Staff Report

A WEEKLY PRICE DETERMINATION MODEL FOR
FLORIDA CELERY

By
J. Scott Shonkwiler

Staff Report 7 September 1979

FAMRC

FLORIDA
AGRICULTURAL MARKET RESEARCH CENTER
FOOD AND RESOURCE ECONOMICS DEPARTMENT
Institute of Food and Agricultural Sciences
University of Florida
Gainesville, Florida 32611
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Food and Resource Economics Department
Institute of Food and Agricultural Sciences
University of Florida, Gainesville, Florida 32611
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The Center is staffed by a basic group of economists trained in agriculture and marketing. In addition, cooperating personnel from other IFAS units provide a wide range of expertise which can be applied as determined by the requirements of individual projects.
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A WEEKLY PRICE DETERMINATION MODEL FOR FLORIDA CELERY

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INTRODUCTION

Florida celery production is concentrated both geographically and organizationally. The two major producing areas in three Florida counties and a dozen growers account for over 90 percent of the state's celery marketings during a crop year. Over the last ten years, Florida celery shipments have comprised about 42 percent of total U.S. celery supply during the Florida season (November through June) with the remaining quantities being supplied by California.

Unlike many fresh vegetables, the timing of celery harvesting is typically flexible within weekly bounds, and once harvested the crop may be stored for short periods with little deterioration. The marketing of most Florida celery production is performed by a single sales cooperative with the capability to set prices. The characteristics of celery supply and marketing make analysis of the short-run price determination mechanism for Florida celery rather unique. This report analyzes the physical, institutional, and economic forces which shape weekly celery harvesting and pricing decisions. A structural econometric model is formulated to represent the dynamic operation of the market.

J. SCOTT SHONKWILER is assistant professor of food and resource economics, University of Florida.
The present study proceeds with an overview of the operation of the Florida celery market followed by discussions of the price determination mechanism and its approximation to competitive equilibrium. The final sections of the paper presents a weekly supply-demand model for representing the short-run operation of this market and consider its appropriateness.

**Florida Celery Production and Marketing**

Florida celery matures from field set plants between 70 and 110 days after planting. As shown in Table 1, maturities are longer in the late fall, but shorten during the spring months. Growers typically have several weeks in which to harvest their crop depending on temperature and moisture conditions. Once harvested, the celery is washed, packed and cooled in preparation for shipment. Total amounts harvested within a given week are not necessarily marketed since short-term storage is possible. A recent study has found that most celery shipments go directly to retail outlets although wholesale celery markets do exist in larger metropolitan areas (Mathis and Degner). This phenomenon has been observed for other Florida winter vegetables and has led Bghali to speculate that the price determination process has shifted from the wholesale level terminal to the production-shipping point.

Approximately 95 percent of celery marketings are overseen directly by the Florida Celery Exchange, a voluntary marketing cooperative which represents all major Florida celery producers. Members pass complete market control over their celery to the Exchange by means of contracts. The Exchange constantly monitors market developments, growing conditions,
Table 1.--Florida celery: days to maturity by month planted.

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and daily production of both Florida and California celery. Then, in an effort to maintain stable weekly markets, the Exchange usually sets a Florida FOB celery price on each Monday and Wednesday morning. Infrequently, prices are changed on other days during the week in order to accommodate rapidly occurring market developments. If prices are lowered on such occasions, buyers are given price protection for purchases made subsequent to the last price quotation. Thus, on a week to week basis, Florida celery price levels and shipments reflect the operation of the Celery Exchange in a market with a structure that has been referred to as a cartel (Brooke and Jung).

