# Vegetarian Newsletter

**A Horticultural Sciences Department Extension Publication on Vegetable and Fruit Crops**

**Eat your Veggies!!!!!**

**Issue No. 554 February 2010**

# Growers Utilize Weather Data and Blueberry Bud Development Stage to Save Water and Money

**By: Gary K. England, Sumter County Extension, Bushnell, Florida**

Florida blueberry growers continue to realize significant profit when they market their crop partly due to the fact that the harvest from the state has very little competition from other production regions within the United States or in other countries. The cultivars of southern highbush blueberries, predominately released from the UF breeding program that has been headed by Dr. Paul Lyrene, have enabled growers in the state to produce this valuable crop during their unique "harvest window" that begins in late March and runs until significant volume from production areas to the north ends the commercial harvest usually in early to mid May. One downside to producing blueberries in this time frame is the challenge of overcoming freezing temperatures that often occur during the blueberry flower and fruit development period. For this reason, freeze protection of some kind is necessary to consistently produce commercial blueberry crops in most Florida production regions. The most common method for accomplishing this is overhead irrigation systems that protect the crop by coating it with ice, thus maintaining the buds, developing flowers and fruit at a temperature of 32° F.

Overhead irrigation for freeze protection is effective but has some negative factors. The potential breakage of blueberry limbs by excessive ice buildup, the use of copious amounts of water are (to provide the 0.25 ac/inches of water per acre each hour that is common in many systems), the associated cost of pumping these volumes and the fact that failure of the system for even a relatively short period of time during the freeze protection event could lead to a complete crop loss from plant tissue temperatures plummeting due to evaporative cooling. For these reasons, overhead irrigation for freeze protection should only be used when absolutely necessary.

As blueberry buds develop, the temperature that could harm them increases as the temperature drops below 20° F when floral buds are tight (Stage 1) to just below freezing when fruit is set on the plant (Stage 7). If growers utilize tools such as the Florida Automated Weather Network (FAWN) and its "Cold Protection Toolbox", other forecast sources such as "Weather Watch" and weather measuring instruments such as appropriately placed and maintained orchard

thermometers and hand held units such as Kestrels®, they will be able to determine if freeze protection of the their crop is necessary. If a grower knows that the stage their crop is at can withstand temperatures in the high teens and the low for the night will be 25° F, there will be no need for freeze protection. In the EDIS document "Protecting Blueberries from Freezes in Florida" (HS 968) many concepts of freeze protection are covered, including a chart that compares precipitation rate of the irrigation/freeze protection system, temperature and wind speed to determine if the system should be operated. There may be situations when critical temperatures will be met but running the system may subject the crop to additional damage because the precipitation rate is not sufficient to overcome evaporative cooling related to very high winds during the night.

Extension programs such as "Winter Weather School" have increased the knowledge of blueberry growers and other producers in west central Florida about the importance of utilizing forecasts and weather conditions compared to their crop stage to help them make decisions on whether to utilize freeze protection or not. During the freezes this year, a majority of the growers did no freeze protection as temperatures generally stayed significantly above critical temperatures for the stage of development of the blueberry crop.

To demonstrate the potential water and application cost on an acre of blueberries, I will utilize 2009 FAWN data from the Brooksville station and compare it to approximate blueberry growth stage in the region last season during some of the significant freeze events. The comparison will be running during freezing conditions versus only running when critical temperatures were approached. Significant freezes started on January 17, 21 and 31; February 4 and 21 when there was a total of 104 hours below freezing. During this time there were 57 hours when freeze protection was necessary to protect a vulnerable blueberry growth stage. Assuming a precipitation rate of 0.25 inches of water per hour, 6,788 gallons of water are applied to an acre during each hour of freeze protection. The remaining 47 hours did not need freeze protection even though temperatures were sub-freezing. This represents a savings of 319,036 gallons (11.7 acre inches) of water and $392.65 (Parvin and Walden 1999) to operate the irrigation system per acre.

