

## **NITROGEN BEST MANAGEMENT PRACTICES (BMPs) FOR FLORIDA RIDGE CITRUS**

**7-23-02**

### ***PURPOSE***

The following BMP reflects reasonable agronomic nitrogen (N) rates for a calendar year, fertilizer application methods, and irrigation management strategies for citrus grown on permeable, better drained sandy soils typical of Florida's central ridge. The purpose of the BMP is to minimize the risk of leaching nitrates from fertilizers to ground water. This can be accomplished by increasing the frequency of fertilizer applications, by scheduling fertilizer applications to avoid periods of excessive rainfall (rainy season), by properly managing irrigation inputs, and by recognizing the need for variable application rates in bearing blocks with significant resets and/or skips (15 % or more).

Recommended rates are derived from interpretation of the many scientific studies completed to date integrated with the economic constraints defined by growers. However, additional research and demonstration projects regarding the management of nitrogen fertilizers and irrigation need to be conducted to better define the nutritional requirements for specific levels of production and the corresponding impacts on ground water. This BMP is a dynamic document and recommended practices may be modified as additional research is conducted and/or economic conditions change.

### ***NITROGEN SOURCES***

Available nitrogen from all sources including dry granular, controlled release, suspension, solution, manure, compost, sludge and municipal effluent, applied to the grove must be included in calculating pounds of N per year. For the purposes of this BMP, the contribution of available nitrogen from purely natural organic sources shall be 70 percent of the total nitrogen content of the source during the year of application. The requirements in Sections A through C below also apply when nitrogen from purely natural organic sources is being utilized. The total nitrogen content of the natural organic product shall be determined from either a guaranteed or residual analysis provided by the manufacturer or distributor, or from appendix B.2 in the University of Florida publication, SP 169, Nutrition of Florida Citrus Trees (1995). For the purposes of this BMP, only 40 percent of the total nitrogen content of foliar-applied urea sources is available during the year of application. The contribution of available nitrogen for all other foliar-applied nitrogen sources shall be 100% of the total nitrogen content of the source during the year of application.

### ***NITROGEN APPLICATION RATES AND TIMING***

A. For Non-Bearing Trees (1 to 3 years-old)

N rates and applications frequencies contained in Table I of this BMP must be followed.

A. For Trees 4 to 7 Years Old:

Determining Total N/acre/year:

Total N/acre/year **shall not** exceed 200 pounds for **round oranges**. Lower or higher rates may be required during a calendar year due to scheduling, horticultural, or climatic factors, but the average annual rate over the four year period may not exceed the maximum rate. Total Nitrogen applied in a mixed variety block (early and mids versus Valencias) may not exceed the maximum N/acre/year for the predominant variety. In addition, records must be kept for each age class which is solid set and represents a significant portion of the block (use 15% as a guideline.)

**These requirements apply to round oranges only. For guidance** on recommended nitrogen rates for mandarin and grapefruit cultivars, refer to the University of Florida publication, SP 169, The Nutrition of Florida Citrus Trees (1995).

In general, maximizing the number of split applications that is technically and economically feasible will minimize the concentration of residual soil N vulnerable to leaching at any point in time.

Maximum rates of N/application:

These specific requirements apply to **round orange, mandarin, and grapefruit** cultivars and consider maximum N/acre/application rates and avoidance of the rainy season for each of the three primary application methods below.

1. Broadcast Applications Only (Includes dry and Liquid Formulations)

DRY SEASON

No more than 65 lb. of N/acre/application from Sept. 15<sup>th</sup> to June 15<sup>th</sup>.

WET SEASON

No more than 40 lbs of N/acre total delivered as one or multiple broadcast applications from June 15<sup>th</sup> to Sept. 15<sup>th</sup>.

1. Broadcast plus Fertigation

DRY SEASON

No more than 65 lb. of N/acre/application from Sept. 15<sup>th</sup> to June 15<sup>th</sup>.

No fertigation applications to exceed 15 lb. of N/acre between Sept 15<sup>th</sup> and June 15<sup>th</sup>.

WET SEASON

No more than 40 lb. of N/acre total from June 15<sup>th</sup> to Sept. 15<sup>th</sup> applied either as one or multiple broadcast applications or as a minimum of four fertigation applications not to exceed 10 lb. of N/acre/week.

