

When It Froze in Florida: The Challenges That Occur When Farmers and Local Residents Collide

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Spraying fields with water during a severe freeze is a common practice in Florida. In January of 2010 this practice resulted in the development of sinkholes, dry wells, and a call for water restrictions. Gary Parke, a hydroponic farmer, did not experience significant crop damage nor did he draw significant amounts of water from the aquifer to protect his crops. Hydroponic farming is an ancient approach to farming where water instead of soil is used to grow plants and is looked upon as a possible approach to environmentally safer farming that can be used in urban and suburban farming.

INTRODUCTION

Over the past several decades water and water rights have become an issue of growing controversy between farmers and non-farmers as rural land becomes suburbs to large, growing urban areas. Where 50 years ago a square-mile in a rural area may have 5 homes and acres of citrus, strawberries, or tomato fields, today that same square-mile could have 500 homes, parks, recreational centers and even hotels that are intermingled with working fields. Yet it is not just access to water that can be points of controversy. Sometimes it is the aftermath when water is used that creates anger, hardship, and a call for change.

In January 2010 the state of Florida experienced 11 straight days of below freezing weather. This weather impacted agricultural crops throughout the state exacting millions of dollars of damage. In central Florida this damage would've been even more devastating, especially for the regions strawberry producers, had it not been for the continuous spraying of the crops with water from deep water wells. This approach to combating freezing temperatures has been the standard for the past 60 years and has saved millions of dollars of crops. That winter however the approach the farmers used created numerous sinkholes, dry wells, and great animosity between the farmers and the homeowners in the region. This animosity created a call for new regulations regarding water access by farmers as well as a call for a new approach to farming.

The following case considers the challenges facing agriculture as farmers try to cope with the increasing intrusion of urban and suburban areas into what were traditionally agricultural farmlands. We will investigate more fully some of the arguments that were made by the farmers who were damaged as well as look at technology being used in the region that allowed some farmers to protect their crops from the freeze without excessively draining underground aquifers. Technology that was developed 5000 years

ago that when used today can create new approaches to farming, new and profitable markets for produce and vegetables, and peaceful co-existence between farmers, homeowners, and businesses.

THE FLORIDA FREEZE OF 2010 AND ITS AFTERMATH

On January 3 of 2010 a cold front settled into Plant City, Florida. Overnight lows were projected to be below freezing and in response to this projection strawberry farmers in the region began spraying their fields to protect their crops. This water was drawn from deep wells that were connected to the primary aquifer that provided water to farmers, homeowners and businesses in the Plant City area. This approach to freeze mitigation has been common practice in Plant City and throughout Florida for over 60 years so there was little concern when the sprayers came on. Over the course of the next 11 nights the temperature continued to drop below freezing and the farmers continued to spray their fields. In spite of the spraying most farmers experienced significant damage to their crops. Yet the biggest challenges that the farmers faced were in many instances not caused by the cold weather but rather by their continuous use of the underground water aquifer to spray their fields. As the cold spell continued sinkholes started to appear in fields, in county roads, and under homes in and around Plant City.

Sinkholes

Sinkholes are ground-surface depressions that result when a subterranean void weakens support of the overlying earth (InterNACHI website). In Florida these depressions were caused due to a rapid depletion of aquifers that could not be replenished through groundwater seepage quickly enough to prevent the collapse of limestone underground structures. Over the course of the eleven-day freeze 140 sinkholes were reported in the region. In addition to the sinkholes there were also over 750 complaints regarding dried-up or damaged residential wells (Jackson, J., 2012). Even as the sinkholes appeared the farmers continued to spray their fields drawing down millions of gallons more of water from the aquifer each night and raising the frustration and anger of their neighbors.

“My home is being consumed by a sinkhole!” one resident in the region told a news reporter, “You can talk about the weather, the aquifer, the farmers, wells, and people’s homes, but it all comes down to a need to restrict water usage” another said (Newman, G., 2010). The farmers were accused of being insensitive to the homeowners. They saw the damage caused by their pumping and still they continued pumping water night after night. Calls for water restriction and alternate water use permits on the farmers soon resounded throughout the region.

