LITERATURE CITED

1. Carter, M. V. 1963. **Mycosphaerella pinodes.** II. The phenology of ascospore release. Australian J. Biol. Sci. 16:800-817.
2. Horsfall, J. G. 1945. Fungicides and their action, p. 38-41. Chronica Botanica Co., Waltham, Mass.
3. Parris, G. K. 1952. Diseases of watermelons. Florida Agr. Exp. Sta. Bull. 491:20-26.
4. Pinckard, J. A. 1942. The mechanism of spore dispersal in **Peronospora tabacina** and certain other downy mildew fungi. Phytopathology 32:505-511.
5. Rankin, H. W. 1954. Effectiveness of seed treatment for controlling anthracnose and gummy-stem blight of watermelon. Phytopathology 44:675-680.
6. Schenck, N. C. 1964. A portable, inexpensive, and continuously sampling sport trap. Phytopathology 54: 613-614.
7. Schenck, N. C. 1968. Incidence of airborne fungus spores over watermelon fields in Florida. Phytopathology 58:91-94.
8. Schenck, N. C. 1968. Fungicidal control of watermelon downy mildew and its relationship to first infection in the field. Plant Dis. Reptr. 52:979-981.
9. Schenck, N. C. 1968. Epidemiology of gummy stem blight (**Mycosphaerella citrullina**) on watermelon: ascorpore incidence and disease development. Phytopathology 58: 1420-1422.
10. Schenck, N. C. and J. M. Crall. 1962. Fungicidal control of watermelon foliage diseases, 1958-1961. Proc. Florida State Hort. Soc. 75:223-228.
11. Stover, R. H. 1964. Leaf spot of bananas caused by **Mycasphaerella musicola**: factors influencing production of fructifications and ascospores. Phytopathology 54:1320-1325.

DEMAND AND SUPPLY RESPONSE TO PRICE CHANGES FOR SELECTED FLORIDA VEGETABLES[1]

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Abstract

This paper presents estimates of demand response to changes in consumer income and to price changes for tomatoes, winter potatoes, snap beans, sweet corn, and squash. Supply (acreage) response to price changes was also determined for each crop. Annual State data for the 13 seasons, 1955-56 through 1967-68, and a distributed-lag model of the Nerlove type were used to obtain structural estimates from which short and long-run elasticities of demand and supply with respect to price were derived. Short and long-run elasticities of demand with respect to consumer income were also estimated. All elasticities were estimated at the means of the data.

Introduction

Demand.—The Principle of Demand is fundamental to economics. This Principle states that the quantity of a product which consumers are willing and able to buy varies inversely with the product's price if all other factors which affect the quantity demanded are held constant. A two dimensional representation of this Principle is given by the demand curve, D_1, in Figure 1. There are several factors which, if not held constant, can shift this curve. For example, if consumers' incomes rise, the demand curve may be shifted to the right as shown by D_2, indicating that consumers are now willing to buy more of the product at the same price or are willing to pay a higher price for the same amount of the product.

The elasticity of demand is a number which explains how quantity changes as price (income) changes at some point on the demand curve. Specifically, the elasticity of demand with respect to price (income) is the percentage change in the quantity demanded resulting from a one percent change in price (income), other factors constant. If the elasticity of demand with respect to price is elastic (inelastic), the quantity demanded is changing relatively faster (slower) than price. This means that if the demand is elastic (inelastic) with respect to price, a price decrease will result in consumers spending a larger (smaller) total amount for the product.

The elasticity of demand with respect to price depends somewhat on the amount of time consumers have to respond to a price change. In a period of one year, which we will call the short run, a price change will normally have less effect on the quantity demanded than in a period suffi-

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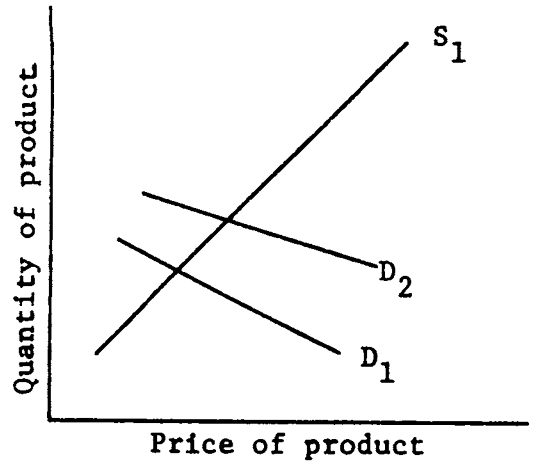

Figure 1. Hypothetical Demand and Supply curves.

ciently long for all effects of the price change to work themselves out.

