



A Healthy Harvest

Research proves that citrus mechanical harvesting can decrease costs while keeping yields high.

By Mongi Zekri (maz@ufl.edu)
and Jim Syvertsen (jmsn@ufl.edu)

To be competitive in an increasingly global marketplace, Florida citrus growers must reduce harvesting costs. Furthermore, immigration issues may force a substantial decrease in the available numbers of workers to harvest citrus. These concerns pushed the Florida Department of Citrus (FDOC) to re-examine the feasibility of mechanical harvesting for citrus. For the last few years, the FDOC and the University of Florida/Institute of Food and Agricultural Sciences (UF/IFAS) have been supporting harvesting research and evaluating several mechanical harvesting machines and abscission chemicals to increase the efficiency of mechanical harvesting.

Research Disproves Reservations

Despite the substantial cost savings of mechanical harvesting relative to conventional hand harvesting, the adoption of mechanical harvesting has been slower than expected. Many factors contribute to the slow acceptance of mechanical harvesting. One factor is the visible damage to the trees that can include breaking of branches, sloughing of trunk bark, exposing root systems, and noticeable leaf, flower, and young fruit drop. Growers worry that these visible signs of physical damage will have negative effects on tree health and future yields. When healthy, well-managed trees are mechanically harvested, there is no scientific evidence that these injuries negatively



Many citrus growers have been slow to accept mechanical harvesting, but research shows that it does not compromise tree longevity.

reduce tree yields or longevity.

For the last five years, several studies have focused on the physiological effects of mechanical harvesting. Short- and long-term physiological measurements revealed that the water use, growth, and yield of healthy, well-managed and well-prepared citrus trees was not negatively affected by mechanical harvesting — even when mechanically harvested annually for several consecutive years. The removal of healthy leaves by mechanical harvesting has no long-term effect on trees, and in some

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The Drought Drags On

The drought situation in Florida keeps getting more serious. We are currently in a La Niña condition, which develops from colder than normal water temperatures in the eastern tropical Pacific Ocean. The Climate Prediction Center expects La Niña to continue through the spring of 2008. The majority of climate models "indicate a moderate-to-strong La Niña through February, followed by a gradual weakening thereafter." La Niñas commonly return every two to seven years.

Warmer Weather

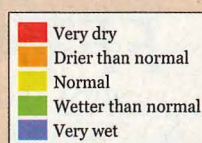
The Southeast Climate Consortium points out that La Niña conditions usually bring warmer weather to the southeastern U.S. From November through March, temperatures usually average 2° to 4°F higher than normal. The warmer temperatures will cause less chill accumulation, and this can affect production of some fruit crops, such as blueberries. For example, from Nov. 1 to Dec. 16, 2007, there were only 14.5 hours near or below 45°F at Lake Alfred in Central Florida.

Reduced Rainfall

In addition to warmer temperatures, La Niña usually brings below-average precipitation to both the southeastern and southwestern U.S. Ironically, La Niña often brings above-average precipitation to the Pacific Northwest, the northern Rockies, Ohio and Tennessee Valleys, and parts of the Great Lakes region. Part of the reason for this is that the jet stream configuration during a La Niña tends to steer winter storms up the Mississippi Valley and Midwest. This leaves the Southeast dry and reduces the impact of winter cold fronts on Florida. For example, ice storms crippled Oklahoma and the Midwest in December 2007,

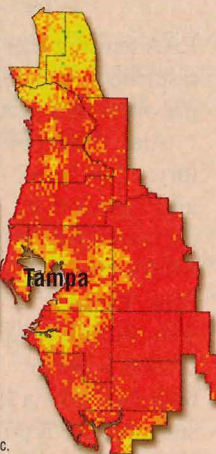
SWFWMD Rainfall Distribution

December 2005 through November 2007



Southwest Florida Water Management District

Data source: OneRain Inc.; Vieux Inc.



while heavy rainfall caused flooding in the Pacific Northwest.

Rainfall in Florida has generally been below average since January 2006. For the two-year period between December 2005 and November 2007, counties in the Southwest Florida Water Management District had a rainfall deficit of more than 20 inches. Lake levels are 1 to 4 feet below where they should be this time of year, and boat traffic between some lakes has stopped because water in the canals is too low.

Serious Situation

This drought may become as serious as the 2000–2001 drought. In January 2008, the U.S. Drought Monitor was showing exceptionally dry conditions in Georgia, Alabama, and the Carolinas. The level of Lake Lanier, one of the main water supplies for Atlanta, fell to record lows in December and is predicted to drop to even lower levels.