The farmers respond by saying that they were willing to repair any damage that they may have caused but it was their belief that the damage was not caused solely by their farming (A. Monroe, personal communication October, 2010). The farmers felt that the change in land use that had occurred over the past several decades was the cause. It was not that long ago when farmers and their farms coexisted with only a few homeowners. In those days they said when cold weather settled over the region spraying the fields rarely caused residential wells to go dry or sinkholes to appear.

The farmers also pointed out that even though it seemed to be excessive the water they used for those 11 nights was actually significantly less than the water they use in late summer when they start to plant their fields, an activity that normally causes little or no damage or sinkholes in the region. It was the farmer’s belief that they were being held solely accountable for what they felt was a combination of their need to access water to protect their crops as well as the high-density housing developments in the area that became much more active in wintertime due to seasonal residents as well as the increased tourism in the area. Combined all of these factors contributed to excessive water use in the region that was then exacerbated during those 11 nights (A. Monroe, personal communication October, 2010).

The farmers noted that they were already responsible for repairing any dry or damaged residential wells that may have been impacted by their actions even though they had been working the land long before these new homes arrived. For some farmers these were significant costs above and beyond what was lost due to frozen crops and freeze damage on their own property. They also wanted people to

remember that their farms provided an economic and a societal benefit to the region even as they are being vilified for trying to protect their livelihood.

After the Freeze

However the repercussions of those 11 days continues to reverberate throughout the state. After that winter freeze the insurance industry asked the Florida Legislature to limit the liability on property damage claims related to sinkholes, while county environmental protection agencies continued to warn that current practices and the states doctrine of sovereign immunity were making sinkholes an even more frequent occurrence to the detriment of the state's economy as well as to public safety. In response to the issue of sinkholes that were occurring in 2012 in Alachua County Chris Bird, the counties EPA Director stated, "Even though it is related to the drought, it's really over-pumping of the aquifer that is making matters worse and making conditions such that we're more likely to have sinkholes" (Gainesville Sun, 2012). As Ted Campbell, executive director of the Florida Strawberry Growers Association said during the freeze, "we really don't want to shrink the industry, yet we want to protect any collateral damage that may occur. So the answer is (to) find alternative freeze mitigation, not to restrict annual use permits, and put farms out of business." (Newborn, S., 2010).

Even before the freeze one farmer in the region had begun to look at new technologies in order to produce a strawberry crop. He took as his inspiration how the ancient Babylonians created their "Hanging Gardens" and how the Aztec's fed their population in their capital city of Tenochtitlan, a city that at that time was twice the size of the largest cities in Europe. The Babylonians and the Aztecs did this by using hydroponic farming methods to grow their crops and this is what Gary Parke of Parke Family HydroFarms had been doing since January 2005.

Parke Family HydroFarms

Strawberry farming in Plant City, Florida has been part of the Parke family heritage for well over 50 years. R. E. (Roy) Parke, the largest strawberry farmer in the state, was a farmer who immigrated to Pennsylvania from Northern Ireland in 1924. He and his family moved to Plant City, Florida in 1956 and started their first farm on 10 acres. Ironically it was Roy Parke that first used his sprinkler irrigation system during a freeze to protect the crops from damage and established the standard that is used for freeze mitigation throughout the state (The Grower, 2008).

The legacy of farming in the Parke family has been passed down from father to son and daughter. Today in the region several Parke family members own strawberry farms or are active members of the Strawberry Farmers Association. They look to promote farming and the value that farming has to the region whenever the opportunity presents itself. Most of their farms are traditional farming operations that require large plots of land. Gary Parke, however, decided to try something different in his approach and began a hydroponics farm.

HYDROPONIC FARMING

While hydroponic farming is extremely old, the modern use of this technology is fairly recent. The central difference between hydroponic farming and traditional farming is that hydroponic farming suspends plants in a water-based solution rather than in soil. The solution allows for moisture and nutrients to be fed directly to root systems rather than having it seep through inches of soil. This approach is not only more efficient it is also more environmentally friendly as fertilizer and other chemicals are applied in appropriate quantities directly to root systems rather than spread on the topsoil and then filtered to the roots, and the environment, through the use of heavy irrigation.