3. Fertigation

All N delivered through irrigation.

DRY SEASON

No fertigation applications to exceed 15 lb. of N/acre/week between.

WET SEASON

No more than 40 lb. of N/acre total from June 15<sup>th</sup> to Sept. 15<sup>th</sup> applied in a minimum of four fertigation applications not to exceed 10 lb. of N/acre/week.

C. For Bearing Trees (Trees Greater Than Seven Years Old):

Determining Total N/acre/year:

Total N/acre/year **shall not** exceed 240 pounds for **round oranges**. Nitrate application rates above 240 lbs of N/acre/year must be justified by a prior three year production average of 700 boxes per acre minimum for early and mid-season oranges, and 500 boxes for 'Valencia' oranges. Lower or higher rates may be required during a calendar year due to scheduling, horticultural, or climatic factors, but the average annual rate over the 4 year period may not exceed the maximum rate without the documented three year production average. **Under no circumstances** can the average annual rate over the 4 year period exceed 270 pounds of N/acre. Total nitrogen applied per acre in a bearing, mixed-variety (early and mids versus 'Valencia') block may not exceed the maximum N/acre rate without the appropriate production averages (700 versus 500 boxes) for the predominant variety. In addition, records must be kept for each age class which is solid set and represents a significant portion of the block (use 15% as a guideline.) **These requirements apply to round oranges only. For guidance** on recommended

nitrogen rates on mandarin and grapefruit cultivars, refer to the University of Florida publication, SP 169, The Nutrition of Florida Citrus Trees (1995).

Maximum rates of N/application:

These specific requirements apply to **round orange, mandarin, and grapefruit** cultivars and consider maximum N/acre/application rates and avoidance of the rainy season for each of the three primary application methods below.

1. Broadcast Applications Only (Includes Dry and Liquid Formulations)

DRY SEASON

No more than 65 lb. of N/acre/application.

WET SEASON

No more than 40 lbs of N/acre total delivered as one or multiple broadcast applications.

2. Broadcast plus Fertigation

DRY SEASON

No more than 65 lb. of N/acre/ broadcast application.

No fertigation applications to exceed 15 lbs. of N/acre.

WET SEASON

No more than 40 lb. of N/acre total delivered as one or multiple broadcast applications or as a minimum of four fertigation applications not to exceed 10 lb. of N/acre/week.

3. Fertigation

All N delivered through irrigation.

DRY SEASON

No fertigation applications to exceed 15 lbs. of N/acre/week.

WET SEASON

No more than 40 lb. of N/acre applied in a minimum of four fertigation applications not to exceed 10 lb. of N/acre/week.

## IRRIGATION MANAGEMENT SECTION

### MICRO-SPRINKLER SYSTEMS

#### Requirements:

Over the past ten years growers have made a considerable effort to convert their irrigation systems from over head irrigation to the more efficient micro irrigation systems. In addition, water allocated to the growers by the Water Management Districts in most situations is based on system efficiencies of 85% which are inherent with micro irrigation systems. In recognition of their efforts and for the purposes of this BMP, growers **must** maintain and provide access to, Water Management District pumpage reports (including monthly and annual maximums), as required by the Consumptive Use or Water Use Permits. All growers on the Ridge, especially those exempt from Water Management Permits are **encouraged** to consult with UF/IFAS for information on irrigation management programs specific to their groves. This requirement is not applicable in the event a Consumptive Use or Water Use Permit is not required or if the permit does not require the collection of pumpage information.

#### Recommendations:

A properly designed and installed irrigation system is essential to applying irrigation water efficiently. The design should take into account emitter size, flow rates, pipe size, and flow velocities as well as changes in topography within the grove being irrigated. Table II, attached to this BMP, is based on the most current UF/IFAS research for irrigation of citrus on permeable, better drained soils found on Florida's Ridge. The table is included to be an educational reference for growers when they determine how many gallons to apply per irrigation event, the interval between irrigation events, and the minimum number of days to delay irrigation events after rainfall. While there are no specific requirements for determining soil moisture depletion, it is strongly recommended that growers implement the use of tools such as tensiometers, other soil moisture probes, the water budgeting method or irrigation software when determining irrigation events. By implementing these technologies growers will be able to develop a site specific irrigation management program. Growers interested in developing a site specific plan should consider consulting with UF/IFAS faculty.

