

Nutrient and Irrigation Management Guide

Spring Potato – 2003

The Soil

Nutrient Holding Ability (Cation Exchange Capacity) – Most of the soil at Suwannee Farms is considered a Blanton Fine Sand or a Penney Fine Sand according to the Suwannee County Soil Survey. Both of these soils are very similar, and for practical purposes can be considered the same for nutrient and irrigation management. The ‘exchange capacity’ of these soils is relatively low due to its very low clay content. Therefore, Nitrogen and Potassium fertilizers are highly prone to leaching. Nutrient management should focus on keeping as much of the nutrients in the root zone as possible throughout the growing season.

Water Holding Capacity - Both of these soils have an average Water Holding Capacity of about 0.60 inches per foot of soil depth.

Compaction Layer – The compaction layer that exists about 8 or 9 inches below the level soil surface was analyzed in Pivot 12 during the Spring 2002 potato crop. The lab results from these samples indicate that this layer prohibits root growth, but does not reduce soil water movement through this zone. Bed excavations during this crop also revealed that root growth stops at the top of the compaction layer. This compaction layer is consistent across the whole farm.

The Root Zone - Given that potato beds are raised, actual measurements of the root zone reveal that from the soil surface to the top of the compaction layer (the root zone) are 12 inches. Also considering that potatoes are planted at about 4 inches depth, this leaves about 8 inches for root growth below the plant; ***allowing for an effective water holding capacity of about 0.45 inches.***



Determining Soil Moisture – It is important to develop a feel for levels of adequate moisture within the bed, since soil moisture will need to be checked daily during peak growth. From experience during the Spring 2002 crops, three basic levels were used to determine soil moisture by touch and feel: Wet, Adequate and Dry.

Wet – Soil ball taken from interior of bed will hold together well when squeezed tightly. Ball will also hold together when rolled gently across hand. Hands will be dirty, and will have to be washed to be cleaned. A wet soil will promote lenticel development.

Adequate – Soil ball taken from interior of bed will also hold together when squeezed tightly. However, the ball may break-up even when gently rolling across hand. Soil can be brushed off hands, and hands will look fairly clean when finished.

Dry – Soil will not hold ball under any condition, and soil will not stick to hand. Lightly brushing hands together will clean them.

Nutrient Management

Nitrogen Recommendation

The IFAS nitrogen fertilizer recommendation for potatoes is 200 lbs per acre per crop, allowing for an additional 30 lbs per acre per crop for a leaching rain. Use of this rate was adequate during the Spring 2002 season on Pivot 12 South, and on potato projects at the North Florida Research and Education Center – Suwannee Valley (NFREC-SV), Live Oak. In fact, the project at NFREC-SV, actually grew the potatoes using only 200 lbs nitrogen per acre, despite the occurrence of a leaching rain.

Nitrogen Program WITHOUT Pre-Plant Nitrogen Fertilizer

Pre Bed

- Nitrogen based fertilizers should not be broadcast to the soil surface before bedding. These will be highly susceptible to leaching.

Bedding

- After bedding, two to four weeks may pass before planting while the soil fumigant dissipates. Nitrogen applied in the bed will be prone to leaching during very heavy rains during this period.

Planting

- Traditionally, 15 lbs nitrogen per acre is applied at planting. However, to since all nitrogen should be applied before the plants are too large, nitrogen rates at planting can be increased to around 30 lbs nitrogen per acre. During the stage between planting and cracking, the small potato plant is mostly utilizing sugars stored in the seed piece for root development.

Cracking

- Once the plants have emerged, photosynthesis begins, and the plant begins increasing its use of nitrogen in the soil. A sidedress application applied at cracking can provide nutrients the plant will need as they become fully emerged. This application should target 80 to 90 lbs nitrogen per acre.

4 to 8 Inch Plant Height

- A final sidedress application can be made. This application should also target an application of 80 to 90 lbs nitrogen per acre.
 - If a leaching rain has occurred during some point between this stage and when the first nitrogen application was made, the IFAS recommendation allows for an additional 30 lbs nitrogen per acre per crop to be made.