One difference between this drought and previous droughts is that some new water sources have been created in Florida. In southeastern Hillsborough County, the C.W. Bill Young Regional Reservoir was built

to increase water supplies. This reservoir was filled to capacity by November 2005, which has made a big difference in supplying water to the Tampa Bay area. The reservoir holds 15 billion gallons, and when full, can supply 25% of the region's needs for more than six months.

Freeze Forecast

Because of the jet stream pattern, the probability of a *severe* freeze during a La Niña winter is less than in neutral years. In fact, none of the past serious freezes in Florida occurred during a La Niña winter. The last serious freeze in Florida was in 1989. Although a serious freeze does not occur every 20 years, over the past 120 years, at least one major freeze has occurred sometime during every 20-year period.

No one knows when the next serious freeze will occur, but the probability increases as time goes on. After a warm March, an historic freeze in April 2007 severely damaged small fruit crops and winegrapes in the Midwest, Carolinas, and Georgia. Florida escaped this freeze, but climate change does not necessarily eliminate the risk of freezes. Although not as severe as the freezes of the 1980s, the recent windy freeze of Jan. 2–3, 2008 reminded us that freezes can still threaten Florida crops.

Dealing With Drought

Florida is now in its dry season, and until the La Niña situation changes, this drought is expected to continue. The Southeast will need to plan on how it will deal with droughts such as this. In the meantime, we can hope that normal rainfall returns sooner rather than later.



WATER WARS

Influence Irrigation

The spring dry season is upon us again, and the National Weather Service predicts that temperatures in Florida will be above normal from now through September. Rainfall in the Southeast is predicted to be at or below normal from March through June or July. The La Niña situation that has dominated our weather pattern since October 2007 is expected to last until May or June 2008. It is the strongest La Niña we have had in eight years. La Niña commonly brings warmer and drier weather to the entire Southeast. The drought this

border is not on the 35th parallel, and Georgia wants the line moved northward to allow access to a part of the Tennessee River. This could potentially allow Georgia to build a water treatment plant on the river and a more than 100-mile-long pipeline to pump several hundred million gallons of water per day to north Georgia and Atlanta.

Restrictions Reduce Water Use

For the first time in its history, the South Florida Water Management District (SFWMD) declared an extreme water shortage that went into effect in January 2008. This directly affects more than five million south Florida people and hundreds of farms. SFWMD instituted the most stringent landscape irrigation restrictions it has ever had to impose. Lawn watering is limited to one day per week. With this Phase III restriction, agricultural users and golf courses must reduce their surface water consumption by 45%. In Martin and St. Lucie counties, water withdrawals will cease if levels in the C-23, C-24, and C-25 canals drop below 14 feet above sea level.

In the Southwest Florida Water Management District (SWFWMD), the rainfall deficit over the past two years is more than 20 inches. In Ft. Pierce, the deficit is more than 40 inches. In January 2007, SWFWMD

implemented lawn-watering restrictions to once per week, and has encouraged skipping a week of irrigation during the cooler months of the winter. It also has promoted and funded a number of projects to create reclaimed water for irrigation.

Effects On Citrus

Also affected is the Valencia orange forecast, which was lowered by two million boxes in February 2008. Some of this reduction is probably due to the drought. Average fruit size is very small and is expected to be lower at harvest than in previous recent seasons. Some fruit drop will also continue.

As most growers know, drought stress in the spring can have a major impact on citrus. Inadequate irrigation can lead to increased young fruit drop, reduced fruit set, and lower yields. Growers need to monitor their irrigation carefully to provide adequate water. Running systems for too long can waste water by forcing it below the main root zone. In the spring, growers should irrigate at 25% to 33% depletion, but can go to a greater depletion level in the fall and winter. During the periods of little or no rain from April through June, microsprinkler irrigation should be run every two to three days for only three to five hours (depending on soil type and root-zone depth).

“...the rainfall deficit over the past two years is more than 20 inches.”

winter continues to be particularly severe in the Carolinas, Georgia, and Alabama. Atlanta has been under extreme drought conditions because of the record low level of Lake Lanier, its main water source.