Supply.—The Principle of Supply is also fundamental to economics. It explains how producers respond to price changes. This Principle states that the quantity of a product which producers are willing to supply will increase as the price of the product increases, if all other factors are held constant. A graphical representation is given by S_1 in Figure 1. The elasticity of supply with respect to price is conceptually equivalent to that of demand in that it gives the percentage change in quantity supplied with a one percent change in price. The length of time one considers after a price change can also affect the elasticity of supply. Normally the longer the time lapse considered the more elastic the supply.

METHOD USED AND RESULTS

The demand and supply relationships for tomatoes, winter potatoes, snap beans, sweet corn, and squash were estimated using a Nerlove distributed lag model [3]. Estimates were based on annual State data for the 13 seasons, 1955-56 through 1967-68. Parameters of the Nerlove models were estimated by ordinary least squares regression and were used to determine short and long-run elasticities of demand with respect to the price of each product and per capita income of consumers. Short and long-run supply elasticities with respect to the price of each product were also determined.

The general form of the model used to esti-

Table 1. Estimates of demand elasticities for five Florida vegetable crops.[a]

Crop	R^2	Estimated elasticities[b]: Price, Short run	Price, Long run	Income, Short run	Income, Long run	Means of variables: Quantity	Price[c]	Income[c]
Tomatoes[d]	.8255	- .8920**	-1.4172**	1.0200**	1.6206**	5182.2812	3.5086	2053.0000
Winter potatoes[e]	.4662	- .7072*	-1.7583*	.6523	1.6218	1732.5383	3.4894	2053.0000
Snap beans[f]	.8361	-1.2490**	-1.4150*	-.0041	-.0046	1577.9229	3.1309	2053.0000
Sweet corn[d]	.9480	- .6444**	- .8918*	1.3602**	1.8824*	2639.3076	2.3674	2053.0000
Squash[f]	.7456	- .9610**	- .9183	.6872**	.6872	418.5640	3.1543	2053.0000

[a] Source of data for tomatoes, potatoes, beans, corn, and squash: Florida Agricultural Statistics [1].
[b] Approximate levels of significance for the coefficients from which these elasticities were estimated are indicated as follows:
** .05 or higher
* .2 to .05
Unmarked Below .2
[c] Price and income have been deflated (1957-59 = 100).
[d] Quantity measured in thousands of crates; price measured in dollars per crate
[e] Quantity measured in thousands of 100 pound bags; price measured in dollars per bag.
[f] Quantity measured in thousands of bushels; price measured in dollars per bushel.

Table 2. Estimation of supply elasticities for five Florida vegetable crops.[a]

Crop	R^2	Estimated price elasticities[b] Short run	Long run	Means of variables Quantity	Price[c]
Tomatoes[d]	.6541	.5663**	1.1351**	17202.562	3.4109
Winter potatoes[e]	.6462	.4140*	1.8047*	9.3657[f]	1.2195[f]
Snap beans[g]	.4988	.1119	.3291	91215.383	3.0531
Sweet corn[d]	.9545	.2588*	.7270*	17397.434	2.2860
Squash[g]	.4243	.1767*	.4817*	8.2594[f]	1.0732[f]

[a]Source of data for tomatoes, potatoes, beans, corn, and squash: Florida Agricultural Statistics [1].

[b]Approximate levels of significance for the coefficients from which these elasticities were estimated are indicated as follows:

**	.05 or higher
*	.2 to .05
Unmarked	Below .2

[c]Price has been deflated (1957-59 = 100).

[d]Quantity measured in acres planted; price measured in dollars per crate.

[e]Quantity measured in acres planted; price measured in dollars per cwt.

[f]Variables for this equation were transformed to natural logarithms; therefore the elasticities were estimated at the geometric means of the original variables.