A properly managed and maintained overhead freeze protection system can protect a blueberry crop from freeze while saving money and a precious natural resource. This is an important consideration in this era of rising production costs, potential reduction in profit margins and ever dwindling water supply.

**References:**

Lyrene, P.M. and J.G. Williamson. 2004. Protecting Blueberries from Freezes in Florida. UF Coop Ext. Serv. Fact Sheet. HS968, 8 pp. http://edis.ifas.ufl.edu/hs216.

D.W. and W.C. Walden. 1999. Estimated Costs and Returns of Strawberries in South Mississippi, 1997. Mississippi Agricultural and Forestry Experiment Station Bulletin 1081. http://msucares.com/pubs/bulletins/b1081.htm.

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# UF/IFAS Potato Fertilizer Trials, Spring 2010

**By: Stewart Swanson, Senior Engineer, Indian River Research and Education Center, Ft. Pierce, Florida**

IFAS fertilizer recommendations for potato production in Florida were originally developed as a guideline for producers to use conjointly with their experience and knowledge of variations in soil types, production methods, application timing and selected cultivars. With the advent of the Best Management Practices program for vegetables IFAS recommendations have taken on a regulatory demeanor.

The current IFAS recommended rate of nitrogen (N) for potatoes is 200 lbs/ac. A supplemental application of nitrogen at the rate of 30 lb/ac can be applied after a leaching rain event, which is defined as at least three inches of rain in three days or four inches in seven days, or when petiole sap tests fall below the sufficiency range.

There is no demonstrable data to support the 200 lb/ac recommendation. Demonstration plots over the years in the Tri-County Agricultural Area (TCAA) have shown a wide variance of response to nitrogen rates depending on the concentration of sand in a particular soil, individual growing practices, and the variation in weather conditions from year to year and whether the varieties being grown were table-stock or chip-stock.

Between 1988 and 1993 twenty five demonstrations were conducted in the TCAA. These demonstrations contained 140 different fertilizer regimes with nitrogen rates ranging from 150 to 360 lbs/ac.

**Table 1.** Nitrogen Rate (Lbs/ac) Resulting in the Highest Yield. (Hochmuth et al. 1993).

| Year | Putnam | Flagler | St. Johns | Arec |
|---|---|---|---|---|
| 1988 | 360 | 215 | 240 | 300 |
| 1989 | 150 | 225 | 150 | 150 |
| 1990 | 255 | 150 | 225 | 225 |
| 1991 | 255 | 150 | 255 | 255 |

Yields in these demonstrations ranged from 75 to 474 cwt/ac. There was not a high correlation between nitrogen rates and yield. In some years and trials, nitrogen rates over 200 lbs/ac produced the highest yields. On other farms or in other years, rates lower than the IFAS recommendation yielded as well as or better than the higher rates (Table 1). The wide variation of results points out the need for well designed randomized and replicated research trials.

The nitrogen requirement for insuring optimal yields has proven difficult to determine. Cover crops grown on 100% of the potato acreage in the TCAA and then incorporated in to the soil prior to planting initially act as a sink for nitrogen and then depending on temperature, moisture and rate of decomposition have the potential to provide a nitrogen source later on in the growing season (Fig. 1).

**Figure 1.** Cover Crop Bedded Up Prior to Potato Planting. Photo: S. Swanson.

Fertilizer management is complicated further because supplemental applications are limited to a one month window between emergence and canopy closure (Fig 2.). The need for supplemental nitrogen applications permitted by the BMP manual after a leaching rain event may fall outside of this window.