The attached tables provides an accurate way for the grower to determine the number of gallons to apply during an irrigation event in order to replenish depleted soil moisture in citrus. Typically, effective rooting depths, on the Ridge, are 2 feet for trees that are 1 to 3 years of age and 3 feet for trees that are 4 years of age and older. UF/IFAS research suggests that the available soil moisture depletion not exceed one-third in the spring and two-thirds in the fall for maximum production. However, growers utilizing one quarter and one-half soil moisture depletion levels respectively, may experience a reduction in nitrate leaching to groundwater. By using Table II growers can determine the necessary gallons of water to replenish depleted soil moisture. Furthermore, growers can determine irrigation run times by dividing the appropriate gallons listed in the Table II by the gallon per hour their emitters supply to the soil, at the design pressure.

In addition, Table II provides growers a way to determine the minimum number of days between irrigation events (irrigation interval.) The number of days between irrigation events listed in Table II are based on the premise that no rainfall has occurred in the grove. In the event a grove receives rainfall the grower can follow Table II for the recommended days to adjust the irrigation interval. The growers are encouraged to place gauges in close proximity to pump stations for easy reference. Available soil moisture amounts are provided in Table III for the most common ridge soils.

**Table I: Recommended N rates and minimum number of applications for non-bearing Citrus trees.**

<u>Years in Grove</u>	<u>lb N/tree/year</u> (Range)	<u>Lower limit of application Frequency</u>	
		<u>Dry</u>	<u>Fertigation</u>
1	0.15 - 0.30	6	10
2	0.30 - 0.60	5	10
3	0.45 - 0.90	4	10

The information above is available in the University of Florida/ Institute of Food and Agricultural Sciences publication SP 169 “ Nutrition of Florida Citrus Trees” 1995



## GUIDELINES ONLY

**TABLE III**

Soil series or types that can be found on the Florida ridge and may occur in citrus groves. Some types are in marginal areas. Actual available soil moisture can vary considerably from the average and local measurement is advised for best irrigation management.

Soil Series or type	Average available soil moisture (in/in)
Apopka	0.08
Archbold	0.03
Astatula	0.05
Basinger	0.09
Candler	0.06
Jonathan	0.04
Pomello	0.08
Satellite	0.05
St. Lucie	0.03
Tavares	0.07
Zolfo	0.09



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**NOTICE OF INTENT TO IMPLEMENT**  
**Nitrogen Best Management Practices for Florida Ridge Citrus**

Section 576.045(6)(a) 2, Florida Statutes and Rule 5E-1.023

Phone (850) 617-1700; Fax (850) 617-1701

In accordance with Florida Statute 576.045(6)(a) 2 and Rule 5E-1.023 the following information is hereby submitted as proof of my intent to implement *Nitrogen Best Management Practices for Florida Ridge Citrus*:

Grove Owner or Leaseholder's Name \_\_\_\_\_

Grove Name \_\_\_\_\_

Grove Address \_\_\_\_\_

County \_\_\_\_\_

Total Number of Acres \_\_\_\_\_

Property Tax ID Number \_\_\_\_\_

Authorized Representative \_\_\_\_\_

Contact Telephone \_\_\_\_\_

Signature of Grove Owner or Leaseholder or Authorized Representative \_\_\_\_\_

Date \_\_\_\_\_

Multiple parcels and associated tax identification numbers may be listed on one NOI. If parcels are owned in more than one county, then one NOI should be submitted for each county, with the list of associated tax identification numbers on each NOI. Use an additional sheet if necessary.

**Mail the completed form to the address in the box at top right. Keep a copy for your records.**

Nitrate Recordkeeping Requirements for the Ridge Citrus BMP

The records listed below are required for each block of citrus enrolled in the Citrus BMP program.

