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IMPACT OF INCREASED ENERGY COSTS ON GREENHOUSE TOMATO PRODUCTION

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INTRODUCTION

According to the 1974 U.S. Census of Agriculture, \$31.7 million worth of greenhouse vegetables were produced on a covered area of 37.2 million square feet. Though this represents less than 2 percent of total fresh market vegetable production in the country, traditionally greenhouse vegetables have provided high quality produce during months when field production is at a low level. This has been especially the case in the Northcentral and Northeast regions where a relatively large and affluent population of the metropolitan areas demands a year round supply of fresh vegetables. Much of the greenhouse production relates to the growing of salad items. Tomatoes are the single most important crop accounting for roughly two-thirds of the covered area and value of all greenhouse vegetables. In 1974, 63 percent of the U.S. covered area for tomatoes was located in the Northcentral region, 10 percent in the Northeast and the rest in the South and the West.

During the last two decades, major changes have taken place in the U.S. greenhouse tomato industry. Covered area and production in the Northcentral and Northeast regions has declined. Area in the South and West has increased but the

increase has not been enough to prevent a decline in national production. The purpose of this paper is to analyze recent trends in the production of greenhouse tomatoes with a special emphasis on the effect of increased energy costs upon production in the Northeast region.

RECENT TRENDS IN GREENHOUSE TOMATO PRODUCTION

Data from the Census of Agriculture show that in 1959, virtually all of the U.S. greenhouse tomato production occurred in the Northcentral and Northeast regions (Table 1). Ninety percent of the covered area for tomatoes and 91 percent of the total value of the crop were accounted for by the Northcentral region alone. The corresponding figures for the Northeast region were 8 percent and 7 percent, respectively.

In the following decade, the covered area in the Northcentral region declined by 15 percent. Because of its initial dominance, however, this region continued to lead other regions, accounting for 77 percent of the total greenhouse tomato production area in 1969. The Northeast, which was the second most important region in 1959, experienced a small increase in covered area in the 60's. In 1969, 10 percent of the greenhouse tomato area was located in this region. However, here too, the traditional production centers in Massachusetts and Rhode Island suffered declines while new productive capacity was added in other states. The South and the West experienced relatively large increases in the covered area during this period of time.

A significant declining trend in the traditional production regions developed in the 70's.

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Table 1. Changes in Covered Area and Value of Production of Greenhouse Tomatoes.

Region	1959		1969		1974	
	Area	Value	Area	Value	Area	Value
	Mil. Sq. Ft.	Mil. Dol.	Mil. Sq. Ft.	Mil. Dol.	Mil. Sq. Ft.	Mil. Dol.
Northeast ^a	2.3	1.1	2.7	1.7	2.5	2.0
Northcentral	25.7	14.8	21.9	15.0	14.8	13.1
South	0.3	0.2	2.0	1.2	3.3	3.4
West	0.1	b	1.7	b	3.0	3.2
U.S. ^c	28.4	16.2	28.4	19.3	23.6	21.7

Source: U.S. Bureau of the Census, Census of Agriculture, 1959, 1969, and 1974 Reports, U.S. Department of Commerce.

^a Delaware, Maryland and W. Virginia are included in the Northeast region.

^b Incomplete data.

^c Due to rounding errors and incomplete data, regional figures do not add up to the U.S. totals.

Covered area for tomatoes declined by 32 percent in the Northcentral region between 1969 and 1974. The Northeast, which had managed to post a small increase in the 60's, suffered a 7 percent decline in the covered area. Meanwhile, the South and the West continued to grow, relegating the Northeast region to the last position in 1974. However, in spite of the sharp decrease, the Northcentral region still ranked first with 63 percent of the national greenhouse tomato production area.

Though a more complete description of trends in the late 70's has to await the 1978 census results, observations from selected states indicate a further loss in greenhouse tomato production in the Northeast and Northcentral regions. For instance, the number of growers in New Jersey has declined from 42 in the 1974 census to only 19 in 1979. Similarly, the 1974 census reported 45 greenhouse tomato growers in Massachusetts with a covered area of 535,842 square feet and according to extension experts the number of growers has declined to 25 and production area decreased to 150,000-200,000 square feet in 1980. In New York and Pennsylvania some of the area formerly planted to tomatoes has been shifted into flowers and bedding plants.

CHANGES IN INTER-REGIONAL COMPETITION AND ENERGY COSTS

Increased inter-regional competition from the southern winter vegetable areas seems to be the primary cause of the decline of the greenhouse tomato industry in the traditional production centers in the north. Two developments have been responsible for the improved competitive position of the southern areas and the worsened position of greenhouse tomatoes. One is the improvement in the transportation system which occurred in the 60's and the other is the increase in energy costs in the 70's.

