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Citrus Greening and Citrus Tree Planting in Florida[1]

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Introduction

Citrus greening, also known as Huanglongbing (HLB), is a bacterial disease of citrus that until recently was confined to Asia and Africa. In 2005, the disease was first discovered in Florida. Since then it has spread rapidly and now can be found in all Florida counties that contain commercially produced citrus. Today citrus greening represents one of the strongest threats to the citrus industry in Florida, the largest citrus-producing state in the United States. Hodges and Rahmani (2009) estimated that the economic impact of the citrus industry on the economy of Florida in the 2007/08 season was US$8.9 billion.

Citrus greening affects citrus trees by blocking the phloem, or the vascular system of the tree, which limits the tree's ability to take up nutrients. The disease is spread by a small leaf-feeding insect, the Asiatic Citrus Psyllid (ACP). The characteristics of the disease are mottled leaves and small, misshapen fruit. Large fruit drop is associated with the disease, but even if fruit remains on the tree until harvest, the fruit is undersized and contains bitter juice, rendering it of no economic value.

The purpose of this article is to examine the impact of the presence of citrus greening on new tree plantings in the Florida citrus industry. Sweet oranges are by far the most important citrus variety grown in Florida, so the analysis is limited to sweet orange plantings. Because citrus greening impacts citrus producers through reduced yield, increased mortality, and increased cost of production, it is expected that the presence of citrus greening has had an adverse impact on the willingness of growers to invest in new trees.

Citrus Greening, news.wfsu.org.

Modelling the Effect of Citrus Greening

Citrus growers adjust output through investment in new plantings. Past work suggests that grower prices and grove maintenance costs are the primary factors that affect new plantings. The number of new trees planted in the previous period is another factor that should be included. Grove maintenance cost (C_t), compiled by the University of Florida each year, is included as a separate explanatory variable. For a mathematical representation of the statistical model, see Spreen and Baldwin (2013).

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To account for the effect of HLB on new tree plantings, a dummy variable approach is used. This variable (HLB) takes on the value 1 for years 2006/07 and later, and zero otherwise. If the presence of HLB has had an adverse effect on plantings, it is expected that the parameter on this variable will be statistically significant with a negative sign.

Data

For this analysis, the data cover the period extending from the 1989/90 through 2010/11 seasons. The decade of the 1980s saw several freezes in the citrus region of Florida, which spurred a massive replanting and therefore was excluded from this analysis.

Data on new plantings of sweet oranges, disaggregated into early- and mid-season maturing (early-mid) and Valencia (late-season) varieties, are reported by the Florida Agricultural Statistics Service (FASS) and are given in 1,000 trees. Grower (on-tree) prices are also disaggregated into early-mid and Valencia varieties. Grove maintenance costs for Florida citrus are compiled annually by UF/IFAS.

In Figure 1, total orange tree plantings in Florida are shown over the sample period. The high level of plantings in the early 1990s was in response to high grower prices associated with reduced supply of juice oranges after the freezes of the 1980s. As grower prices declined in the latter portion of the 1990s, so did new tree plantings. Hurricanes occurred in the citrus-growing area in both 2004 and 2005. The reduced supply of oranges caused prices to rise, but note the failure of new plantings to respond to higher prices.

Statistical Analysis

The statistical model depicts new plantings in time period t as a function of grower price, new plantings, and grove maintenance cost (obtained from Muraro and associates) in period t-1, as well as a dummy variable that indicates the presence of citrus greening in period t. Disaggregating new plantings into early-mid and Valencia varieties, two separate regression models are estimated, with their explanatory variables corresponding to the specific variety. Preliminary results indicate an insignificant explanatory power of grove maintenance costs and, as a consequence, this variable was removed from the analysis.

