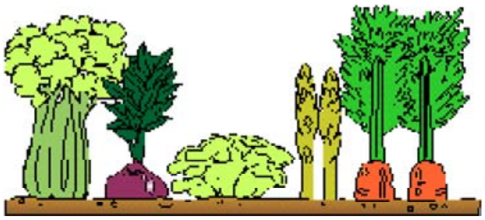

VEGETARIAN NEWSLETTER

A Vegetable Crops Extension Publication
Vegetarian 03-07
July 2003

University of Florida
Institute of Food and Agricultural Sciences
Cooperative Extension Service

Vegetarian Archive Vegetarian Index

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List of Extension Vegetable Crops Specialists

* * * * * * * UPCOMING EVENTS CALENDAR * * * * * * *

AgriTech Strawberry Conference. Plant City. August 26-27. Florida Strawberry Growers Association: http://www.straw-berry.org/

Florida Tomato Institute. Ritz-Carlton Hotel. Naples. September 4, 2003. Contact Bill Stall at wms@ifas.ufl.edu

49th Conference of the InterAmerican Society for Tropical Horticulture. Fortaleza, Brazil, Aug. 31- Sept. 5, 2003.

ISHS International Symposium on Protected Culture in a Mild-Winter Climate. Renaissance WorldGate Hotel - Kissimmee, Fla. March 23-27, 2004. Contact: Daniel Cantliffe at djc@mail.ifas.ufl.edu

CONTROLLED-RELEASE FERTILIZER OPPORTUNITIES AND COSTS FOR POTATO PRODUCTION IN FLORIDA

The recent emphasis on the development of vegetable production Best Management Practices has prompted a re-examination of fertilization practices in Florida potato production. One fertilizer practice that can meet the production and environmental goals of both growers and regulatory agency personnel is the use of controlled-release fertilizers (CRFs). CRFs are polymer coated nitrogen fertilizers, typically urea, that are engineered to release nutrients based on soil temperature and not soil moisture. This release profile decreases the nitrogen leaching potential of the fertilizer. IFAS research over the past three years has demonstrated that nitrogen rates can be reduced with a CRF program compared to a soluble nitrogen fertilizer program (non-coated urea and/or ammonium nitrate) without reducing crop yield or quality. Although CRF technology can improve nitrogen use efficiency, the cost of the material has limited the adoption of CRF technology in potato production. However, the development of BMPs coupled with the cost-share potential of CRFs at the national, state and/or local level has improved the chance that CRFs will be used as a fertilizer source for potato production.

The objective of this article is to compare the costs and benefits of a *nitrogen* CRF program to a traditional soluble nitrogen program in potato. The cost of a soluble nitrogen fertilizer program varies between growers and over years based on manufacturing costs, nitrogen sources, and rate. Therefore, a range of possible costs and rates are detailed in Table 1. The BMP nitrogen rate for a soluble program is 200 lb N/acre and is included for comparison. In Table 2, several cost and rate combinations for a CRF program are listed. There are several unknowns with the CRF program. The most important of which is material cost per ton.

Soluble Nitrogen Source

Highlighted in Table 1 are combinations of common cost and rates for a soluble nitrogen program in northeastern Florida over the past few years. Highlighted nitrogen costs range from 2.1 to 3.5% of the total production cost for potato ($1800 total production cost). To find the nitrogen cost for a specific farm or program, locate the cost of nitrogen for the previous season at the top of the chart and move down the column to the appropriate nitrogen fertilizer rate.

Table 1. Traditional soluble fertilizer program costs per acre using a blend of urea and ammonium nitrate with a final grade of 32-0-0.

Rate (lb N/a)	Soluble Fertilizer Cost ($/ton product)[z]					% Total Production Costs
	130	**140**	**150**	**160**	**170**	
150	31	33	35	38	40	
175	36	***38***	***41***	***44***	47	2.1 - 2.4
200	41	***44***	***47***	***50***	53	2.4 - 2.8
225	46	***49***	***53***	***56***	60	2.7 - 3.1
250	51	***55***	***59***	***63***	66	3.1 - 3.5
275	56	60	64	69	73	
300	61	66	70	78	80	

[z]1 ton of 32-0-0 material would fertilize 3.2 acres at the BMP nitrogen rate (200 lb N/acre).