Although celery is a fairly perishable commodity, the flexibility in time of harvest and its short-term storability imply that weekly supplies are not totally predetermined by past plantings. In fact, the price setting capability of the Celery Exchange suggests that quantities supplied and demanded, rather than prices, adjust to produce a market equilibrium. Of course, prices set by the Exchange each Monday do not
necessarily correspond to actual average prices received by Florida celery producers the entire week; the Exchange may adjust price on Wednesday (or more frequently) to accommodate unforeseen changes in Florida and California supplies or national forces such as variations in demand conditions. Two important prices then are generated by the operation of the Florida Celery Exchange. The Monday price may serve as a signal to Florida growers. The subsequent adjustments to the Monday price may prompt different grower responses depending on whether prices have changed significantly and whether physical factors allow harvest flexibility.

These features and their interpretation imply that weekly Florida celery price determination must account for producer response, the short term storable nature of celery, the operation of the Exchange, components of demand and California competition. The formulation of a model to appropriately replicate the operation of this market is strongly conditioned by assumptions concerning the degree of competition existing. Specific concerns are directed to deciding whether prices adjust sufficiently during the week to maintain balance between quantities supplied and demanded. Therefore, the exact process by which prices are determined in the Florida celery market must be further analyzed before modeling decisions can be made.

Price Determination Description

The fixing of a non-negotiable market price by the Florida Celery Exchange represents a substantial departure from the theoretical price determination process of a competitive market. The unique characteristics
of the Exchange's pricing system, however, imply that the weekly average prices generated during the period under study closely approximate the price patterns which would likely exist given competitive equilibria. To understand the pricing mechanism involved and its relation to theoretical price determination conditions, the pricing activities of the Exchange will be developed more fully.

The Manager of the Celery Exchange meets with the three-member pricing committee every Monday and Wednesday morning and presents detailed market information collected during previous days. Specifically, he has compiled the previous days' harvestings, sales, and inventory levels of the member celery producers. These data are collected daily via the private communication system linking major producers and shippers with the Exchange. Further, he has current estimates of that day's production as well as production estimates for the entire week. This information fairly well summarizes the supply side of the Florida market when merged with observations on weather and labor availability.

To collect information on demand conditions, the manager usually contacts Florida celery salesmen a day or two before the pricing committee meets. From conversations with them, he elicits the number of new buyers in the market, changes in size and frequency of orders, and other information about distribution and demand developments. A similar method is also employed to infer the general tone of the California celery market. Calls are made to a select group of California shippers and a subjective appraisal is made concerning their current market conditions. To augment this information, U.S.D.A. Market News reports are constantly checked in order to monitor shipments and representative prices for the California crop.
With this information base, the Exchange sets non-negotiable prices for the major size categories of celery. Because much of the information used is non-quantitative, the Exchange employs no empirical models in its price setting activities. Rather, the collective experience and knowledge of the manager and the pricing committee translate current and projected market conditions into a price that is expected to clear the market. If market conditions are so uncertain that rapid developments are expected, then the pricing committee may decide to meet more often than Monday and Wednesday. In this manner the Exchange closely monitors Florida cold storage inventories, the California market, and exogenous developments such as weather in order to set a price which presumably clears the market.

Market Equilibrium

The concept of a market clearing price is, of course, fundamental to the competitive equilibrium presumed to occur on a week to week basis. The market clears in the sense that the Exchange does not control supply in the short-run. During the period under study, there were no harvesting holidays or other supply restrictions imposed. However, the Exchange is constrained in its ability to manipulate prices for long periods because of the perishability of the crop. This fact is evidenced by the considerable attention given by the pricing committee to unsold celery inventories held at the beginning of each price setting period. Breimyer (p. 116) terms the price determination mechanism employed by the Exchange as "supply-demand estimation pricing." This terminology implies first that supply curves are relevant concepts for
identifying output and secondly that the set price actually acts to clear the market. Because no supply restrictions are imposed and for other reasons discussed in the following section, it will be assumed that a supply curve exists for the weekly observational period. The second implication concerning the ability of the administered price to equilibrate supply and demand suggests the need for a more thorough analysis.

