Sweet Corn
(Western Oregon)
J.M. Hart, D.M. Sullivan, J.R. Myers, and R.E. Peachey

Summary

Preplant management

Lime
Soil pH between 5.8 and 6.2 is recommended. Apply lime according to Table 1 (page 2) if the soil pH is below 5.8.

Nitrogen (N)
Apply 30 lb N/a in a band at planting unless sweet corn follows a legume or legume–cereal cover crop.

Phosphorus (P)
Apply P according to Table 7 (page 7) if the soil test for P is below 50 ppm.

Potassium (K)
Apply K according to Table 8 (page 8) if the soil test for K is below 200 ppm.

Sulfur (S)
S can be supplied by applying 15 to 20 lb S/a in the sulfate form at planting time.

Calcium (Ca)
On sandy or river-bottom soil types (e.g., Newberg), apply 1 ton lime/a if Ca is below 5 meq/100 g soil, even if soil pH is adequate.

Magnesium (Mg)
If soil test Mg is below 120 ppm or 1 meq/100 g soil, and if dolomitic lime is not applied, band 10 to 15 lb Mg/a at planting.

Zinc (Zn)
Apply 3 to 4 lb Zn/a in a band at planting or broadcast 10 lb Zn/a preplant if the soil test for Zn is below 0.8 ppm (below 1.5 ppm in the Stayton area).

In-season

An in-season measurement, the pre-sidedress soil nitrate test (PSNT), is used to determine sidedress N fertilizer rate. Sidedress N fertilization rates are given in Table 10 (page 10).

Nutrient recommendations for processing and fresh-market sweet corn in western Oregon are provided in this guide. Sweet corn is typically grown in Benton, Clackamas, Lane, Linn, Polk, Marion, Yamhill, and Washington counties on Amity, Chehalis, Cloquato, Coburg, Concord, Newberg, Salem, Stayton, Willamette, and Woodburn soil series. Nitrogen is the most yield-limiting nutrient for sweet corn production. Addition of phosphorus, zinc, sulfur, potassium, magnesium, and lime may also be necessary.

The nutrient recommendations in this guide assume adequate control of pests, including weeds, insects, and diseases. Lack of pest control cannot be overcome by the addition of nutrients. Common pest problems for sweet corn production in western Oregon are corn rootworm (twelve-spot cucumber beetle, *Diabrotica undecimpunctata undecimpunctata*); grass weeds such as barnyardgrass (*Echinochloa crus-galli*) and wild proso millet (*Panicum miliaceum*); and broadleaf weeds such as black nightshade (*Solanum nigrum*), pigweed (*Amaranthus spp.*), and common lambsquarters (*Chenopodium album*).

To receive the greatest return from your fertilizer investment, healthy plants with an adequate root system are required. Root rot disease reduces nutrient uptake efficiency and can reduce yields of some older varieties by more than 25 percent. Newer, root-rot-tolerant sweet corn varieties demonstrate improved nutrient uptake efficiency.
Corn kernels contain a starchy endosperm and an oily embryo or “germ.” Differences in endosperm composition determine corn type (silage corn, sweet corn, popcorn, etc.). Furthermore, many types and varieties of sweet corn exist (su1, se, sh2). Fertilizer need, especially N need, differs with corn type. See “Types of corn” (page 3) for an explanation of these terms.

Much of the N research for this guide was conducted on plots of the sugary type (su1) Golden Jubilee F1 hybrid. Newer hybrids, such as Basin (sh2), Coho (su), and GSS1477 (sh2), yield as much or more than Golden Jubilee and require similar or lower N supply. Some N rate field research was performed with these varieties in 2009 and 2010.

The average sweet corn yield in western Oregon is 10 to 12 t/a. The recommendations in this guide, especially those for N, are adequate to produce yields of 14 t/a or more.

Sweet corn processors desire uniform maturity, uniform ear size, and a cylindrical (rather than tapered) ear filled to the tip with narrow, deep kernels. Deep kernels give high percent cut-off or net yield. Many of these traits are influenced by nutrient management.

Guidance for organic sweet corn production is found in the section titled “Managing PAN from organic amendments and cover crops” (page 12).

Before planting

Soil pH and lime

A soil pH between 5.8 and 6.2 is adequate for sweet corn production. Sweet corn is sensitive to soil pH, with a substantial yield reduction possible when soil pH is below 5.8. Yield can be 1 to 4 t/a less at soil pH 5.5 than at soil pH 5.8. If the soil pH is below 5.8, added nutrients will not be used efficiently.

A soil pH of 6.6 or 6.8 is not detrimental to sweet corn production. However, as shown in Figure 1, no economic benefit is realized by applying the amount of lime needed to raise pH to this level.

Soil pH indicates whether lime is needed, and the SMP buffer or lime requirement test (LR) estimates the amount of lime needed. Sample and test soil for pH, SMP buffer lime requirement, and Ca well before planting, since lime should be mixed into the seedbed before seeding. A lime application is effective for several years. Lime application rates can be estimated from Table 1.

Soil pH changes 0.3 to 0.5 unit seasonally. It is lowest (most acidic) in late August and September, before the fall rains begin, and highest in February or March, when the soil is wettest. Sample soil for pH at the same time each year to avoid confusion from seasonal fluctuation.

Guidance for organic sweet corn production is found in the section titled “Managing PAN from organic amendments and cover crops” (page 12).