[g]Quantity measured in acres planted; price measured in dollars per bushel.

mate demand elasticities is given in equation (1). Equation (2) gives that for the supply model.[2]

(1) $q(t) = f_1(q(t\text{-}1), p(t), I(t), u(t))$

(2) $A(t) = f_2(A(t\text{-}1), p(t\text{-}1), v(t))$

The first says that the quantity of the crop that consumers will buy in the present time period, q(t), depends upon the quantity they bought in the previous time period, q(t-1), the price in the present time period, p(t), per capita income in the present time period, I(t), and some other factors about which we have no knowledge, u(t). This last term, u(t), is not actually observed as are the other variables. It is simply the residual variation in q(t) that is not explained by the included variables.

The second equation says that the number of acres farmers plant in the present time period, A(t), depends upon the acres that were planted in the previous time period, A(t-1), the price in the previous time period, p(t-1), and the disturbance term, v(t). In both of these equations we naturally hope that the influence of the disturbance term will be small.

Two functional forms were fit through the data—a linear function in real numbers and a function linear in logarithms of the variables. The linear function in real numbers generally gave the best fit. When the logarithmic function was used it is so designated in the footnotes of Tables 1 and 2. The estimation results for equation (1) are shown in Table 1. The column headed R_2 indicates the proportion of variation in q(t) explained by the variables q(t-1), p(t), and I(t). Thus, in the case of tomatoes, the influence of these variables accounted for about 83 percent of the variation in q(t). The equation, therefore, failed to explain about 17 percent of

[2]The equations also contained dummy variables [2, pp. 218-227] which recognized the average effect of seasonal variations.

the variation in quantity of tomatoes demanded. In the case of winter potatoes the designated variables explained only about 47 percent of the variation in q(t), a result which was not as satisfactory as those for the other crops.

The price and income elasticities were estimated at the means of the data. The sign of the number indicates the direction of response. For example, if the price of tomatoes were increased one percent, we would expect the quantity of tomatoes which consumers would purchase to decrease by about .9 percent during the first year (short run), and about 1.4 percent after a period sufficiently long for all adjustments to work themselves out. If per capita income were to increase one percent, we would expect consumers to purchase about one percent more tomatoes in the next time period, and 1.6 percent more after sufficient time for all adjustments.

The estimation results for equation (2) are presented in Table 2. The values in the R^2 column are interpreted exactly as those in Table 1. The price elasticities were also estimated at the means of the data. Thus if the price of tomatoes increased one percent in the present time period, we would expect growers to plant about .6 percent more tomatoes in the next time period and 1.1 percent more tomatoes over a period of time long enough for the price rise to have its full effect.

Although we still have much improvement to make, estimating demand and supply functions is becoming more precise as new mathematical and statistical methods are developed. As this precision improves, the economics profession can be of greater service in developing marketing and production strategies.

REFERENCES

[1] Florida Department of Agriculture, in cooperation with the U.S. Department of Agriculture and Agricultural Experiment Stations of the University of Florida. **Florida Agricultural Statistics: Vegetable Summary, 1967.** Orlando, Florida: Florida Crop and Livestock Reporting Service, 1967.

[2] Goldberger, Arthur S. **Econometric Theory.** New York: John Wiley and Sons, Inc., 1964.

[3] Nerlove, Marc, May 1958. "Distributed Lags and Estimation of Long-Run Supply and Demand Elasticities: Theoretical Considerations," **Journal of Farm Economics.** 40:301-311.

EFFECT OF TOBACCO MOSAIC VIRUS AND BACTERIAL INFECTIONS ON OCCURRENCE OF GRAYWALL OF TOMATO

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ABSTRACT

Twenty-seven of the 54 plants of each of three tomato cultivars, that varied in degrees of susceptibility to graywall, were inoculated in a greenhouse with Ohio strain V of the tobacco mosaic virus (TMV). Differences in incidence of natural graywall could not be attributed to the presence of TMV. The Ohio TMV-resistant cultivar was not systemically infected as shown by assays to two local lesion hosts following inoculation, but graywall was observed in its fruit. Graywall also occurred in fruit from virus-susceptible plants not inoculated with the virus. Moreover, TMV could not be detected in these graywall-affected fruit in assay tests.

After inoculations with a bacterium, *Erwinia ananas* Serrano, more browning occurred and the bacterium multiplied to a higher level in TMV-diseased fruit than in virus-free fruit.