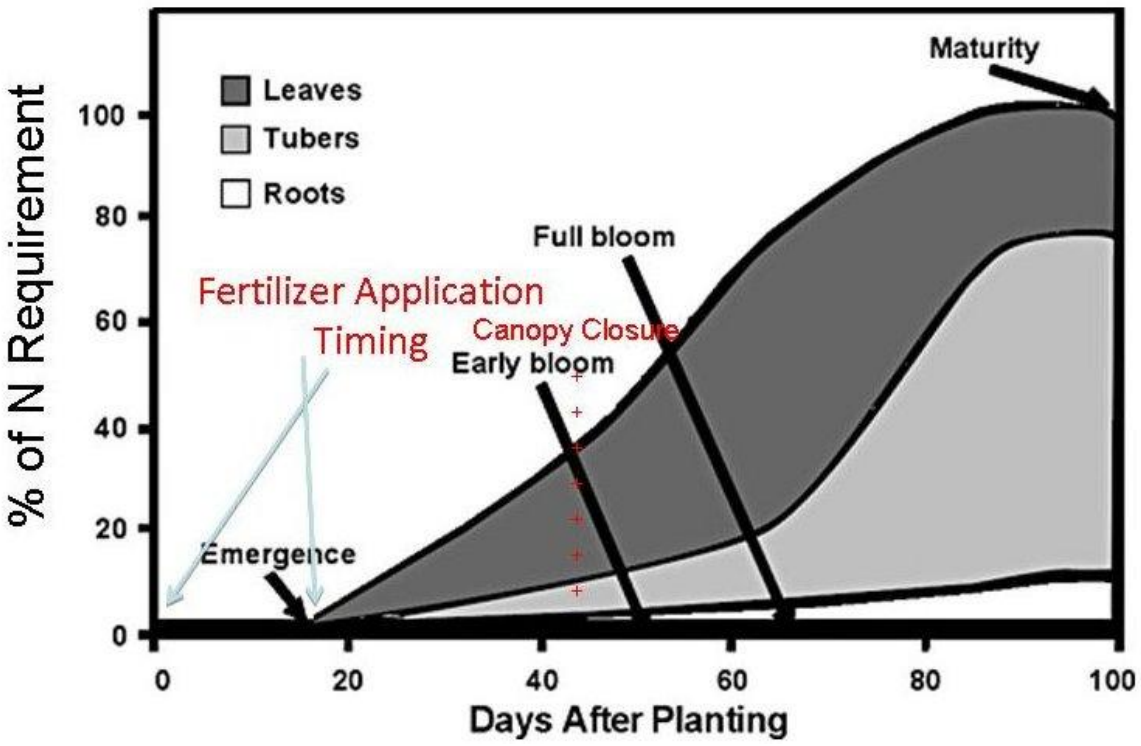


**Figure 2.** Nitrogen Uptake by Potato. Figure adapted from www.ext.vt.edu.

Fertilizer timing is critical because the majority of the crop's nitrogen uptake occurs after canopy closure (Fig 2.). Most growers put out fertilizer in split applications: at fumigation and again at emergence. Nitrogen requirements are also confounded by the varieties grown as most table-stock varieties take 80 to 95 days to maturity while chip-stock varieties can take 100 to 120 days.