The effects of hydroponic farming on water usage are significant. Parke says that each of his strawberry plants requires 4.8 ounces of water daily compared to 250 ounces of water daily that is required for his neighbor's field grown plants (Parsons, V., 2007). As Parke said, "traditional farms probably use more water in half an hour than I use in two weeks". Yields are also much higher according to Parke where an acre of strawberries planted in hydroponic towers is equivalent to 6 acres of field

grown plants (Behnken, S., 2010). Yet to acquire these advantages requires a significant upfront investment.

When Gary Parke established his hydroponic farm his family and neighbors questioned his decision to invest the amount of money that he invested to prepare such a small amount of acreage. According to Ted Campbell a hydroponic farm may cost as much as \$60,000 an acre to prepare (Behnken, S. 2010). A similar investment in a traditional farm would have prepared 5 to 10 times the acreage. Parke had to drill deeper wells, and he had to use a complex array of plastic, PVC piping, and plant towers in order to support his crop. In spite of the costs Parke believed that this approach to farming was superior to traditional farming methods. His reasoning was that this approach not only produced healthier crops, it was also a safer way to farm.

Hydroponic Farming – A Safer Food Source

In all types of farming providing plants with water and nutrients represents the greatest, and most expensive, challenge. At Parke Hydrofarm Gary Parke provides nutrients directly to root systems, which unlike traditional and organic farmers, insures that leaves and produce are not contaminated with fertilizer being left on the plant. “Hydroponics is a safer food source; it's a more controlled food source. Do you remember salmonella? Unfortunately, it killed two folks – the spinach scare a few years ago? Well, what happened was that a farmer or farmers were broadcasting their fertilizer. They were fertilizing their fields like all farmers do. You spread out the manure and then you turn on the water. For example, if you were out in the middle of the field it would land on your chest and everywhere. You turn the water on to get it to go off your chest and go into the ground where you want it to go. For whatever reason, they (*the farmers of the contaminated spinach – authors*) didn't leave the water on long enough. Maybe the sprinkler in a section of the field wasn't turning properly or something and the salmonella dried, the manure dried, on the spinach leaf. And when it's dried we cannot see it, so it's harvested and sold and unfortunately people die. Hydroponically I feed everything to the root system. What happened to the spinach is called feeding foliarly (*applying an application to the leaf of the plant - authors*). You put it out everywhere and then you use your watering system to put it into the ground. I don't leave anything on the leaf so it's never a problem” (A. Monroe, personal communication October, 2010).

Hydroponic Farming – Public Health and Safety

It was this concern for safety that was one of the main appeals for Parke when he started his hydroponic farm. Not just food source safety for the consumer but also work-place safety for himself. Parke decided to go into hydroponic farming because “I didn't want to use insecticides and pesticides because I will be exposed to it. The fringe benefit of my customers getting pesticide free produce is that I'm not getting exposure. I was a pallbearer in my 20s for a farmer who was 46. I am now 47. Guy never smoked or drank and I am burying him because he was exposed to the pesticides he was using every day” (A. Monroe, personal communication October, 2010).

Chronic exposure to pesticides and chemical fertilizers have come to be consider as a risk factor for certain neurodegenerative diseases and certain types of cancers for farmers and other members of the farming community. When the National Cancer Institute conducted its Agriculture Health Study they found that people in the farming community have lower death rates than the general population for chronic diseases such as coronary heart disease as well as for lung, esophagus, bladder and colon cancer. Researchers felt that this reduced risk was due to a general healthier life style that included lower smoking rates, a more physically active lifestyle, and dietary factors.