Parameter estimates and associated statistics for the model are shown in Table 1. For each model, the inclusion of lagged new plantings and grower prices is seen as highly significant. The positive parameters associated with these variables imply that, everything else being equal, increases

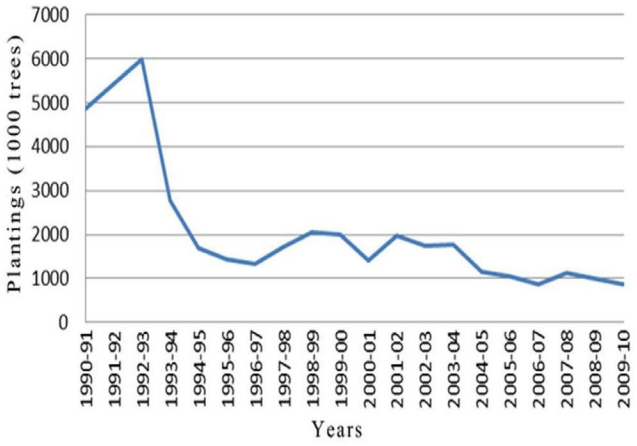

Figure 1. Total Florida orange new tree plantings (1990–2010)

in previous years' planting and prices result in increased new plantings. This is consistent with *a priori* expectations based on previous observations. The dummy variable (HLB) is significant within both early-mid and Valencia models, attaining levels of significance within 95 percent and 90 percent, respectively. The negative sign on the parameter provides evidence in explaining the expected adverse effect of HLB on willingness to invest in new trees.

A striking result of the regression results is the magnitude of the estimated coefficient on the HLB dummy variable in both the early-mid and Valencia new planting equations. The coefficient in the early-mid equation is –779.02, which suggests that, each year, the presence of HLB reduces new plantings of early and mid-maturing varieties by 779,000 trees. In 2011, approximately 550,000 early-mid trees were planted. Therefore, the HLB effect reduced potential new plantings by more than 50 percent. The coefficient of the HLB dummy variable in Valencia equation is –585.16; the estimated number of Valencia new tree plantings in 2011 was approximately 490,000. Again, the effect reduced potential new plantings by more than 50 percent.

Concluding Remarks

Citrus greening is a relatively new disease to the Florida citrus industry. The consequences of citrus greening are higher tree mortality, reduced yields, and higher grove maintenance costs, all of which have negative impacts on grove profitability. A causal examination of new plantings in Florida suggests the presence of HLB has reduced the willingness of Florida growers to invest in new plantings.

Two new tree planting equations were estimated for Florida sweet oranges (early and mid-maturing varieties)

and Valencias using data that spanned the period 1989/90 through 2010/11. To account for the possible impact of citrus greening, a dummy variable approach was used. The estimated coefficients for grower prices and lagged prices were statistically significant and of the correct sign. The estimated coefficient for the citrus greening variable was negative and quite large in magnitude, although it was statistically significant only at the 90 percent level for Valencias.

The large negative coefficient estimated for the HLB dummy variable in both the early-mid and Valencia equations suggests that HLB is having a powerful negative effect on the willingness of growers to invest in new plantings. The existence of this effect has negative ramifications for the industry looking forward.

The results presented herein provide one measure of the adverse impact that HLB is imposing on the Florida citrus industry. The disease also has other dimensions of impact and continues to threaten the future viability of the Florida citrus industry.

References

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Table 1. Regression results for Early-Mid and Valencia new plantings

	Early-Mid	**Valencia**
Constant	–334.8273	–404.2993
	(306.1506)	(298.6336)
Lagged New Plantings	0.6858283***	0.6897042***
	(0.1558799)	*9,111694)
Grower Prices	210.5084**	142.0528**
	(88.61119)	(63.52688)
HLB	–770.092**	–585.1652*
	(365.9027)	(322.3179)
Required	0.6992	0.8329
Adjusted R-squared	0.6390	0.7995
No observations	19	19
Standard errors are reported in parentheses. *, **, *** indicates significance at the 90%, 95%, and 99% levels, respectively.		