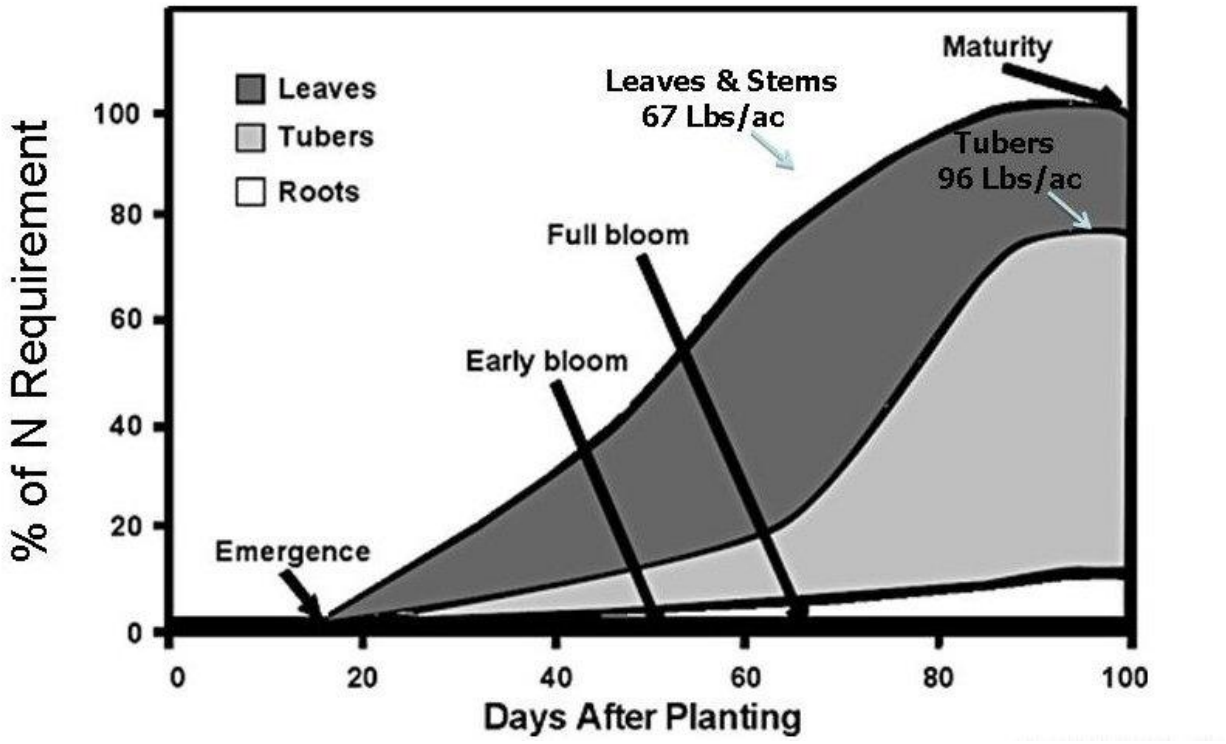


**Figure 3.** Recovery of Nitrogen from Potato Plants & Tubers. Figure adapted from www.ext.vt.edu.

In trials in 2009 a total of 163 lbs of nitrogen per acre were recovered from leaves stems and tubers. It was not possible to recover the nitrogen contained in the roots but there was a residual in the soil of 25 lbs/ac. The N in the tubers (96 lbs/ac) was measured at harvest (Fig. 3). The N in the leaves and stems (67 lbs/ac) was measured well before harvest and the possibility exists that even more N is taken up by these plant parts as the plants mature (Fig. 3) ( Z. Chen, 2009, unpublished data).

There are many costs associated with growing a crop from land preparation through harvesting and marketing. There is often a negative economic pressure to risking lower yields through under fertilization.