If the Exchange price does not permit the market to clear, then the quantity actually transacted either lies on the demand or the supply curve, but not at their intersection. Fair and Jaffee\textsuperscript{3} represent this market with a demand and supply equation of the form

\begin{align*}
D_t &= \alpha_0 XD_t + \alpha_1 P_t + \varepsilon_t \\
S_t &= \beta_0 XS_t + \beta_1 P_t + \eta_t
\end{align*}

where \( XD \) and \( XS \) represent demand and supply shifters respectively and \( P \) represents the exogenous price. The quantity transacted in any period, \( Q_t \) equals either \( D_t \) or \( S_t \) because price does not necessarily adjust to permit \( D_t = S_t = Q_t \). A third equation to complete the disequilibrium model then is

\[ Q_t = \text{Min} \ (D_t, S_t) \]  \hspace{1cm} (3)

A graphical representation is given in Figure 1.

The heavily shaded lines in Figure 1 represent price-quantity combinations which may occur in a disequilibrium market. When demand
Figure 1.--Quantity determination in the disequilibrium market.
(supply) at $P_t$ exceeds supply (demand) at $P_t$ then shortages (gluts) exist and transactions occur along the darkened supply (demand) curve. Therefore, in a given period either supply or demand is unobservable, and concern is focused upon whether the quantity transacted follows from equation 1 or equation 2. An indicator of which relation is responsible for the observed transacted quantities is the direction of the price changes from period to period. Fair and Jaffee point out (p. 501)

Most dynamic theories of price-setting behavior formulate the change in price as some function of the excess demand existing in the market. If the change in price and excess demand are related in this manner, then the change in price may be used as an indicator of the amount of excess demand (or supply) in the market.

If the price change is instantaneous and complete then supply and demand will be equilibrated. But, the magnitude of the response rate must be referenced to the length of the observational period. In the present context, the celery market may be in disequilibrium from Monday to Wednesday until prices can be adjusted to mitigate the consequences of excess demand or supply. Viewed over a weekly period then the market may nearly replicate the competitive solution.

To illustrate this feature of lengthening the observation period so as to allow more adjustments, consider the price adjustment mechanism suggested by the present disequilibrium analysis

$$\Delta P_t = \gamma(D_t - S_t).$$

Clearly, market adjustment depends not only on the magnitude of $\gamma$ and the length of the observation period, but on the number of adjustments
made (or allowed) per observation period. Because the weekly Florida celery market permits at least two adjustments to equilibrate supply and demand, the assumption that the Exchange's price represents a true equilibrium value over the weekly period appears justified.

**Model Specification**

The few studies of short-run price determination in the celery market have not taken a structural approach which allows simultaneous determination of supply and demand relationships. Of course, the explicit assumption that supply is actually determined, in part, by current prices typically is suppressed in modeling many agricultural markets. The advantages of a full structural model stem from the requirement for a formal description of the price determination process and the corresponding restrictions this structure imposes on the reduced form parameters. The following discussion of the structural specification adopted, therefore, takes into account information regarding physical constraints, perceived market operation, and relevant economic theory. The model is dynamic in the sense that current Florida conditions affect current and future levels of key variables; but because lagged California shipments and prices enter the model, these variables must be set at pre-specified levels to analyze periods longer than a week. Thus, interpretation of other than impact (i.e., single period) multipliers or elasticities must be conditioned on these features.

As mentioned previously, celery production is largely concentrated in the hands of a few Florida producers, which suggests that an oligopolistic treatment of the market may be warranted. In imperfectly competitive
markets, supply functions are not theoretically valid concepts because
the output levels of individual producers are assumed to influence the
market price. In the present context, however, the price to which
Florida producers respond is, to some extent, given by the Exchange.
The Monday celery price declared by the Exchange represents a parameter
(rather than a variable) on which growers may base harvesting decisions.
In this case the supply price perceived by producers is assumed to be
the average weekly price which is, of course, highly correlated with the
Monday price. A relatively high current supply price may induce accelerat-
ed or more thorough harvesting of the celery crop, reductions of stocks,
and thus, larger marketings. Yet, the crop base is essentially fixed
for periods of less than three months, so a substantial limit to supply
response must be imposed over the short-run.