Border Battle

To show how serious battles over water can become, the Georgia state legislature recently voted unanimously to move the Georgia-Tennessee state line. The border was originally set by the U.S. Congress in 1796 at the 35th parallel. However, when mathematician James Camak surveyed the line in 1818, it was established about 1.1 miles south of the 35th parallel. Modern surveys have verified that the present

FOR MORE

Check the guidelines in “Management of Microsprinkler Systems for Florida Citrus” at <http://edis.ifas.ufl.edu/HS204> for further information. A more detailed irrigation schedule that can be tailored to local sites can be found at: <http://fawn.ifas.ufl.edu/tools/irrigation/citrus/scheduler/>.



Gaining Command Of OJ Demand



By Tom Spreen
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There has been considerable discussion recently regarding concerns that with decreased per capita consumption of orange juice, U.S. orange juice demand is sagging. In fact, some analysts have used this reasoning to suggest why the futures market price has remained below \$1.50 per pound solid even with a less than robust crop forecasted for the 2007–2008 season.

The “law of demand” states that other things being equal, as prices increase, consumption will decrease, then when supplies are plentiful, prices will be relatively low. When supply is short, prices increase in order to

ration off decreased availability, and hence consumption decreases.

Consumption vs. Production

For most agricultural commodities, per capita consumption is measured by dividing total production by population. For a product such as orange juice, which can be stored, an inventory adjustment must also be included. Since actual consumption is not directly observed, per capita consumption figures should more accurately be called “per capita production,” because this is how these numbers are calculated.

Net Effect Of Smaller Citrus Crop

The last three seasons have witnessed significantly smaller orange crops in Florida due to a number of factors. The near-record crop of 242

million boxes in the 2003–2004 season has been followed by three crops at or below 151 million boxes.

After reaching a record of nearly 890 million single-strength-equivalent (SSE) gallons in 2000–2001, consumption as measured by AC Nielsen began to sag. As lower consumption in 2001–2002 through 2003–2004 was not accompanied by a price increase, there is evidence that demand was declining. Research has provided some support that this decline was caused, in part, by the “low-carb” diet craze. By 2004, however, the low-carb diet fad had waned, and demand appeared to stabilize.

Consumption continued to decline in 2005–2006 and again in 2006–2007. These declines, however, were accompanied by substantial price increases with the weighted average retail price of orange juice being \$5.45 per SSE gallon in 2006–2007, a record high.

Bucking A Bad Trend

Retail sales figures increased from 1998–1999 through 2000–2001, peaking at \$3.87 billion. When the effect of the low-carb diet craze was felt in the 2001–2002 through 2003–2004 seasons, sales declined, reaching \$3.56 billion in the 2003–2004 season — a decline of nearly 10% from the peak in 2000–2001. Even though OJ sales as measured by AC Nielsen continued to decline in 2004–2005 and 2005–2006, this figure made a dramatic turnaround in 2006–2007, rising to \$3.68 billion.

Therefore, the story of U.S. orange juice demand over the past nine seasons is not a simple one to tell. Expanding demand at the end of the 20th century was followed by a period of declining demand in 2002 through 2004. The data suggests, however, that this trend has ended. The results for 2006–2007 are encouraging to the industry. **FG**

Tom Spreen is professor and chair of the Food and Resource Economics Department with the University of Florida.

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A Coordinated Attack

Cooperation among neighboring growers is key to grove sprays for psyllid control.

By Michael E. Rogers, Philip A. Stansly, and Lukasz L. Stelinski

Even when using the most effective products available for psyllid control, insect population reductions can be short lived (one to two weeks). This is of special concern because psyllids may be carrying the citrus greening pathogen into a grove not yet infected with the disease. Due to the constant movement of psyllids between groves, cooperation among growers is needed for effective control. Working together to develop a plan for coordinated grove sprays will help to more effectively reduce psyllid populations.

Aerial Application

When planning a coordinated spray involving a number of groves in close proximity, completing the application as quickly as possible is important to minimize psyllid re-colonization from untreated to recently treated areas. Use of aerial applications is the most realistic manner for achieving this goal. Aerial applications can be made using either fixed-wing aircraft or helicopter. In some situations, aerial applications cannot be used due to flight path obstructions or proximity to restricted areas such as bodies of water. In these cases, ground sprays could be used, concurrent with the aerial applications, to treat localized targets.

Picking A Product

Immature psyllid stages are difficult to control due to their inaccessibility, immobility, and the rapid growth of new flush. Thus, broad-spectrum insecticides used for targeting adult



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Top-Notch Tool

In January 2008, the University of Florida/Institute of Food and Agricultural Sciences released the second edition of *Nutrition of Florida Citrus Trees*.