However, these same individuals were also found to have higher incidence rates for leukemia, non-Hodgkin's lymphoma, multiple myeloma and soft tissue sarcoma as well as for cancers of the skin, lip, stomach, brain, and prostate (National Cancer Institute, 2011). Other research conducted by the National Institute for Neurological Disorders and Stroke (NINDS) found that chronic exposure to pesticides appeared to also be a risk factor of certain neuro-degenerative diseases such as Parkinson's Disease (Petrovitch, H., Ross, G.W., Abbott, R., Sanderson, W.T., Sharp, D., Tanner, C.M., Masaki, K., Blanchette, P.L., Popper, J.S., Foley, D., Launer, L., White, L.R., 2002). The complex nature of these and

other environmental exposures has made it hard as yet to determine the magnitude of the risk that chronic exposure of chemical fertilizers and pesticides poses to the farming community or the general public. One thing is clear however, these studies have shown that a health risk does exist that is related to these exposures and that the overall potential impact to the general public health will grow as farming and non-farming populations continue to merge together.

Hydroponic Farming – Crop Yields and Obstacles

In addition to providing crops that are pesticide and fertilizer free, as well as less water intensive, Parke has the additional advantage of getting greater crop yields on fewer acres of land. He grows 54,000 plants on a half-acre of land, a number of plants that would require 3 acres or more of traditional farming (Behnken, 2010). His yields are also increased per plant, “Instead of getting one pound per plant, you’ll get between three and four pounds per plant,” Parke said (Parsons, V., 2007). The lower supply requirements as well as increased yields drives the total costs for the life of the plant to about a tenth of the cost of a traditionally farmed plant. According to Parke to generate the same amount of income using traditional farming you would need several times the amount of acreage.

Yet Parke does face obstacles with his approach to farming. In addition to the large upfront costs his hydroponic system is not considered in Florida to be irrigation and for that reason his water use is taxed “I went ahead and spent a lot of money and jumped to the front of the pack. Everything that you and I walked through (*Parke’s hydroponic fields – authors*) to get over here by law, by definition is irrigation. No irrigation in the State of Florida is taxed except for mine. We are trying to get some laws – why do I have to fight or go to Tallahassee, go to my county to get some laws changed? Why do I have to change anything? (*Water use for hydroponic farming – authors*)... that's irrigation. We have a law. It's non-taxable. Why am I getting taxed?” Finally since Parke uses refined nutrients in feeding his plants instead of unrefined nutrients such as manure and since he does not plant in soil his produce cannot be called “organic” under Florida statute (A. Monroe, personal communication October, 2010).

Hydroponic Farming – The Advantages of Small Scale

Even with these challenges Parke feels that his approach to farming is safer, more environmentally and community friendly and most importantly, can reduce the risk of farming. This was clearly demonstrated during the Florida freeze of 2010. While some farms lost up to 25% of their crops even with water spraying Parke lost less than 10%. This was due to the fact that, because of his smaller acreage and more compact planting he was able to use plant coverings instead of spraying. If his coverings were not sufficient he used misters instead of spray to provide added protection. His advantage is due to his scale. “All the alternatives – covers, foam, high tunnels, chemical applications – have all been tried.” Ted Campbell says, “Some work fairly well on a small scale but are hard to manage on a large, commercial scale. The physical ability to cover 8,000 acres of strawberries on a regular basis is overwhelming” (Behnken, S., 2010). Parke himself says that if the 54,000 plants he has on his half acre were spread out over several acres then he would not be able to use coverings, “Where do you store 30 acres worth of covering”. Yet what Parke has done describes a different approach to farming that, as we move into the 21st century needs to be carefully considered as an alternative to traditional ways to grow food.

FARMING IN THE 21ST CENTURY

Farming in Urban/Suburban Areas

Migration of populations into urban areas has been a consistent phenomenon for decades. A natural outcome of this migration has been the expansion of urban and suburban residential and business centers into traditionally agricultural areas. Over the past several years however a reverse trend of moving farming operations into urban areas have been in the making. Perhaps no plans are as ambitious as those of Hantz Farms in Detroit, Michigan.