1. The following records are required for each block of **Round Oranges, Grapefruit, and Mandarin cultivars**. Records must reflect the predominant variety for each block enrolled in the BMP program. In addition, records must be kept for each age class, which is solid set and represents a significant portion of the block (use 15% as a guideline).
  - a. Record the information required below
    - i. **Trees 1-3 years of age**
      1. Date of each fertilizer application containing nitrogen
      2. Amount of nitrogen per tree per year
      3. Numbers of applications per block of citrus
    - ii. **Trees 4-7 years of age**
      1. Date of each fertilizer application containing nitrogen
      2. Amount of nitrogen applied per application (dry season).
        - a. Broadcast (lbs N)
        - b. Broadcast/ Fertigation (lbs N)
        - c. Fertigation (lbs N)
      3. Amount of nitrogen applied per application (wet season).
        - a. Broadcast (lbs N)
        - b. Broadcast/ Fertigation (lbs N)
        - c. Fertigation (lbs N)
    - iii. **Trees 7 years of age and older**
      1. Date of fertilizer application containing nitrogen
      2. Amount of nitrogen applied per application (dry season)
        - a. Broadcast (lbs N)
        - b. Broadcast/ Fertigation (lbs N)
        - c. Fertigation (lbs N)
      3. Amount of nitrogen applied per application (wet season).
        - a. Broadcast (lbs N)
        - b. Broadcast/ Fertigation (lbs N)
        - c. Fertigation (lbs N)

2. This section does not apply to **trees 1-3 years in age**. The following records are required for each block of **Round Oranges** enrolled in the BMP program. This information is necessary regardless of the nutrient application method you use in your grove.
  - a. **Trees 4-7 years of age**
    - i. Total nitrogen applied per acre per year
    - ii. A four-year average of nitrogen applied per acre per year (including current production year).
  - b. **Trees 7 years of age and older**
    - i. Total nitrogen applied per acre per year
    - ii. A four-year average of nitrogen applied per acre per year (including current production year).
    - iii. The three-year production average must be documented, if you intend to exceed the 240 lbs N/acre/year maximum for the current production year. The three-year production average must equal at least 700 boxes per acre for early and mid-season fruit and 500 boxes per acre for Valencia to exceed the 240 lbs of N/acre/year in the current production year. Nitrogen application can never exceed 270 lbs N/acre/year

Irrigation Recordkeeping Requirements for the Ridge BMP

Where applicable, growers **must** maintain and provide access to Water Management District pumpage reports (including monthly and annual maximums, as required by the Consumptive Use or Water Use Permits.

**Record keeping Example**

The record keeping example forms are merely a suggested way you may want to keep your Nitrogen records.

Block Identification: \_\_\_\_\_

Tree age: 1 to 3 years

Growers are required to follow the guidelines for total N/ tree/ year and the frequency of application listed in the UF/IFAS publication SP 169, Nutrition of Florida Citrus Trees dated 1996. The requirements are also found in the Best Management Practices titled Nitrogen Best Management Practices for Florida Ridge Citrus dated 7-23-02.

Date of Application	method of application	Pounds of N/ tree
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Pounds of N/ tree/ year: \_\_\_\_\_

## Record keeping Example

The record keeping example forms are merely a suggested way you may want to keep your Nitrogen records.

Block Identification: \_\_\_\_\_

Tree Age:        4 to 7

Application date & method	wet or dry season	Amount of N/ Acre/ application
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Total N/ acre **Wet Season** \_\_\_\_\_

Total N/ acre/ year: \_\_\_\_\_

Total N/ acre/ year from the previous 3 years: Year 1: _____ Year 2: _____ Year 3: _____ 4 year Average: _____
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## Record keeping Example

The record keeping example forms are merely a suggested way you may want to keep your Nitrogen records.

\* Please note that in order to exceed the 240 lbs N / acre/ year a grower must have the previous three year production averages as stated in the BMP. Furthermore, growers cannot, under any circumstances exceed the 270 lbs N/ acre/ year maximum.

Block Identification: \_\_\_\_\_

Tree Age:            Mature ( 7 years of age and older)

Application date & method	wet or dry season	Amount of N/ Acre/ application
_____	_____	_____
_____	_____	_____
_____	_____	_____

Total N/ acre Wet Season: \_\_\_\_\_

Total N/ acre/ year: \_\_\_\_\_

Average Yield: “ Previous 3 years”

Total N / acre/ year “ Previous 3 years”

Year 1: \_\_\_\_\_

Year 1: \_\_\_\_\_

Year 2: \_\_\_\_\_

Year 2: \_\_\_\_\_

Year 3: \_\_\_\_\_

Year 3: \_\_\_\_\_

Four year average \_\_\_\_\_