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GROWER

NEW ENGLAND VEGETABLE AND SMALL FRUIT NEWSLETTER

CONTENTS

Personal Protective Equipment
John W. Bartok, Jr.
3

Using an Enterprise Budget
Boris E. Bravo-Ureta
4

The Colors of Raspberries
Karen I. Hauschild
6

Proper Pricing Revisited
Richard A. Ashley
7

Past, Present and Future of Nitrogen Management

Tom Morris
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University of Connecticut

Recommended rates of nitrogen (N) fertilizer for vegetables have changed little in the past 25 years. The recommendations primarily have been based on research performed in the 1960s. Subsequent research in the 1970s and 1980s seemed to confirm the results from the 1960s, but new research data suggests that current recommendations frequently are higher than needed for field and sweet corn. I suspect that our recommended rates for many vegetable crops also are higher than needed for many fields in many years. I suspect this because, without a soil test to provide a field-specific estimate of N availability, recommended N rates have to be higher than needed for many fields. There is too much financial risk to underfertilization and only a slight penalty to overfertilization. The following discus-

▶ *page 2*

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Future of Nitrogen

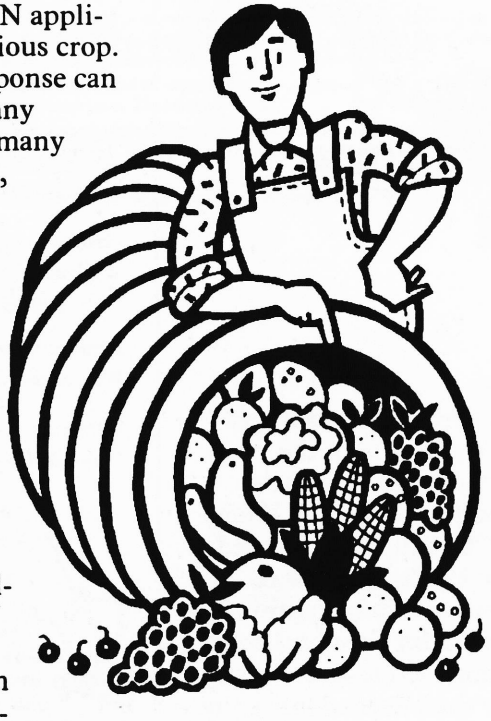
▶ *page 1*

sion is meant to help you understand how N recommendations have been developed and why they frequently are higher than needed.

How are N Recommendations Developed?

Our current N recommendations for vegetable crops are not based on a soil test for N. Instead, the recommendations are based on two types of research data. The first type of data is the traditional N response experiments where numerous rates of N are applied to a field in a randomized and replicated manner. A typical experiment would have four rates of N fertilizer from 0 to 180 lbs N/acre in sixty-pound increments and have four replications for a total of 16 plots. The yield from each of the plots would be measured and recorded. From this data, N response curves can be generated. These types of curves are used to estimate the rate of N needed for maximum yield of a crop.

One of the problems with this type of data is that the response to N varies depending on many factors. Some of the major factors affecting an N response curve are type of soil, weather, variety, time of N application and previous crop. Because the response can vary greatly, many experiments at many sites are needed, but it has been difficult to obtain sufficient funding to have experiments at many sites. Another problem is that when data from a number of sites are available, the rate of N needed to reach maximum yield varies substantially, and there usually is no easy way to predict the best rate of N for an individual site. When making N recommendations for a large area, such as a state, scientists in the past usually have set the fertilizer rate high enough so that all or almost all sites would attain maximum yield. This was a prudent decision because significant yield reductions can occur from shortages of N.



The other type of data used to develop N fertilizer recommendations is the amount of N removed from the soil by a crop. Each crop requires a certain amount of N to produce a unit of biomass or yield. This is known as the internal N requirement of the crop. It has been found that the amount of N needed for maximum yield does not vary much for an individual crop. From this type of data, the rate of N fertilizer needed for maximum yield of a crop can be estimated.

These two types of data provide good information about the maximum rate of N fertilizer for crops. Recommendations derived from this type of data are good general recommendations that ensure a crop is never or rarely deficient in N. This type of data, however, provides little information about the specific N fertilizer requirements of crops in individual fields in any given year. A soil test for N is needed before N fertilizer recommendations can be field specific.

The Present Art of Nitrogen Management

A major advancement in N management has occurred in the past 10 years. A reliable soil test for N has been developed. The test is called the presidedress nitrate test and it allows field-specific N recommendations. The test was originally developed for field corn and is now available for sweet corn growers (see the March and April 1995 issues for more information about the test). The test has been extensively used in Vermont, Iowa, Pennsylvania, New Hampshire and Connecticut for field corn.