Although off season greenhouse tomatoes sell for premium prices in the northern markets, they have to compete with the field grown tomatoes imported from the south. The downturn in the greenhouse tomato industry of the dominant Northcentral region coincides with the increased exports of field grown tomatoes from the south and Mexico to the northern markets. In the 60's improvements in the transportation system stemming from the completion of the Inter-State Highway network increased the accessibility of markets to the distant production centers. As a result the

volume of southern field tomatoes shipped to northern markets increased with adverse effect on the local production of greenhouse tomatoes. According to Simmons et al.⁽³⁾ the amount of winter tomatoes shipped from Florida and Mexico to U.S. markets increased from 991 million pounds in 1967/68 to 1,298 million pounds in 1974/75.

The effect of increased shipments of southern tomatoes on the Northeast region was not apparent immediately. Tomato production area in Massachusetts and Rhode Island declined in the 60's, but it was more than offset by the new production capacity added in other states. The expansion in other states was probably due to the advent of low cost plastic greenhouses which encouraged the entry of many part time growers. However, increasing imports had a depressing effect on prices and hence the profitability of the enterprise. According to Dhillon (1) the profitability of tomato production under plastic greenhouses was only marginal in 1969.

In the mid and late 70's increased energy cost dealt a second blow to the greenhouse production in the north. It affected the cost structures of local greenhouse tomatoes and imported field grown tomatoes in such a way that the position of the former product in inter-regional competition worsened. This resulted in a sharp decline in the production of greenhouse tomatoes in the Northcentral and Northeast regions.

Southern field tomatoes and northern greenhouse tomatoes are produced by totally different techniques. Of particular interest here is the amount of energy used in the production of two types of tomatoes. Though the distant southern areas have to rely on the transportation system to deliver their tomatoes, the field production of these tomatoes involves very little use of energy. It has been shown that direct energy used in producing and transporting imported tomatoes on a per unit basis is much less than for the greenhouse tomatoes produced in the north. According to a New Jersey study (2) a 30 lb. carton of spring greenhouse tomatoes used 8.1 gallons of #2 home heating oil plus electricity. By comparison, based on a Florida study (5) a 30 lb. carton of winter and spring Florida tomatoes required only 0.25 gallons of diesel fuel for production and another 0.2 gallons for transportation to the New York-New Jersey market or a total of 0.45 gallons. Thus greenhouse tomato production in the north is more sensitive to energy price changes than the competing product. In 1974 energy costs made up 23.1 percent of the total production costs of greenhouse tomatoes vs. 2.7 percent of Florida tomatoes delivered in the north. Thus, in recent years the escalating energy costs have increased the production costs of greenhouse tomatoes more than the costs of imported tomatoes. This development has tended to price the greenhouse tomatoes out of the market.

RECENT CHANGES IN PRODUCTION COSTS

Cost of producing spring greenhouse tomatoes in the Northeast region and cost of producing and delivering Florida tomatoes into the New York-New Jersey market are shown in Table 2. According

¹ It is recognized that 1978 Census data on greenhouse enterprises would have been very useful in gauging the impact of increased energy costs on greenhouse tomato production. Unfortunately these data won't be available for sometime to come. Volume I Census reports have just been released, but they do not carry the breakdown of greenhouse vegetables into individual products such as greenhouse tomatoes. According to correspondence with the Census Bureau, such detailed data is planned to be published in a special report in December 1981 or later.

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to these figures the total cost of producing a 30 lb. carton of greenhouse tomatoes in New Jersey increased from \$14.17 in 1974 to \$22.11 in 1979 or by \$7.94. This represents a 56 percent increase in the cost over the five year period. In contrast, the per carton cost of obtaining Florida tomatoes, which compete with greenhouse tomatoes, increased by only \$0.75 or 12.4 percent. According to these estimates the production cost of greenhouse tomatoes increased by four to five times the rate experienced by the tomatoes imported from Florida. Clearly, this had an adverse effect on the greenhouse industry in inter-regional competition.

The chief factor responsible for the differential in cost increases is the cost of energy. In 1974, the direct energy cost of fuel for Florida tomatoes, including their transportation was estimated to be 16.1¢ per carton (8.8¢ for production and 7.3¢ for transportation). By 1979 the direct energy cost had risen to 34¢ per carton. Though this represents a more than 100 percent increase in the energy cost, it increased the overall costs of imported tomatoes by only 3 percent. In the case of greenhouse tomatoes, direct energy cost increased from \$3.28 per 30 lb. carton in 1974 to \$6.30 in 1979 or by \$3.02. This large absolute increase produced a 21 percent increase in the overall costs of greenhouse tomatoes. Thus, the increased energy costs in recent years have impacted more heavily on the greenhouse tomatoes than the imported tomatoes.

PRICES AND RETURNS

Differential increases in costs alone would not have been a sufficient cause for the decline of the greenhouse tomato industry if the price of greenhouse tomatoes had kept up with the costs. Such a development would have offset the effect of higher costs on the net returns of the producers. However, this has not been the case. As illustrated by the New Jersey figures in Table 3, even though greenhouse tomato price increased by a slightly higher rate than the price of imported tomatoes, the differential was not commensurate with the difference in costs.