Foliar Nutrient Applications

Foliar nutrient applications are less effective than soil applied nutrients. This is largely due to the leaf's nature of shedding water. It has been estimated that of the foliar nutrients applied to the crop, only around 1% will be used by the crop.

Irrigation Management

Irrigation management will be the major factor that keeps the nutrient management program on track. Nitrogen is easily leached, and over-irrigation is easy to do, especially when pressed for time. A thorough evaluation of the irrigation system by the Mobile Irrigation Lab will provide tools that will be essential to aggressive irrigation management. This evaluation should be completed prior to bedding.

Pre- Bed

- Soil should be moist to facilitate fumigation and bedding
 - Rainfall could be sufficient.
 - If irrigation is necessary, apply no more than 0.20 inches the day prior to cultivation.

Post Bedding

- Irrigation may be necessary to seal fumigant in the soil.
 - Apply no more than 0.20 to 0.25 inches.

Pre-Plant

- If soil moisture is not adequate, apply a light application (0.15 to 0.20 inches) prior to planting.

Post-Planting

- Irrigate lightly to seal beds to conserve moisture prior to emergence (0.15 to 0.20 inches).

Pre-Emergence

- In the weeks between planting and cracking, irrigation should not be necessary. The seedlings are using very small amounts of moisture from deep within the bed, and can be sustained from existing moisture for several weeks.
 - However, if additional moisture is needed, apply no more than 0.15 inches per application.

Cracking to Full Emergence (10 to 14 days)

- Water use is growing daily, and may range from near zero on cool overcast days to 0.15 inches per day at full emergence.
- Irrigation strategy should allow the crop to utilize existing soil moisture (just short of stressing plants) to encourage root development. As the roots respond with increased growth, and as water demand increases, this may provide for more efficient water use; and may help maintain the crop during peak use and high temperatures.
- Irrigation applications should range from 0.18 to 0.25 inches per day, assuming the beds are fairly “dry.”

Full Emergence to Early Bloom (10 to 14 days)

- Water use during this period will range from 0.15 to 0.25 inches per day.
- Irrigation management (checking soil moisture, making thoughtful decisions about application rates) should intensify with crop growth/height.
- Irrigation applications:
 - Daily – begin at 0.15 inches per day at full emergence increasing up to 0.25 inches per day as the crop continues to develop.
 - Alternately – applications can alternate days, applying more water less often, making applications of 0.25 inches every 2nd or 3rd day.

Early Bloom to Full Canopy (15 to 20 days)

- Water use is increasing rapidly, and at full canopy (leaves between rows are touching) the crop may use up to 0.30 inches per day.

- Irrigation should be applied daily
 - Apply 0.27 to 0.30 inches per day during high heat and sunny days.
 - Apply 0.23 to 0.28 inches per day when cooler, mostly cloudy or with heavy fogs that last until late morning.

Full Canopy to Lodging

- Water use is at its maximum during this period, and can sometimes exceed 0.30 inches per day.
- Irrigation water should be applied daily, at a rate of 0.27 to 0.33 inches per day.
- Some plants may stress during the early afternoon despite having adequate moisture in the bed. (Result of an inadequate root system.)

Lodging to Decline (~14 days)

- Potatoes are bulking up (center of bed will crack).
- Water use is still very high (0.25 to 0.28 inches per day), requiring daily applications.

Decline to Desiccation (~14 days)

- Water use is decreasing daily
- Irrigation applications are reducing down from 0.30 inches per day.
 - Amount of reduction is hard to anticipate.
 - Check soil moisture often.
 - Too much moisture in the bed will promote lenticel development.
 - Applications may be daily or less frequent.

Pre-Desiccation

- Plants should be allowed to “mine” remaining moisture to achieve a fairly “dry” bed at desiccation.

Post-Desiccation

- No irrigation is necessary. Excessive soil moisture may promote lenticel development.