Data from Iowa and Connecticut demonstrate that recommendations derived from the soil test average about one-third lower than recommendations derived from the traditional method. The main reason for the lower recommendations is the new information about N availability provided by the soil test. This information is field specific. It is the type of information that was lacking in traditional recommendations.

I would not recommend that you reduce your N fertilizer applications by one-third. The rate of N fertilizer recommended by use of the test can vary greatly among fields and among years. In some fields, in some years, the results of the test will indicate little to no N fertilizer is needed. In other years, the test will indicate that the amount of N you normally apply is needed. The only way to know what rate of N is needed in any field, in any year is to use the test.

I will explain in more detail in future articles about the best way to use the information provided by the test.

Personal Protective Equipment

John W. Bartok, Jr.
University of Connecticut Extension

Do you provide personal protective equipment for your employees? Have they been trained how and when to use it?

The dollars spent on personal protective equipment can benefit you two ways. First, it will increase the productivity of your employees by reducing fatigue and making tasks easier to perform. Second, although it will not reduce accidents, it will minimize the injury if an accident occurs.

In the past couple of years, many new protective devices have been introduced. Let's look at where some of these will benefit your operation.

Back Protection

Many greenhouse operations involve lifting and moving materials. In fact, a container of plants may be moved as much as a dozen times from when it is first filled with media to the time when it is delivered to the garden center. Although most containers are relatively light, other materials, such as bales of mix, boxes of pots and bags of fertilizer, can put a strain on the back muscles when handled.

Several companies are now making lumbar belts that support the lower back and prevent strain to abdominal and back muscles. These are worn securely fastened around the waist either inside or outside of clothing. Support comes from fabric or leather with a padding of foam or air chambers. The cost is from $30 to $90.

Training in the proper lifting methods and carrying techniques should also be provided. Alternate moving methods, such as conveyers, carts and fork lifts can reduce the need for humans to handle material.

Wrist Support

Tasks, such as transplanting and keyboard operation, require continuous, repetitive wrist movement. This can lead to carpal tunnel syndrome, the compression of the medium nerve where it passes through the wrist. The symptoms of tingling, numbness and pain in the fingers can be debilitating, resulting in lost work time.

Wrist supports help to maintain proper hand and arm position. Most are made of an elastic fabric that gives support and retains body heat to aid blood flow without limiting hand movement. Some supports also container a splint to keep the wrist in a neutral position. Cost is $10 to $15.

Dust Mask

The other day I was talking with a grower in the shipping area of his greenhouse range. As it was near quitting time, the employees were cleaning up. One employee with a large push broom was sweeping the floor, creating a cloud of dust from the spilled soil. This was being carried through the building by the ventilation system. No one was wearing a dust mask.

Disposable dust masks that cost less than $1.00 can be used several times until breathing becomes difficult or they become physically damaged. They keep particulate matter and vapors out of the nose, lungs and respiratory tract. Choose the right one to protect against dust, fumes, mists, gases or vapors, and instruct employees on when and how to use them properly.

Ear Protection

Exposure to excessive noise from materials handling equipment, thermal foggers, chain saws, tractors and radios can result in temporary or permanent hearing loss. It also interferes with the ability to communicate.

In some cases, noise can be reduced by proper maintenance of equipment or by shielding with absorbent or insulating material. Where this can't be done, hearing protection should be made available.

Inexpensive earplugs (less than 15 cents) made of soft foam are comfortable, effective and adjustable to fit the wearer. Ear muffs, if they fit well, are more comfortable to wear, provide better protection and are easier to put on and remove. Most people readily adjust to hearing protection in a short time.

Eye Protection

The eye is perhaps the body part most vulnerable to work injures. Eye protection should be used during hazardous jobs such as mixing fertilizers and pesticides; spraying; operating power equipment; and using soil mixers or container filling equipment.

Lightweight, plastic safety glasses with side shields are low cost items ($5.00 to $8.00) that give good protection from flying objects. Purchase those that are antifogging and neutralize static charges.

Goggles should be used whether protection from liquid chemical splash or spray materials is needed. They can also be placed over regular glasses. A face shield may be needed in the shop area when welding, grinding metal or working with wood.

Personal protective equipment is available from some greenhouse suppliers and safety ▶ *page 4*

Protective Equipment

▶ *page 3*

firms. Mail order houses, such as Direct Safety Company, 7815 South 46th Street, Phoenix, Arizona 85044 or Global Occupational Safety, 713B Hemlock Drive, Hempstead, New York 11550 have a large selection of equipment listed in their catalogs.