The discrepancy between quantities harvested and quantities shipped
is accounted for by adjusting levels of celery storage. Data on the
response of stock holdings to price changes were not readily available
for the analysis so this effect must be implicitly incorporated into the
postulated supply function. Stock reductions, hence a corresponding
supply increase, are expected when current prices rise. Because stocks
may not be immediately replenished, the effect of higher prices over
several successive periods would preclude supply expansion from stock
reductions.

Besides including average weekly prices in the supply equation,
additional variables are required in order to reflect short-run rigidities
in supply. Although data are available on weekly plantings of celery
for every season analyzed, experimentation with alternative lag forms produced generally poor results. Probable difficulties with this approach include the fact that the correlations between plantings from week to week are typically large and the effects of weather in terms of varying maturities in yields obscure the relationship between lagged plantings and supply. Therefore, to approximate the traditional seasonal production pattern, a weekly low order polynomial in time was specified. It gave generally superior results relative to combinations of lagged weekly plantings.

In order to account for the fact that the crop's perishability probably limits short-run supply response to a one- or two-week period, lagged prices were included in the supply equation. As expected, it was found that high prices the previous week tend to reduce the current week's supply due to the fact that stocks were likely reduced the previous week and celery harvesting was accelerated. To complete the specification, lagged celery production was included to capture production inertia and two seasonal dummy variables were introduced to represent poor growing conditions during 1973 and 1976.

The quantity of celery demanded by wholesale and retail outlets is postulated to depend on the current Florida price, the amount of previous California celery marketings, prices received the previous Friday in California, and seasonal or annual variations in demand. The responsiveness of demand to short-run price changes is generally constrained by the perishable nature of the commodity. That is, the relatively short interval between purchases and ultimate consumption limits adjustments to prices. Also, demand for Florida celery is discontinuous because
commercial marketings do not begin until the late fall; which requires a
decided change-over by wholesalers and retailers to the Florida product
and reduced purchases of the California product (Mathis and Degner).
Thus, lagged levels of demand may be important indicators of how rapidly
wholesalers and retailers begin handling Florida celery. The pace of
the change-over is probably conditioned by custom and habit as well as
economic factors.

Previous demand levels may also indicate the size of wholesale and
retail inventories or the extent of market saturation, and thus are
hypothesized to depress current weekly prices. As suggested by consumer
theory, the elasticity of demand for Florida celery should increase over
time due to adjustment to California marketings and demand substitution.
Prices of possible vegetable substitutes and consumer income are not
included in the present analysis because price determination is presumed
to occur at the producer-shipper level rather than at the retail level
during the weekly observation period.

Some seasonality in demand has been suggested by Brooke and Juny
who found that demand tended to erode toward the end of the marketing
year. Monthly dummy variables are used to capture this presumed season-
ality. Year to year growth in consumption due to increasing population
and incomes as well as changing preferences are included in the demand
specifications via a yearly time trend. An admittedly ad hoc specification
of the demand relation is the result of limiting observations to
only a week's duration. Finally, a variable representing the Christmas
holiday week is incorporated to account for interruptions in product
distribution and demand. With these considerations in mind the following
equations represent the formal model adopted.
Supply equation

\[ Q_t = f_s(\Delta P_t, \Delta P_{t-1}, Q_{t-1}, W_t, W_t^2, D73, D76) \]

Demand equation

\[ Q_t = f_d(P_t, Q_{t-1}, PC_{t-1}, QC_{t-1}, YEAR, DH, M_j) \]