Hantz Farms and Detroit, Michigan

Hantz Farms has proposed to the city council of Detroit, Michigan that they be allowed to acquire inner city acreage for large scale farming operations. Hantz believes that the introduction of traditional farming into abandon land sites would not only provide the region with locally grown food but also generate jobs and tax revenue from previously under-utilized or abandoned property. Originally proposing traditional crops Hantz has worked with the city and over the past four years has revised their plans due to concerns regarding pests and pesticide exposure. Today Hantz Farms proposes that the inner-city acreage would be better suited for tree farms that would become orchard's or timber though even these revised plans are being meet with resistance (Berman, L., 2012; Berggren, M., 2012).

The public concerns regarding food quality, environmental and public health damage due to excessive pesticide and fertilizer run-off, and access to water exacerbates how urban and suburban residents interact with farmers. Other concerns include turning over large tracts of land that could be dedicated to providing better housing for the poor. On the other hand, there also has been an increase in market opportunities as consumers have become more concerned with how, and where, their food is grown.

Public Support for Locally Grown Foods

Other concerns notwithstanding, there is growing support of regional farming. Local residents and businesses view regional farming as a way to promote small sized farmers, their community, and as a way to acquire fresher vegetables and produce. The desire for organically grown food, or perhaps more appropriately pesticide free food, continues to be an increasing market opportunity for farmers and restaurants. Finally direct to consumer marketing either through the use of "farmer's markets" or "u-pick" harvesting continues to gain in popularity as consumers continue to move closer to producers or vice-versa. The challenge remains on how can you economically meet these changing market desires and still achieve efficient scale with a smaller environmental and land use footprint.

The Hydroponic Solution

Hydroponic farming offers many opportunities to serve smaller communities with locally owned farms that require smaller acreage, smaller water requirements, and minimal or no potential for run-off contamination. These farms can be as small as a half acre and, because of high production capacity, can be financially viable in an inner-city setting. Unlike Hantz Farm, which is considering the acquisition of up to 10,000 acres in urban Detroit for the world's largest farming operation, hydroponic farming can provide many of the same advantages to the local community while using significantly less land and water resources. They can be designed as micro-farms, providing fresh produce and vegetables to consumers that do not have access to reliable transportation and therefore need to be have food providers within walking distance, as well as entrepreneurial opportunities for the small farmer. In addition to smaller physical size, yields can be such that urban farming using hydroponic technology could generate sustainable revenues and not be at risk of being displaced when economic growth places a higher premium on inner city land.

There are challenges of course to this approach to farming. Initial investment is substantial, though less when one considers the additional necessary infrastructure (i.e. tractors, irrigation, storage, labor) that is need for large scale farming operations. There are also government grants and support to help establish the infrastructure to begin hydroponic farming operations. Tax policy, especially at the state level, must be reviewed and, if necessary, reconsidered to provide hydroponic farming with the same water use benefits that are currently provided to traditional farmers. Given the potential environmental, social, and economic benefits that these farms can provide tax policy may even need to be modified to support the creation of larger numbers of small-scale hydroponic farms, especially in urban and sub-urban areas. Finally the general public must come to accept the delivery of refined nutrients to the plant as clean, safe, and equivalent to organic farming and therefore warranting an "organic" or equivalent certification. This will allow hydroponically grown fruits and vegetables to have the same value added and price benefits as organically grown food.

“It’s kind of cheating, but it works.” Parke says, “People talk about what hard work farming is, or how back-breaking it is to pick berries, and I just smile” (Parsons, V. 2007). Gary Parke’s approach to farming addresses a number of the growing concerns that the general public has regarding how we can grow safe food in an environmentally friendly manner. It addresses how farmers and non-farmers can live next door to each other and not feel that they must compete for the most basic of resources such as water, or worry that their homes will sink into a hole in the ground, or that their children will be chronically exposed to pesticides or fertilizers. It addresses how the small farmer can survive and how the local community can access the freshest fruits and vegetables for their restaurants and their homes. Most importantly it addresses how farming can again become part of a local community and appreciated as a good neighbor. As Parke says, “The more you look at it, it’s a safer, more nutritional way, and the ground gets some rest” (Gulfport Patch, 2011).

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