We seldom give much thought to the need for personal protective equipment until an injury occurs. Although not specifically covered by OSHA regulations, the general duty clause states that "every employer must provide a safe working place, one which is free from recognized hazards". Citations have been issued to employers for failure to provide and enforce the use of personal protective equipment.

Reminder

Preregistration is necessary for the New England Vegetable and Berry Conference and Trade Show, December 12-14 at the Sturbridge Host Hotel.

The preregistration fee to attend any part or all of the conference or trade show is $35.00 for the first member of a farm business and $15.00 for each additional member (family or employee) when preregistered with first member. The preregistration fee for students (high school or college) is $10.00 each when preregistered by the instructor. There is an additional fee of $5.00 for all categories for late registration or walkins.

Make checks payable to NEV&BG Conference and send registration by December 1 to:

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Using an Enterprise Budget

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The September issue of the *Grower* contained an article that discussed the meaning of an enterprise budget and defined the major concepts that are used in these budgets. The purpose now is to provide an example of how an enterprise budget can be used in decision making.

Enterprise budgets can be used for several tasks including breakeven analysis, whole-farm planning, financial management, credit application and risk management. In this article, the use of an enterprise budget for calculating the breakeven price and yield for sweet corn is discussed.

Breakeven analysis is a technique used to determine the level of a variable where returns are equal to costs, holding the values of all other variables constant. Among the most commonly used variables in breakdown analysis are yield and output price. Other variables that are often used in this type of analysis are cost of inputs such as land, labor and machinery.

Breakeven (output) price and yield are calculated as follows:

$$\text{Breakeven Price} = \frac{\text{Total Costs}}{\text{Expected Yield}}$$

$$\text{Breakeven Yield} = \frac{\text{Total Costs}}{\text{Expected Price}}$$

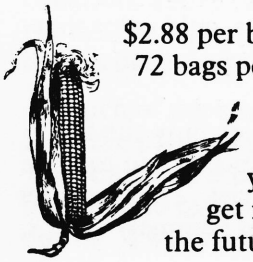
Table 1 presents an enterprise budget for sweet corn. The data in this table reflect 1995 prices. As shown in Table 1, total variable costs for producing one acre of corn are expected to be $514.50 while total fixed costs are $61.00. The total cost figure then is $575.50.

It should be noted that costs for management and land are excluded. Also excluded are expenses that might be incurred in marketing the product. The gross returns expected from this acre of corn are $1,600 resulting from the sale of 200 bags at $8.00 per bag. The projected net returns are $1,024.50 per acre. Net returns in this case represent primarily the expected return to land and management, given that charges for these two inputs are not included in the budget.

Using the formula given above and the figures in Table 1, the breakeven price for a yield of 200 bags per acre is approximately $2.88 per bag ($575.50/200 bags). The breakeven yield, given a price of $8.00 per bag, is approximately 72 bags ($575.50/$8.00 per bag). Therefore, the breakeven analysis shows that the minimum price required to cover all costs at the expected yield is

Table 1. Enterprise Budget for One Acre of Sweet Corn

Item	*Unit*	*Quantity*	*Price ($)*	*Amount ($)*
Variable Costs				
Purchased Input Costs				
Lime	ton	1	21.00	21.00
Fertilizer				
100-50-130	lbs	100N	.32	32.00
		50P	.30	15.00
		130K	.13	16.90
Nitrogen Sidedressing	lbs	60	.32	19.20
Herbicide				
Aatrex 4L	2.5 g	.20	41.14	8.25
Dual	2.5 gal	.08	225.00	18.30
Seed	lbs	13	5.35	69.55
Insecticide				
Asana	gal	.18	152.00	27.40
Containers	bag	200	.30	60.00
Machinery Operating Costs				
Plow	acre	1	8.30	8.30
Disc	acre	4	3.30	13.20
Fertilizer	acre	1	4.30	4.30
Row Planter	acre	1	12.30	12.30
Spray Boom	acre	1	1.20	1.20
Spray Mist	acre	1	0.85	0.85
Sidedress	acre	1	5.25	5.25
Labor Costs				
Machinery	hour	9	8.50	76.50
Harvesting	hour	20	5.25	5.25
Total Variable Costs				**$514.50**
Fixed Costs				
Depreciation on Equipment				56.30
Interest on Investment				3.95
Insurance and Taxes				0.75
Total Fixed Costs				**$61.00**
Total Costs				**$575.50**
Gross Returns	Bags	200	8.00	1,600.00
Returns over Variable Costs				1,085.50
				$1,024.50
Breakeven Analysis, Total Costs				
Breakeven Price @ 200 Bags per Acre			2.88 per bag	
Breakeven Yield @ $8.00 per Bag			72 bags	



$2.88 per bag, while a minimum yield of 72 bags per acre would be needed at the expected price.