CRF Nitrogen Source

Current IFAS research indicates that tuber quality and yield with a CRF program of 150 to 175 lb N/acre are comparable to a standard soluble fertilizer program at the BMP rate (200 lb N/acre). CRF prices are based on discussions with industry personnel. To be competitive, however, products should be priced between $400 and $700/ton. Therefore, the projected cost of nitrogen from a CRF program ranges from 3.9 to 7.8% of the total production costs for potato ($1800 total production cost) (Table 2).

Table 2. Alternative CRF fertilizer program costs per acre using a polymer coated urea with a final grade of 43-0-0.

Rate (lb N/a)	CRF Fertilizer Cost ($/ton product)[z]						% Total Production Costs
	300	400	500	600	700	800	
125	44	59	73	88	101	116	
150	53	***71***	***87***	***105***	***122***	140	3.9 – 6.7
175	61	***82***	***102***	***123***	***142***	163	4.6 – 7.8
200	70	94	116	140	162	186	
225	79	105	130	157	183	209	

[z]1 ton of 43-0-0 material would fertilize 5.7 and 4.9 acres at the 150 and 175 lb N/acre, respectively.

Discussion

Tables 1 and 2 list the potential grower costs for the soluble and CRF fertilizer programs. The most expensive highlighted CRF program ($142/acre) is 3.7 to 2.3 times more expensive than the least and most expensive highlighted soluble fertilizer programs ($38 and $63/acre), respectively. There are, however, several benefits to using a CRF program that may offset some of the cost of the CRF program. The benefits of a CRF program compared to a soluble fertilizer program include:

1. A CRF program requires a single, pre-plant, fertilizer application compared to multiple applications (application number dependent on season) with a soluble fertilizer program. The BMP program recommends at least a single split application (2 trips) when using soluble nitrogen sources. Each trip across the field costs approximately $3/acre.

2. A polymer coated CRF releases nutrients based on soil temperature and not soil moisture. Therefore, during potato seasons with substantial rain, nitrogen in the CRF prill will remain in the field and not leach into the watershed. The current BMPs for the soluble fertilizer program allow up to 30 lb N/acre to be added during the season after each leaching rain event to make-up for leaching. This past season (2003), some growers applied an extra 90 lb N/acre as part of the BMP program because of all the rain (total 290 lb N/acre for BMP program in 2003). No added nitrogen was necessary with the CRF program (150 – 175 N/acre in 2003).

3. The CRF program improves nitrogen use efficiency as alluded to above (2). A higher percentage of applied nitrogen makes it into the crop when fertilized with a CRF compared to a soluble fertilizer source. This is because CRFs release nitrogen slowly over the season as the crop needs it. Therefore, there is less opportunity for nitrogen to leach into the watershed with a CRF program. CRF nitrogen rates of 175 and 150 lb/acre translate into a yearly nitrogen savings of 450,000 to 900,000 lb in the St. Johns River watershed production area compared to the *BMP nitrogen rate*. By reducing the CRF nitrogen rate below the BMP rate, growers and manufactures can develop good will with the public while reducing the potential for nitrate to enter the watershed.

4. The CRF program improves operational efficiencies. With limited trips through the field to apply fertilizer and reduced worry during rainy seasons, growers can spend more time doing other things such as marketing potatoes.

A CRF program costs more than a traditional soluble fertilizer program. However, Florida citizens and growers would benefit if CRF costs were shared by all parties that have a stake in improving water quality in the St. Johns River watershed. In this simple model, the cost of a soluble nitrogen fertilizer program in most years falls between $38 to $63/acre (Table 1). Estimated CRF program costs (highlighted in Table 2) would be approximately $8 to $79/acre more than the most expensive soluble nitrogen program ($63/acre, Table 1). If this cost difference was supported 100% by local, state or national regulatory agency funds, the cost-share program would require $144,000 to $1,422,000 annually to be fully funded.