Edited by Drs. Tom Obreza and Kelly Morgan, the publication provides a comprehensive discussion of all aspects of citrus nutrition and fertilization. It maintains the same objective as the first edition, which was "to develop a sound citrus nutrition program that optimizes financial returns while sustaining yields and maintaining soil and water quality." The second edition updates the first edition by incorporating "the findings of numerous citrus nutrition research projects conducted since the mid-1990s."

Starting with an excellent summary of the history of important Florida citrus fertilizer research, the new 96-page bulletin summarizes the development of best management practices (BMPs) and the role of nitrate nitrogen, Florida porous soils, and impacts of fertilizer practices on groundwater quality. Along with up-to-date information, the publication also has excellent color illustrations and photographs. Maps of soil-type locations and pictures of common ridge and flatwoods soils are particularly useful.

The Scoop On Soil

Examples of the wide variety of chapters include one on soil fertility that discusses macro and micronutrients. Relative leachability of the different elements is covered along with the effect of soil pH on nutrient availability. One interesting table shows the amount of various nutrients contained in orange fruit and illustrates nutrients lost with harvesting. For example, 100 boxes (900 pounds) of oranges contain 10.6 to 13.6 pounds of nitrogen (N)

and 13.3 to 17.6 pounds of potassium (K). Effects of different nutrient elements on fruit quality are summarized. A table shows how different elements affect fruit size, color, soluble solids, acid, juice content, peel blemishes, and decay during storage.

Fertilizer Facts

The chapter on recommended fertilizer rates and timing is particularly important. Graphs show the recommended rates of N fertilization for trees of different ages and tree planting density. Another diagram shows the recommended fertilizer rate based on projected fruit yield in boxes or pounds solids per acre. Using these graphs, a grower can determine the recommended rate of N to apply.

A chapter on fertilizer sources and formulations discusses solid and liquid sources, foliar sprays, and controlled-release fertilizers. For organic citrus production, a table shows the amount of N, phosphorus, and K in manures from different animals.

Testing Techniques


A chapter on soil and leaf-tissue testing points out how leaf element concentrations change throughout the year and the best time for leaf

sampling. Optimum, excessive, and deficient levels of various elements are shown. Proper techniques for soil and leaf sampling are covered as well.

Other Useful Info

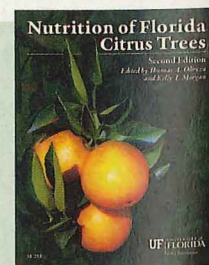
Given the current high price of fertilizer, growers will be interested in the chapter on precision agriculture. Using remote sensing, GIS, GPS, and variable rate application, growers can potentially reduce fertilizer application rates based on tree size. Fertilizer savings can be particularly noticeable in groves that have many young resets or missing trees due to tree removal.

A chapter on special situations discusses particular aspects of sci-ons, rootstocks, calcareous or saline soils, and irrigation with reclaimed water. Fertilizer strategies for wind- or freeze-damaged trees help deal with recovery from environmental stresses.

The appendices are particularly useful. They provide easy-to-read tables showing physical and chemical properties of typical Florida citrus soils, along with nutrient concentrations, solubility, and salt index of different fertilizer materials. Pictures of different macro and microelement deficiencies in the last chapter are very helpful in showing leaf symptoms. 

Get It For Free

This publication is a practical and handy source of information on citrus nutrition all in one thin book. Because publication costs were covered by the Florida Department of Agriculture and Consumer Services, this bulletin can be obtained at no charge. Copies of the publication or a CD can be obtained from citrus county agents. It can also be found on the Web at <http://edis.ifas.ufl.edu/pdf/SS/SS47800.pdf>. *Nutrition of Florida Citrus Trees, Second Edition* is an updated, relevant, and complete source of information that all citrus growers should examine.





Florida's Alternative Fuels

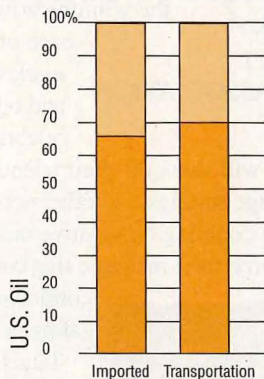
The Florida Department of Agriculture and Consumer Services and others recently sponsored Farm to Fuel Summit in Orlando. Nearly 500 people attended this third annual summit. Charles Conson, Commissioner of Agriculture, has been promoting Florida as a state that has great potential for biomass and bio-fuel production.