Considering that the expected yield and price shown in the budget represent the best estimate of what the future might bring, the breakeven analysis can be repeated for different expected prices and yields. The resulting combination of breakeven prices and yields can then be used to decide whether or not costs are likely to be covered. This same exercise can be undertaken for all crops a grower might be interested in, before making the final choice of what to grow.

The Colors of Raspberries

Karen I. Hauschild
University of Massachusetts Extension

In the retail marketing industry there is always a need for a unique marketing twist to attract new, or even excite current, customers. After working with the Federation of Massachusetts Farmers' Markets at their booth in the Massachusetts Building at the "Big E"[1], it struck me that there may be a niche for pre-packaged multicolored raspberries.

At the Federation booth, where we had several items for sale, our most consistent sales were for cups of fall raspberries. 'Heritage' red berries were more frequently requested, even though perhaps 25% of customers asked if the berries were "fresh" or "local". Sales of cups of reds mixed with 'Goldie'™, a newer fall cultivar with berries that range in color from gold to deep orange, were also brisk. 'Goldie' berries did not sell well when packaged without 'Heritage' mixed with them. The majority of customers were not familiar with yellow raspberry cultivars. Offering a sample berry or two the previous year did persuade many customers to request this "new" color berry.

Many consumers view raspberries as a real treat, an "almost gourmet" item. Others see them as attractive, but often the price discourages purchase. This is certainly a valid statement for chain store shoppers! Those of us of European descent are perhaps more familiar with different types of raspberries, brambles and other berries, such as currants, and are willing to overlook price as a purchasing factor. From a more positive perspective, we might be more willing to acknowledge the **value** of the product! The attractive power of red fall raspberries, priced inexpensively in relation to other items available at the Big E, but simultaneously priced to make a profit for the federation, was undeniable.

Following are suggestions for trial marketing of mixed colors of raspberries, as well as suggestions for cultivars. Be sure to choose only those cultivars that are recommended for your state or area.

Strategies

1. Mix different colored berries (different cultivars and types) and package in half-pint or pint containers.

Hardiness and time of ripening may vary with location. Please consult with your local Extension personnel for cultivars, etc. suitable for your site.

2. Mix differently-colored red raspberries; subtle differences in flavor will also be apparent.

3. Offer your customers small **samples** of different types of raspberries and/or different cultivars, or mixed berries.

4. Enhance your raspberry display with sample uses of multicolored berries, either actual products or **good quality** photographs. Some of the uses I have considered are:

- cheesecake covered with mixed-colored raspberries
- mixed berries layered with ice cream/frozen yogurt or a layer of black raspberries–ice cream–red raspberries–ice cream–purple berries
- mixed berries **over** ice cream, pound cake or shortcake
- mixed berries in fresh fruit salad
- use differently-colored berries to decorate cakes, an appropriately-colored flag for the 4th of July or Labor Day, or different colors for patterns, to spell names, etc.

Suggestions for Cultivars

Early Summer Bearers

'Boyne'—a darker red, though small to medium sized

'Killarney'—medium sized, very bright red

'Reveille'—medium to large fruits, bright red

Midsummer Bearers

'Canby'—medium to large, bright red

'Hilton'—large, dark red

'Success'—small berries, dark purple

'Jewel'—large, glossy, black berries

Late Summer Bearers

'Taylor'—medium to large, red

'Brandywine'—large, reddish purple berries

'Royalty'—large, reddish purple berries

'Huron'—medium-sized, glossy black berries

'Ruby'—very large, bright red berries

Ever Bearers

'Heritage'—medium sized, red berries

'Fall Gold'—medium-sized, yellow berries

'Goldie'™—medium-sized berries, gold color that deepens to orange-red when overripe

Note: Although many growers pick only the fall crop of everbearing varieties, these plants can each be fruited for their summer crop of berries. This provides yellow- to orange-colored berries for summer.

Cultural techniques such as planting on raised beds and/or double cropping ever bearers or using row covers to adjust time of fruiting can each affect fruit quality and/or time of ripening. For additional information on cultivars, cultivar selection and approximate time of ripening, consult the following references and/or your state or local Extension specialists.

References

Handley, D.T. 1995. *Raspberry Varieties for Maine.* University of Maine Cooperative Extension Bulletin #2172, Orono, ME, 8 pp.

Pritts, M.E. and D.T. Handley. 1989. *Bramble Production Guide.* NRAES 35, Northeast Regional Agricultural Engineering Service, Cooperative Extension, Ithaca, NY, 189 pp.