Price identity

\[ \Delta P_t = P_t - P_{t-1} \]

where

\[ t = 1, 2, \ldots, 26 \quad , \quad j = 1, 2, \ldots, 6 \]

and

- \( Q \): Florida celery shipments in carloads
- \( P \): Average Florida celery price in cents per 2 - 2 1/2 doz. carton
- \( PC \): Celery price in California on Friday
- \( QC \): California celery shipments
- \( W \): Weekly trend term for each season, second week in December is 1
- \( W^2 \): \( W \) squared
- \( D73, D76 \): Dummy variables having values of one during 73 or 76 season and zero otherwise
- \( YEAR \): Annual trend term, 1972-73 season is year 1
- \( DH \): Dummy variable for Christmas holiday week
- \( M_j \): Dummy variables for each month except March
The Estimated Model

The weekly Florida celery price determination mechanism was analyzed using 156 observations for six December-June marketing seasons (1972-73 through 1977-78). Table 2 presents the parameter estimates for the behavioral equations using both two and three stage least squares estimation techniques. Both estimation methods yield consistent structural parameter estimates, whereas three stage least squares also produces efficient parameter estimates. Calculated 't-values' are conditional in the sense that the desirable statistical properties of both methods depend on large-sample behavior. For the two-stage least squares models the calculated value of first order serially correlated residuals, $p$, is presented. Because reduced form predictions derived from the three-stage least squares parameter estimates were substantially better for the price equation and only slightly poorer for the quantity equation, the following discussion of the structural estimates will refer to the three-stage results.

The estimated supply equation includes current and lagged price changes in an effort to capture short-run supply responsiveness and its rigidities. A 10 percent increase in current price causes about 5 percent increase in supply. But, a 10 percent increase in prices the previous period calls forth a 2.5 percent decrease in current supply, reflecting the fact that stocks may have been reduced and harvesting accelerated the previous period. Structural impact and interim mean elasticities of supply are presented in Table 3. The interim elasticities show the supply effect of a price increase diminishes rapidly.

Coefficients on the weekly polynomials in time suggest that celery production peaks about the 12th week of the season each year. This
Table 2.--Structural results.

<table>
<thead>
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<th>2SLS Demand</th>
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Table 3.--Structural impact and interim elasticities.

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<td>t+2</td>
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<td>.047</td>
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<td>t+3</td>
<td>-.017</td>
<td>.030</td>
</tr>
<tr>
<td>t+4</td>
<td>-.011</td>
<td>.019</td>
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</table>

Suppose equation (3SLS)

| t      | -.481               | -.481              |
| t+1    | -.254               | -.735              |
| t+2    | -.135               | -.870              |
| t+3    | -.071               | -.941              |
| t+4    | -.038               | -.979              |

would correspond to the period between the end of February and the first part of March. The dummy variables D73 and D76 were included to reflect the poor growing weather experienced during these seasons, and they are both expected to have negative signs. Apart from the calculated significance of these latter variables all other variables enter the supply equation at highly significant levels and with the expected signs.

The estimated demand equation shows that demand is inelastic at the producer-shipper level with a 10 percent price increase causing a 4.8 percent reduction in demand. Demand does become more elastic in the long run as illustrated in Table 3. Of course, these structural elasticities represent only partial effects because for periods longer than a week there appears to be a strong relationship between the California and Florida markets. In fact, a 10 percent increase in either the previous week's shipments or the Friday price in California will respectively reduce demand by 2.1 percent or increase demand by 3.4 percent.
Some seasonal factors enter the demand equation with high levels of significance. As expected, demand tapers off toward the end of the season (Brooke and Jung) but otherwise there were no other a priori notions about the magnitudes of the monthly dummy variables; and their significance levels suggest little contribution to the equation. The dummy variable representing the Christmas holiday shows how demand drops from previous levels during this period. Finally, the coefficient on the annual trend variable has the interpretation that, all other factors held constant, demand for Florida celery grows about 4 percent per year.

The usefulness of the structural approach arises from the comparison of the least squares estimates of the unrestricted reduced form to the restricted reduced form parameter estimates implied by the structural model. Table 4 presents the reduced form parameter estimates and calculated standard errors for both estimation methods. Typically, these parameter estimates would be used for forecasting and control because the direct effects of changes in predetermined variables on price and quantity can be observed.