Wigs

The importance of this conference was highlighted by the presence of Florida Governor Charlie Crist and USDA Secretary of Agriculture Ed Schafer. Emphasizing the importance of energy and fuel, Governor Crist said that Florida could be a green-energy leader. Secretary Schafer pointed out that the nation's farmers are being seriously impacted by the price of oil, feed, and fertilizer, even though they recently produced record crop exports. He brought up the contention that people who blame the production of ethanol for the increase in the price of food do so unjustly. This point was debated by other speakers later on. He mentioned that the Department of Energy estimated that blending ethanol reduced the price of gasoline by 10¢ to 35¢ per gallon.

Figures From IFAS

Besides speakers from renewable fuel industries, a number of speakers were from the University of Florida/Institute of Food and Agricultural Sciences. Dr. John Erickson from the



We rely on foreign oil for about 65% of domestic supplies and 70% of total U.S. usage is dedicated to transportation.

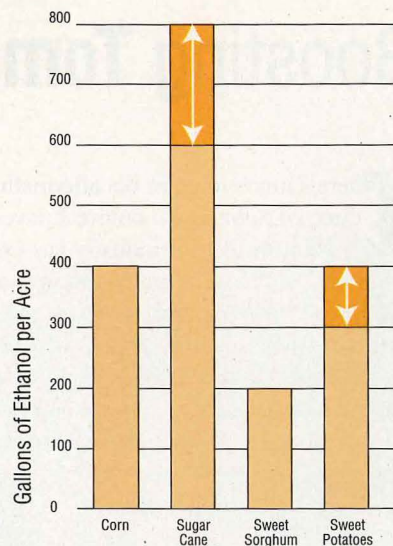
Agronomy Department discussed feedstocks for bioenergy in Florida. He pointed out that the Department of Energy reported that about two-thirds of U.S. oil is imported, and 70% of all U.S. oil is used for transportation. In 2007, the U.S. consumed about 142 billion gallons of gasoline and produced about 6.5 billion gallons of ethanol. Estimates for U.S. ethanol production in 2008 are close to 10 billion gallons. Most ethanol

in the U.S. is currently obtained by fermenting corn, and most ethanol biorefineries are in the upper Midwest. With corn, one can produce about 400 gallons of ethanol per acre. About 20% of the corn harvested recently went to ethanol production.

Potential For Florida

Sugarcane and sweet sorghum are warm-season grasses that are native to tropical and sub-tropical areas and are well adapted to parts of Florida. They could be used as feedstocks for ethanol production, and both of these crops fix carbon. In Florida, sugarcane is grown commercially on about 400,000 acres. Most of it is grown just south of Lake Okeechobee, and cold winter temperatures would limit how far north current cultivars could be successfully grown in Florida. Roughly 600 to 800 gallons of ethanol could be produced per acre from sugarcane in Florida.

In Florida, about 5,000 acres of forage and grain sorghums are grown, but



sweet sorghum is not commercially grown here. Sweet sorghum has been historically grown in the southeastern U.S. for syrup. There is the potential for two crops per year in Florida. About 200 gallons of ethanol per acre would be possible here based on sugar yields from preliminary growth trials in South Florida, but 400 gallons per acre has been reported for some cultivars grown in Texas. University of Florida researchers are continuing to evaluate cultivars and production practices for improved sugar yields here. Florida growers who have lost citrus trees to canker or greening might be interested in growing crops for biofuels, but more refining capacity will be needed.

Other speakers discussed starch, oil crop, and cellulosic feedstocks for bioenergy production. Dr. George Hochmuth pointed out that sweet potato is grown in much of the southeast and could be a potential bioenergy crop. Calculations have shown that 300 to 400 gallons of ethanol per acre could be produced from this crop, making it competitive with sweet sorghum.

There are certainly alternatives to corn for ethanol production that can be grown in Florida. Florida will be a major player in the future of alternative fuels.

FIG



Price Predictions

Lower consumption and larger inventories of OJ may hurt processed prices for the 2008–2009 orange crop.

By Tom Spreen
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On Oct. 10, the Florida Agricultural Statistics Service released its 2008–2009 citrus crop forecast. The forecast was for an orange crop of 166 million boxes to be produced — a crop slightly smaller than the 170 million boxes marketed in 2007–2008, but considerably larger than the 129 million boxes harvested in 2006–2007.