Between 1974 and 1979 the wholesale price of Florida tomatoes at Hunts Point, New York increased by 21.4 percent. Since the cost of producing and shipping Florida tomatoes to the New York-New Jersey market increased by only 12.4 percent the profitability of Florida tomatoes must have at least remained intact, if not improved. In contrast the price of New Jersey greenhouse tomatoes increased by 37% over the 5 year period. But, since costs increased by 56%, the net returns of greenhouse tomato growers must have shrunk during this period.

The decline in net returns to management from greenhouse tomato production is further illustrated in Table 4. In 1974, net returns to management for a typical greenhouse tomato operation were estimated at 1.3¢ per pound. In 1979 the comparable net returns to management declined

Table 2. Production and Transportation Costs of Green Mature Florida Tomatoes Imported into New York-New Jersey Area and Cost of Producing Vine Ripened Tomatoes in Plastic Greenhouses in New Jersey.

	1974			1979		
	Cost of Direct Energy ^a	Other Costs	Total Costs	Cost of Direct Energy	Other Costs	Total Costs
Dollars Per 30 Pound Carton						
<u>Florida Imports</u>						
Total costs incurred in Florida	0.088	4.91	5.00 ^b	0.182	5.41	5.59 ^c
Transportation to N.Y.-N.J. ^d	0.073	0.96	1.03	0.158	1.03	1.19
Total Cost	0.161	5.87	6.03	0.340	6.44	6.78
<u>New Jersey Greenhouse Tomatoes</u>						
Production cost ^e	3.28	10.89	14.17	6.30	15.81	22.11

^a Direct energy used in the form of fuel and electricity.

^b Weighted figure for the entire Florida state based on Simmons, *et al.* (3).

^c Based on Zepp (5) whose figures refer to S.W. Florida which are comparable to Simmons' estimates.

^d Based on Zepp (5).

^e Based on P.S. Dhillon (2).

Table 3. Prices of Large Pink-green Florida Tomatoes at Hunts Point, New York and the Prices Received by N.J. Greenhouse Tomato Growers, 30 Pound Carton.

Item	1974	1979	% increase
Florida tomatoes (April to June) ^a	\$11.34	\$13.77	21.4
New Jersey Greenhouse ^b tomatoes (average for the season)	14.55	19.98	37

^a Based on published and unpublished data obtained from the Federal State Market News Service, Bronx, New York.

^b Based on unpublished data obtained from the Certified Markets, New Jersey Farm Bureau, Trenton, New Jersey.

Table 4. Net Returns to Management From Tomato Production in Plastic Greenhouses in New Jersey, Per Pound of Output Produced.^a

Item	1974	1979
Price received	48.5¢	66.6¢
Cost, f.o.b. farm	47.2¢	73.7¢
Net Returns to Mgt.	1.3¢	-7.1¢

^a Based on price estimates obtained from the Certified Markets, New Jersey Farm Bureau, Trenton, and updated cost estimates obtained from Dhillon *et al.* (2).

to -7.1¢ per pound. In the later year not only did the grower not receive anything for his management input, but he also lost on the use of other inputs.

Under these economic conditions the entry of new growers would be expected to stop while existing growers gradually ease out of the industry as their greenhouses depreciate or as they adopt alternative enterprises. This is exactly what has been happening in New Jersey and the rest of the Northeast. In New Jersey the number of growers declined from 42 in 1974 to only 19 in 1979. Some growers switched to other enterprises such as producing bedding plants, while others did not renew their investment in physical plant and abandoned greenhouse production altogether.

CONCLUSIONS

The greenhouse tomato industry which once played a useful role in supplying a high quality product to many northern markets has suffered a sharp decline in recent years. The decline is attributed to the increased competition from winter tomatoes produced in Florida and Mexico and trucked north. In the 60's, improvements in the U.S. transportation system benefited the winter tomato exporting regions. The increased shipments of southern tomatoes depressed the greenhouse tomato industry in the Northcentral region and arrested its growth in the Northeast region. In the 70's, increasing energy costs dealt a further blow to the greenhouse tomato industry in the traditional regions, resulting in a steep decline in the production area. Since local production of greenhouse tomatoes requires an extensive use of fossil fuels production costs of greenhouse tomatoes increased at a higher rate

than the cost of imported tomatoes. At the same time, the price of greenhouse tomatoes did not increase enough to match the cost increase. As a result, the net returns to growers declined and many greenhouse tomato producers either moved into alternative enterprises, such as the production of bedding plants and flowers, or ceased production as their greenhouses wore out.

Given the present pessimistic energy outlook, the northern greenhouse tomato industry is expected to suffer further declines in the future. With the present technology, its costs are expected to increase relative to the cost of imported tomatoes, thereby putting the greenhouse tomatoes at a further disadvantage in the marketplace.

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