[1] Eastern State Exposition, W. Springfield, MA (New England's State Fair).

TM Trade Mark, US patented cultivar available solely from Nourse Farms, Inc., (for US and Canadian growers)

Additional information for this article was supplied by A. Tirrell, Nourse Farms, Inc., and *From Our Fields to Yours,* 1955, Catalogue Nourse Farms, Inc., 41 River Road, S. Deerfiled, MA 01373.

Proper Pricing Revisited

Richard A. Ashley
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Vegetable Crops

In the January, 1993 issue of the *Grower,* I discussed the application of cost-based pricing to agricultural retailing. Price calculations were based on calculating a markup percentage at retail using the equation:

$$\text{Markup Percentage at Retail} = \frac{\text{Planned Retail Operating Expense + Planned Profit}}{\text{Planned Net Sales}} \times 100$$

The retail selling price for any product can then be calculated using the formula:

$$\text{Retail Selling Price} = \frac{\text{Merchandise Cost}}{1 - \text{Markup at Retail}}$$

How do you calculate the proper selling price when all the product cannot be sold at the same price? Frequently it is necessary to reduce the price of merchandise in order to respond to competition, to accommodate overproduction or to clear out seasonal products and shop-worn samples. When using the Markup Percentage at Retail and Retail Selling Price equations above to calculate selling price, rounding the selling price up to even dollars or just under even dollars helps compensate for markdowns.

Much of the cost of markdowns still comes directly from the planned profits when using this method. The Markup Percentage at Retail equation can be modified to reflect the effect of anticipated markdowns. When modified it becomes:

$$\text{Initial Markup Percentage at Retail} = \frac{\text{Planned Retail Operating Expense + Planned Profit + Planned Retail Price Reductions}}{\text{Planned Net Sales + Planned Retail Price Reductions}} \times 100$$

Both equations for markup percentage at retail are based on estimates of cost and sales and a profit target. What pays the bills is the markup percentage we can maintain throughout the season. This can be calculated using the formula:

$$\text{Maintained Markup Percentage at Retail} = \frac{\text{Actual Operating Expenses + Actual Profit}}{\text{Actual Net Sales}}$$

Let's say for example we produce 10,000 flats of bedding plants (10 packs per flat) at a cost of $10 per flat and sell them retail. Our planned retail operating expense is $40,000 (cost of selling, not the cost of producing and selling), and we would like to make $60,000 in profit. Our experience has been that we can sell 80% of our bedding plants at full price, then as the end of the season approaches, we clear out the remaining 20% in a buy-one-get-one-free sale. Our net sales average around $200,000.

If we calculate selling price using the Markup Percentage at Retail Formula we get:

$$\text{Markup Percentage at Retail} = \frac{\text{Planned Retail Operating Expenses + Planned Profits}}{\text{Planned Net Sales}} \times 100$$

then:

$$\text{Markup Percentage at Retail} = \frac{\$40{,}000 + \$60{,}000}{\$200{,}000} \times 100 = 50\%$$

▶ *page 8*

Proper Pricing

▶ *page 7*

The retail selling price is then calculated using:

$$\text{Retail Selling Price} = \frac{\text{Merchandise Cost}}{1 - \text{Markup at Retail}}$$

At $10 per flat of 10 packs production cost the cost per pack is $1. Therefore:

$$\text{Retail Selling Price} = \frac{\$1}{1 - .50} = \frac{\$1}{.50} = \$2$$

If we then calculate the selling price using the Initial Markup Percentage at Retail formula we get:

$$\text{Initial Markup Percentage at Retail} = \frac{\text{Planned Retail Operating Expense + Planned Profit + Planned Retail Price Reductions}}{\text{Planned Net Sales + Planned Retail Price Reductions}} \times 100$$

If we sell 20% of our bedding plants (20% of 100,000 = 20,000) in a buy-one-get-one-free sale, then we are selling them in effect for $1 per pack instead of $2. Therefore, the planned retail price reduction is $20,000. So:

Initial Markup Percentage at Retail:

$$\frac{\$40{,}000 + \$60{,}000 + \$20{,}000}{\$200{,}000 + \$20{,}000} \times 100 = 54.5\%$$

The retail selling price needed to meet your profit goal then becomes:

$$\text{Retail Selling Price} = \frac{\text{Merchandise Cost}}{1 - \text{Markup at Retail}}$$

$$\text{Retail Selling Price} = \frac{1}{1 - .545} = \$2.20$$

Next month we will see how close we came to meeting our profit goals using these two different approaches.

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