The results in Table 4 point out the inverse relationship between lagged prices and current shipments and between lagged shipments and current prices. Reasons for these effects were mentioned in the previous section. By and large the unrestricted and restricted reduced forms correspond closely with respect to coefficient signs and relative magnitudes. Notable exceptions are the coefficients on $QC_{t-1}$ in both the quantity and price equations. Essentially, the 3SLS restricted reduced form discounts the importance of lagged California shipments on Florida shipments and shifts this effect to the Florida price variable. The
Table 1.—Reduced form results.

<table>
<thead>
<tr>
<th>Variable</th>
<th>( Q_t )</th>
<th>( P_t )</th>
<th>( Q_t )</th>
<th>( P_t )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \hat{\beta}_Q )</td>
<td>( SE )</td>
<td>( \hat{\beta}_P )</td>
<td>( SE )</td>
</tr>
<tr>
<td>INTERCEPT</td>
<td>303</td>
<td>196</td>
<td>-620</td>
<td>275</td>
</tr>
<tr>
<td>( P_{t-1} )</td>
<td>-.098</td>
<td>.041</td>
<td>.461</td>
<td>.057</td>
</tr>
<tr>
<td>( \Delta P_{t-1} )</td>
<td>-.207</td>
<td>.048</td>
<td>.166</td>
<td>.067</td>
</tr>
<tr>
<td>( Q_{t-1} )</td>
<td>.493</td>
<td>.060</td>
<td>-.163</td>
<td>.084</td>
</tr>
<tr>
<td>( P_{C_{t-1}} )</td>
<td>.079</td>
<td>.035</td>
<td>.416</td>
<td>.049</td>
</tr>
<tr>
<td>( Q_{C_{t-1}} )</td>
<td>-.203</td>
<td>.039</td>
<td>-.042</td>
<td>.054</td>
</tr>
<tr>
<td>( W_t )</td>
<td>.284</td>
<td>6.18</td>
<td>-7.12</td>
<td>8.69</td>
</tr>
<tr>
<td>( W_t^2 )</td>
<td>-.074</td>
<td>.206</td>
<td>.365</td>
<td>.269</td>
</tr>
<tr>
<td>YEAR</td>
<td>-.228</td>
<td>2.64</td>
<td>10.4</td>
<td>3.71</td>
</tr>
<tr>
<td>DH</td>
<td>-87.4</td>
<td>17.2</td>
<td>28.2</td>
<td>24.2</td>
</tr>
<tr>
<td>DEC</td>
<td>10.8</td>
<td>46.0</td>
<td>-10.3</td>
<td>64.6</td>
</tr>
<tr>
<td>JAN</td>
<td>-18.1</td>
<td>26.9</td>
<td>-12.0</td>
<td>37.9</td>
</tr>
<tr>
<td>FEB</td>
<td>-26.4</td>
<td>15.6</td>
<td>17.7</td>
<td>21.9</td>
</tr>
<tr>
<td>APR</td>
<td>13.4</td>
<td>16.1</td>
<td>10.7</td>
<td>22.7</td>
</tr>
<tr>
<td>MAY</td>
<td>-25.7</td>
<td>30.3</td>
<td>-40.5</td>
<td>42.5</td>
</tr>
<tr>
<td>JUN</td>
<td>-45.4</td>
<td>44.2</td>
<td>-63.7</td>
<td>62.2</td>
</tr>
<tr>
<td>AUG</td>
<td>-16.9</td>
<td>8.84</td>
<td>18.5</td>
<td>12.4</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>.805</td>
<td>----</td>
<td>.951</td>
<td>----</td>
</tr>
<tr>
<td>( \hat{\rho} )</td>
<td>-.04</td>
<td>----</td>
<td>.02</td>
<td>----</td>
</tr>
</tbody>
</table>
effect of the weekly polynomial in time is much greater in the 3SLS reduced form since this seasonality is more systematically introduced. Also, the dummy variable for the Christmas holiday, DH, reflects a depressing effect on both shipments and prices in the structural model's reduced form.