These numbers serve as a starting point for discussion regarding the value of using CRFs in potato production in the St. Johns River watershed. There are approximately 18,000 acres of potatoes in the St. Johns River watershed that can benefit from a CRF program. In addition, there are well over 100,000 acres of other vegetable crops on seepage irrigation across Florida that could benefit from a CRF program. This acreage increases greatly if one considers all the production areas in the U.S. where nitrogen may be negatively impacting surrounding watersheds. A CRF program can be a win-win-win opportunity for growers, manufactures, and regulatory agencies by helping all meet their production, business, and environmental goals.

Additional Information

Hutchinson, C.M., W.A. Tilton, and E.H. Simonne. 2002. On-farm demonstration of a controlled release fertilizer program for potato production. Vegetarian Newsletter, Horticultural Sciences Department, University of Florida. June. http://www.hos.ufl.edu/vegetarian/02/June/June.htm

Hutchinson, C.M. and E.H. Simonne. 2002. Development of controlled release fertilizer program for potato production. Vegetarian Newsletter, Horticultural Sciences Department, University of Florida. March. http://www.hos.ufl.edu/vegetarian/02/March/Mar02.htm

(Hutchinson and Simonne - Vegetarian 03-07)

SAVING SEEDS FOR ANOTHER SEASON

Don’t toss out the half-sown packet of seeds – save it for another season. Seeds, which contain living embryos just waiting to grow, can be stored until another crop is needed.

Sometimes there are failures and replanting is necessary. Often just a few weeks after planting a row of beans or radishes, it is time to sow another. Saving the leftover seeds is one way of reducing the costs of an edible landscape.

Seeds from a few non-hybrid crops, often called open-pollinated varieties, can be harvested from fruit left on the vine and allowed to mature. When grown as pure stands, these varieties come true from seed and can be counted on to produce more fruit that resembles that of the parent plant.

Hybrids, however, are produced from crosses of plants that may not be completely alike in looks or yields. When seeds from the fruit of hybrids are saved and later sown, many of the offspring will be different from the crop that produced the seed. It is best to buy fresh hybrid seed when the supply is exhausted.

Sometimes saved seeds produce garden treasures when sown. Squash seeds that have been collected, dried, and later planted may result in an unfamiliar harvest. Bees carrying pollen between squash in your garden and that of a neighbor may have produced some crosses of their own. The result is a sort of hybrid that gives a new variety once the seed is sown. Such unusual fruit can be a pleasant surprise and is edible.

When seed is to be saved from the garden, allow the fruit to mature on the plant. Normally there is a color change: Bean pods brown, peppers turn bright red and squash skin becomes golden yellow – signs of the full development of the embryo within the seeds. When this occurs, the fruit can be picked, the seeds extracted and air-dried in the shade, then stored or planted.

Most seeds can be stored for several years if kept in cool, dry conditions. Jars with tight lids are ideal containers, but more modern gardeners now use plastic food storage tubs or self-sealing bags. To reduce moisture in the containers, some gardeners add a handful of dry milk powder wrapped in a paper towel. This absorbs much of the moisture that could encourage growth or a deterioration of the seeds.

Claim a shelf in the refrigerator to store the seeds. Cool temperatures in the high 30s to low 40s are ideal. Do not place the seeds in the freezer, which could damage them. Date the seeds and use the oldest ones first.

(Tom MacCubbin – Ext. Agt. IV, Orange County Coop. Ext. Service - Vegetarian 03-07)

ON-FARM DYE TEST HELPS GROWER UNDERSTAND WATER MOVEMENTS AND PROVIDES GUIDELINES FOR ADJUSTING IRRIGATION

Approximately 60,000 acres of vegetables are currently grown in Florida with plasticulture. Plasticulture is the use of raised beds, drip irrigation and plastic mulch. This represents all the tomato, eggplant and strawberry acreage. An increasing amount of watermelon and to a lesser extent, muskmelon is also grown with plasticulture.

Scheduling irrigation for vegetables consists in knowing when to irrigate and how much water to apply in a way that satisfies crop water needs, maintains soil water tension between field capacity and 15 cbar at the 12-in depth, and prevents nutrient leaching. Preventing the leaching of nutrients such as nitrate nitrogen (NO_3-N) may be achieved when irrigation schedule maintains water in the root zone. The key is for irrigation volume not to exceed soil water depletion at the time of the irrigation. In the Suwannee Valley, soils are between 6 and 20-ft deep, and have low organic matter content as well as low nutrient and water retention. Hence, drip-irrigation management is important for successful watermelon production in North Florida.

