enter the industry.^{10 11} With the increased supply, prices to

growers would be lowered and might be practically the same as if larger supplies of foreign tomatoes were imported.

FLORIDA'S COMPETITIVE ADVANTAGES

Florida vegetable producers have a number of advantages which they can continue to exploit—location nearer the large consuming centers than their competitors, close contacts with buyers, and direct shipping connections by rail and truck to all domestic markets. Also, improved varieties, better growing practices and other factors have made and will continue to make for increased production efficiency. To date a number of advances have been made in marketing efficiency, but additional improvements, especially in physical handling, are desirable if growers are to receive higher returns, and if consumer satisfaction with Florida vegetables is such that larger quantities are purchased.

As incomes and population have increased in Mexico and Cuba, more tomatoes and other vegetables are being consumed there. This should mean less foreign competition unless vegetable production in these countries greatly increases. New markets for Florida tomatoes may be found in Latin America, Europe and elsewhere abroad.¹² A program to provide consumers with high quality tomatoes at reasonable prices may cause the level of per capita consumption of tomatoes to rise from its present plateau. Even if per capita consumption levels do not change, an increasing population should mean an expanding market for Florida vegetables.

¹²The development of such markets would undoubtedly be a difficult task but it is a possibility which should be given serious consideration. Dr. F. S. Jamison, Horticulturist at the Florida Agricultural Experiment Station, stated to the writer that Scandinavian and other European countries now have no, or practically no, supplies of winter tomatoes.

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⁷The same principle holds for regions within countries.

⁸Tariffs now effective on tomatoes (other than Cuban) are as follows: Those entering November 15 to last day of February, 1.5 cents per pound; March 1—July 14, 2.1 cents per pound; July 15 to August 31, 1.5 cents per pound; and September 1 to November 14, 2.1 cents per pound. Duties on Cuban tomatoes are 0.3 cent a pound lower than those from other sources except in the July 15 to August 31 period (13).

⁹United States exports of tomatoes to Canada during the November-March period have ranged from half a million to nearly a million dollars in value over the past five years. Those from November to June have varied from nearly three to almost four million dollars in value (12).

¹⁰This is under the assumption that no marketing agreement or other measure limits the quantity produced or marketed.

¹¹Production of hot-house tomatoes may also be expanded. It is estimated that the current annual production of 150 million pounds is nearly triple the 1935-44 average. ((7), p. 784; (8), p. 50).

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FORMATION OF PLOWSOLE PANS IN FLORIDA SOILS

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Compaction of the subsoil immediately below the depth of tillage is becoming a problem in certain areas of Florida. This compacted layer is commonly referred to as a "plowsole pan," because it first came to attention where it was associated with the use of moleboard plows. Pounding by the feet of draft horses or pressure of equipment wheels in the bottom of the plow furrow was thought to be the major cause of the condition.

Plowsole pans should not be confused with the brown or brownish-black hardpan commonly found in our palmetto flatwood soils. These brown pans are formed as a result of a natural movement downward and subsequent deposition of soil colloids and materials in solution under the influence of high soil acidity, while plowsole pans are the result of pressure or pounding on the undisturbed subsoil. There is less tendency for pans to develop where a tilled soil cushion is maintained between the maximum depth of tillage and the depth to which equipment wheels penetrate.

The plowsole pan is detrimental because it interferes with the deep penetration of the roots of the crop, and with the free movement of water and air through the soil. As a result the drainage of excess water through the soil is slowed down to the point where an otherwise well-drained soil may become boggy and water-logged after periods of heavy rainfall. This pan also prevents the normal return of subsoil moisture to the surface during dry periods. Coupled with the fact that the

crop is necessarily shallow rooted over the pan, this leads to severe drought during periods of limited rainfall.

Plowsole pans also have an effect on the efficiency of various irrigation practices and on the leaching of fertilizer residues. They will tend to prevent the normal deep penetration of water applied by overhead irrigation and will restrict the rise of water applied by sub-irrigation. There is a greater tendency toward the accumulation of soluble salts. This may be a significant factor where heavy fertilization is practiced or where water of marginal salinity must be used.

Formation of tight plowsole pans is associated with certain soil conditions. Dry soil will not compact readily, while wet soils are lubricated by their moisture and result in the tightest pans. Sandy soils compact quite readily when the soil approaches saturation, but clay soils compact the most readily at a moisture content slightly less than that which will make the soil sticky and plastic. At higher moisture levels, a clay soil will ooze out from under the wheels rather than form a compact pan.

Another differentiating characteristic of soils is their ability to recover from pans formed during a given crop season. A clay soil will swell and shrink during wetting and drying. This tends to re-granulate hardpans, so that roots and water can penetrate them. Freezing and thawing are very important factors in bringing about this granulation in the north where frost penetrates to the pan. On the other hand, a sandy soil has little or no swelling and shrinking taking place during wetting and drying. Thus, when a pan forms it tends to remain, and the added pounding it receives each year adds to the tightness of the pan.