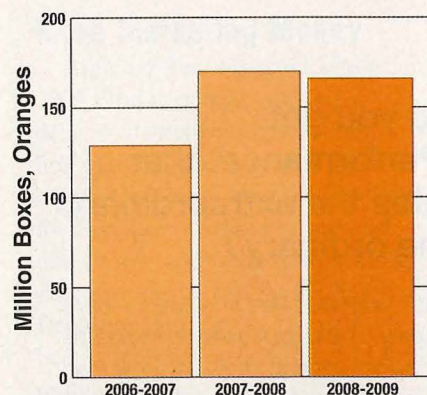
The last two seasons have witnessed a roller coaster ride for processed orange prices with the small crop of 2006–2007 producing record delivered-



in prices of nearly \$2 per pound solid for Valencias. The larger crop in 2007–2008 combined with slower movement at retail resulted in inventory accumulation of FCOJ, and consequently, delivered-in prices declined through most of the 2007–2008 season with the average delivered-in price being \$1.39 per pound solid. Orange juice inventories at the end of the 2007–2008 season totaled nearly 30 weeks of supply. This large inventory, combined with a crop of 166 million boxes, suggests that grower prices will likely be lower (although not dramatically lower) in 2008–2009.

Consumption Assumptions

Let's put the 2008–2009 in perspective by first noting that a crop of this magnitude will produce more than one billion single-strength-equivalent (SSE) gallons of orange juice. While the U.S. orange juice market used to exceed 1.5 billion gallons of consumption, Atkins and other "low-carb" diets followed by higher retail orange juice prices cut estimated U.S. orange juice consumption to 1.089 billion SSE gallons in 2007–2008. The 2008–2009 crop will be almost sufficient to meet U.S. orange juice consumption.

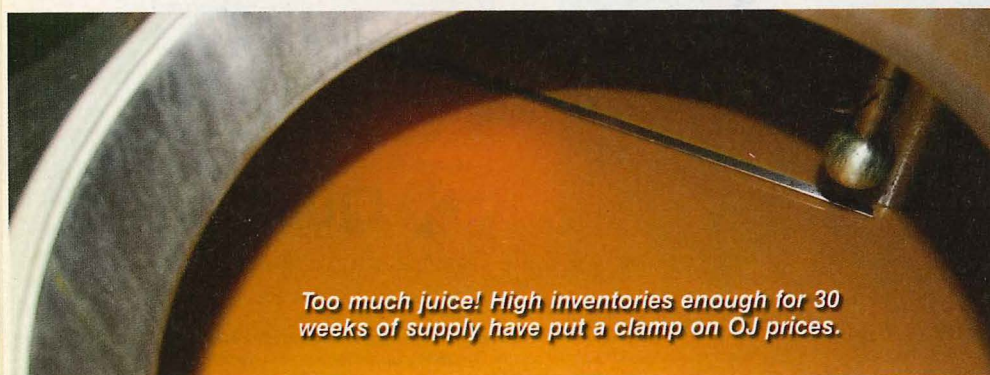


Processed Prices

Florida remains a primary supplier of orange juice to Canada, but the U.S. will import nearly 400 million SSE gallons in 2007–2008 (according to the U.S. Department of Commerce). The Brazilian orange crop is down substantially in 2008–2009, but imports also come from Mexico, Costa Rica, and Belize. All of these figures add up to suggest that grower prices for both early-mid and Valencia oranges sent to the processor will decline in 2008–2009. The Florida Department of Citrus recently released its crop outlook and suggested an average delivered-in price of \$1.20 per pound solid, but this figure includes both cash-market and contract plans. It is likely that the cash market will be lower, and cash prices for early-mid varieties may struggle to average \$1 per pound solid.

Inventory Accumulation

What needs to happen to turn grower prices around? The big culprit in lower grower prices is the large juice inventories. It took just one season of higher production and lower consumption to cause the accumulation of large inventories. The last time the industry faced inventories of this magnitude was after the near-record crop of 2003–2004. It took two years of hurricanes (2004 and 2005) and the exceedingly low crop of 2006–2007 to work off the inventories accumulated by the end of the 2003–2004 season. This author does not want to live through two years of hurricanes again. Without a major weather event, however, it will take a few years to decrease inventories to more favorable levels. So while I remain bullish about prices in the long term, the price outlook for the next few seasons is not favorable. **F9**



Too much juice! High inventories enough for 30 weeks of supply have put a clamp on OJ prices.

Tom Spreen is professor and chair of the Food and Resource Economics Department with the University of Florida.