While recent Extension programs have trained growers how to use soil moisture sensing devices such as tensiometers and time domain reflectometry (TDR) probes to fine tune irrigation, growers still tend to rely on experience to determine irrigation rates. Visualizing the effect of irrigation volume on water movement in the root zone of vegetable crops is naturally difficult because of where this process occurs. Often, wetted soils look like dry soil, and seeing water in the root zone requires extensive digging. Using a blue dye and grower's records of irrigation, we have demonstrated in a vegetable grower field how fast the water front moves in the soil profile and below the root zone.

A commercial watermelon field was selected in the Spring of 2003. Plasticulture was used and the drip tape had a flow rate of 24 gal/hr/100 ft. On May 15, when watermelon fruits were at the 5-lb stage, three quarts of dye (Terramark SPI High Concentrate, ProSource One, Memphis, Tenn.) were mixed with water (1:1 v:v) and injected into a section of the field. The dye front was at the 7-in depth immediately after the injection (Table 1). The irrigation schedule for the following days was approximately 2 events on May 15, 4 on events on May 16, 2 events on May 17, 4 events on May 18, and 1 event on May 19. As each event was a 2-hr irrigation cycle, this corresponds to a total of 24 hours of irrigation over a 5-day period for an average irrigation rate of almost 5 hours per each day. After digging on May 19, the dye front was found at the 40-inch depth. The observation of the profile showed that watermelon had viable roots approximately to the 36 to 40-inch depth. Based on this, the grower adjusted the irrigation schedule and applied an additional 16 hr of irrigation between May 19 and May 27. This reduced schedule only applied an average of 2 hours each day (48 gal/100ft/day). A second digging was done on May 27. On that day, no trace of dye was found above the depth of the water table (Fig. 1). The water table was found at the 6-ft depth. The grower acknowledged that his irrigation schedule was probably still too high.

Table 1. Position of the blue dye as affect by irrigation of a commercial watermelon field in North Florida.

Date	Depth of Blue Dye	Total Irrigation Applied
May 15, 2003	7 inches	24 gal/100 ft (1 hr)
May 19, 2003	40 inches	576 gal/100 ft (24 hrs)
May 27, 2003	72 + inches (depth of water table)	960 gal/100 ft (40 hrs)

Figure 1. No blue dye was found in the top 6-ft after digging of the soil profile on May 29.

Many growers in North Florida use similar irrigation practices. The main reason for excessive irrigation rates is the presence of ‘course sandy spots’ in the field or the presence of ‘sand hills and bottoms’. The course sandy spots hold water poorly, and therefore require additional irrigations. One possible solution to circumvent this issue, is to use two types of drip tapes. The drip tape with ‘normal’ flow rate may be used in the bulk of the field, and drip tape with 30% to 50% higher flow rate could be used on the ‘course sandy spots’. Hence, for a single drip system operating time, different irrigation amount (and also fertilizer) may be applied to different zones of the field. The problem with ‘sand hills and bottoms’ may be addressed when the irrigation system is design by placing submain lines (typically the layflat) in a manner that facilitates the hook up of the tapes with different flow rates. In either case, using two different drip tapes is preferable to using two drip tapes under the plastics because of cost.

While knowledge of how much fertilizer moves with the water front currently incomplete, this on-farm test was instrumental in demonstrating the rate of movement of the water front and the depth of the root zone.

(Simonne and Bob Hochmuth, ext. agt. IV, NFREC-Live Oak - Vegetarian 03-07)

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Chad Hutchinson Assistant Professor, vegetable production	**Eric Simonne** Assistant Professor ***and EDITOR***, vegetable nutrition
Elizabeth M. Lamb *Assistant Professor, production*	***William M. Stall*** *Professor, weed control*
Yuncong Li *Assistant Professor, soils*	***James M. Stephens*** *(retired)* *Professor, vegetable gardening*
Donald N. Maynard *Professor, varieties*	***Charles S. Vavrina*** *Professor, transplants*
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