Market Implications

Questions now focus on why the Exchange exists. After all, no supply restrictions have been imposed in recent years and its price-setting behavior appears to replicate the competitive equilibrium. The empirical results do provide some indication. It was found that structural elasticities of supply and demand are almost identical in the short-run (one week). If during periods less than a week supply is more elastic than demand, the market price determination process would be unstable given some lag in the short-run adjustment of supply to price. Thus, the Exchange, by pegging a price, may reduce a short-run tendency of divergence from equilibrium.

An alternative view is that since there are only a few sellers in the market with different amounts of information concerning market conditions, an oligopolistic interdependence may lead to varying forms of non-competitive equilibria based on conjectural variations, a dominant firm's price-setting power, or the cartel model. Or, market uncertainty may generate price wars and non-price competition and lead to a misallocation of resources and price instability (Wu). Certainly in a market with a homogeneous, perishable commodity of this type, instability seems more likely to occur in the absence of an institution such as the Exchange.
And the cost of stability may not be the existence of prices much above the competitive norm. Wu (p. 70) states, "I suggest that while stable prices are found in conjunction with monopoly power, stable price itself does not necessarily lead to inefficient allocation of resources."

Recent work in the economics of information illustrates the uncertainty faced by firms and the implications of market structure on price determination and dispersion. It turns out that price equilibrium conditions and the informational value of prices depend largely on how information is transmitted and collected (Garbade, et. al.). The costs associated with the collection and analysis of information concerning a market or commodity reflect an expenditure of resources. If prices are widely dispersed in an imperfectly competitive market, buyers of inputs may lose market opportunities if they purchase inputs at higher prices than their competitors. Thus, there may be substantial returns to buyers who incur search costs in such markets. Finally, even fairly competitive markets may still yield significant price dispersion despite relatively available and costless information (Pratt, et. al.).

CONCLUSIONS

The present analysis has focused on providing a structural representation of weekly Florida celery price determination. The results obtained appear consistent with an equilibrium market in which price adjusts to equate supply and demand. For intra-weekly periods some evidence of disequilibria may be found, but this would require the analysis of daily data, some of which is not available.
Prices observed may closely approximate a competitive market's operation despite the fact that the price-setting features of the Exchange seem to suggest a monopoly position. Because the observed prices correspond to a structural model developed from the assumption of a competitive market, an apparent conclusion is that "rational" price setting behavior is manifested by the Exchange. That is, the projections of prices are rational in the sense that unbiased estimates of the actual price arise from information collected and given an interpretation implied by relevant economic theory. For instance, if the Exchange's price forecasts had some systematic bias it would pay either producers or buyers to take advantage of this bias by altering shipping or buying patterns (DeCanio). No evidence of this type of activity was discovered, however.

These findings together indicate that the Exchange provides a valuable information collection and interpretation system which probably yields stable prices at or close to short-run competitive levels and substantially reduces the buyers' search costs.
FOOTNOTES

1. For an overview of the Florida celery industry see Rose.

2. The Florida celery marketing order does limit acreage planted, but on a weekly basis the crop base is considered predetermined.

3. Their model has been extended by Hartley to one where supply is exogenous, and an application to an agricultural market has been presented in Goldfield and Quandt.

4. The importance of unsold celery stocks on price formation is noted by Riggan and Brooke.

5. For a discussion of non-price determinants of demand see Godwin and Manley.

6. Kirman has suggested that imperfectly informed firms may attain "false" equilibria. Salop and Grossman and Stiglitz have both recently discussed some aspects of information and market structure.

7. For example, see Muth or Pashigian.
REFERENCES


Pashigian, B. Peter. "Rational Expectations and the Cobweb Theory.


Economics Report 69, Food and Resource Economics Department, Institute of Food and Agricultural Sciences, University of Florida, May 1975.