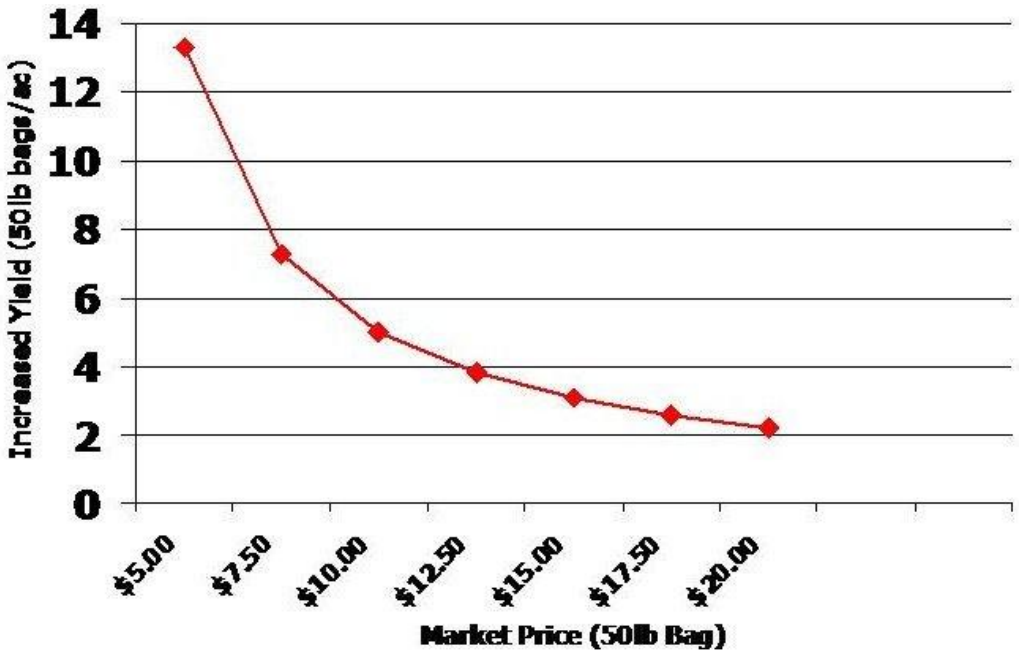


**Figure 4.** Potato yield needed to recover expenses incurred from an increase of N Fertilizer from 200 to 300 lbs./ac.

The above chart demonstrates that it takes very little increased yield to recoup the costs for a significant increase in the use of nitrogen fertilizer (Fig. 4) (S. Swanson, 2009 unpublished). If 50 lb bags of potatoes are selling for $13.75 it only takes a yield increase of 4 bags per acre to pay for the additional 100 lbs of N fertilizer applied.

Excessive nitrogen fertilization is a significant concern in the effort to protect surface and ground water resources. In an increasing regulatory environment, vegetable growers need fertilizer recommendations that they can be confident in and which make allowances for the monetary risk involved in producing a crop. To address these issues the University of Florida/IFAS is conducting nitrogen rate and timing trials this spring on two varieties of potatoes at six locations in the TCAA (Table 2). These large scale replicated trials are being conducted in growers' fields and subject to commercial production practices.

**Table 2.** Potato Nitrogen Rate and Timing Trials for Spring 2010 (lbs/ac N).

| Treatment | Pre-plant | Emergence | 6-8" Stage | Total |
|---|---|---|---|---|
| 1 | 50 | 0 | 50 | 100 |
| 2 | 50 | 0 | 100 | 150 |
| 3 | 50 | 50 | 50 | 150 |
| 4 | 50 | 50 | 100 | 200 |
| 5 | 50 | 100 | 50 | 200 |
| 6 | 50 | 100 | 100 | 250 |
| 7 | 50 | 150 | 50 | 250 |
| 8 | 50 | 150 | 100 | 300 |

Controlled release fertilizers (CRF) offer the potential to address the risk of a leaching rainfall event after canopy closure and the potato crop's high nitrogen requirement as it nears maturity. IFAS has conducted trials on potatoes with controlled release nitrogen but the results have proven inconsistent. There is much work that needs to be done on comparing different CRF products to conventional nitrogen fertilizers before they can be deemed to be a viable alternative best management practice. These types of trials will be costly and there is currently no funding for this work. In addition, CRFs are expensive and an economic analysis is needed to evaluate the effect on production costs.

The implementation of agricultural Best Management Practices (BMPs) is an essential tool in the protection of Florida's surface and ground water resources. The prevention of over fertilization of agricultural crops is a key component in preventing resource degradation. The rates of fertilizer used by growers must be adequate to insure yields consistent with a profitable enterprise and must take in to consideration variations in field and climatic conditions. BMPs by definition must be based on sound science and the potato fertility trials being implemented by IFAS this spring in the TCAA are designed to address these various issues.

**Reference**

Hochmuth, G.J., E. Hanlon, G. Kidder, S. Hensel, W. Tilton, J. Dilbeck, and D. Schrader. 1993. Fertilization Demonstrations for the Tri-County Potato Production Area of Northeast Florida. Proc. Fla. State Hort. Soc. 106: 190-198.

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