Before planting

Table 1.—Lime rate recommendations for western Oregon using the SMP buffer test when soil pH is below 5.8.a

<table>
<thead>
<tr>
<th>Use SMP buffer test when soil pH is below</th>
<th>SMP buffer test for limeb</th>
<th>Apply this amount of limec (t/a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.8</td>
<td>Below 5.6</td>
<td>4–5</td>
</tr>
<tr>
<td>5.6–5.8</td>
<td>5.6–5.8</td>
<td>4–3</td>
</tr>
<tr>
<td>5.8–6.0</td>
<td>5.8–6.0</td>
<td>3–2</td>
</tr>
<tr>
<td>6.0–6.3</td>
<td>6.0–6.3</td>
<td>2–1</td>
</tr>
<tr>
<td>Over 6.3</td>
<td>Over 6.3</td>
<td>None</td>
</tr>
</tbody>
</table>

aLime recommendations are based on the SMP buffer test only. If other buffer tests are used, recommendations may differ. Liming rates cannot be determined based solely on soil pH.
bNote that the SMP buffer test is an index of lime needed and does not equal soil pH.
cLime rate is based on 100-score lime.

Calcium (Ca)

Sometimes sandy or river-bottom soil types such as Newberg have less than 5 meq Ca/100 g soil. In this situation, apply 1 ton lime/a to supply Ca, even if soil pH is adequate. When soil test Ca is above 5 meq/100 g of soil, no relationship exists between soil test Ca and leaf Ca concentration (Figure 2). Thus, 5 meq Ca/100 g of soil is sufficient.

![Figure 1.—Sweet corn yield change with soil pH (North Willamette Research and Extension Center, Aurora, OR). Source: McAndrew 1983, data combined from 1980, 1981, and 1982.](image1)

![Figure 2.—Relationship of sweet corn leaf calcium concentration and soil test calcium (1978 western Oregon survey). The third leaf from the top of plants was collected and analyzed when the corn was about 20 inches tall.](image2)
Types of corn

Corn is a worldwide commodity and crop. Its widespread popularity is amazing, as Europeans did not “discover” corn until the Columbian exchange with the New World, initiated in the 15th century.

Most early Native American farmers of central and southern North America and throughout South America used corn. It originated about 7,000 years ago in west-central Mexico from *Z. mexicana*, or teosinte, a vigorous grass with tiny ears composed of small, hard-shelled kernels. From Mexico, corn spread south into Central and South America and north into southwestern, midwestern, and eastern North America. Corn was one of the first New World crops that Columbus encountered on his visit to Hispaniola in 1492.

From a central beginning, corn has been selected, bred, and adapted to create several “types” for distinct uses.

** Flint corn** — Rounded, smooth kernel consisting of soft starch covered by horny starch. Many ornamental “Indian” corns are flint type. Makes good-quality corn meal. Also used as livestock feed, usually ground.

** Dent corn** — Side walls are composed of horny starch, but crown is soft starch, which indents as the kernel dries. Most dent corn is used for livestock feed and biofuel. Dent corn is the major type grown throughout the U.S.

** Flour corn** — Composed almost entirely of soft starch. Kernels have only a thin layer of horny covering at the sides. Like flint corn, kernels are round and smooth, but they are usually pale in color because the yellow color is visible only in the horny starch. Mainly used for making corn flour for human consumption.

** Popcorn** — Contains a higher percent horny starch than flint. Kernels are usually small, with a sharp point where the silk attaches. The endosperm bursts on heating.

** Sweet corn** — In sweet corn (Figure 3), mutations can affect genes that control starch production in the endosperm, causing sugars to accumulate in the immature kernel. These genetic differences produce five main types of sweet corn: sugary-1 (*su1*), sugary enhanced (*se*), supersweet or shrunken-2 (*sh2*), Hawaiian brittle (*bt1* and *bt2*), and ADX Pennfresh types. (The latter two are not used extensively in the U.S.)

Sugary (*su1*) sweet corns typically have 5 to 15 percent sugar and smooth, creamy texture due to the presence of phytoglycogen. In the dry state, the kernels have a translucent, glassy appearance. (The seed treatment may need to be washed from the seed to make this trait visible.)

The sugary enhancer (*se*) gene acts as a modifier of *su1* that further increases sugar accumulation. It does not have an effect on its own and must always be used in the presence of *su1*. It can be introduced to *su1* through one (homozygous *se*) or both (homozygous *se*) parents of an F1 hybrid. Adding *se* to *su1* increases the sugar content to 10 to 25 percent, depending on whether *se* is heterozygous or homozygous. These varieties, known as *su1* types, maintain the creamy texture of the unenhanced *su1* type, but have a longer shelf life as fresh product compared to unenhanced sugary varieties. Dry kernels are vitreous (glassy), as in *su1*.

Supersweet (*sh2*) sweet corns have 25 to 35 percent sugar, a crisp texture, and dry kernels with an opaque appearance. Supersweet types have even less endosperm than *su1* or *se* types and are more prone to germination and emergence problems, particularly when soils are cooler and wetter than optimal. Supersweet varieties have long shelf life potential for fresh market use.

Sugary (*su1*) and *se* types are compatible and can be grown in proximity to one another, but these types cannot be grown near *sh2* types. Cross pollination between *su1* or *se* varieties and *sh2* varieties will result in field corn kernels on both types. Field corn kernels reduce overall ear quality because they are tough and starchy and often a different color than sweet corn kernels.

The *su1* and *sh2* genes can be combined to produce lines with extremely high sugar content (up to 50 percent), but these types have very poor germination and thus are not commercially feasible. Recently, however, seed companies have been developing combinations that are homozygous for one type and heterozygous for the other. Going by names such as synergistic, Xtra Sweet, Augmented, Xtra Tender™, Gourmet Sweet™, Multisweet™, Triplesweet™, and Sweet-Breed™, these varieties combine a high level of sweetness and quality with robust field performance. Refer to seed company literature or talk to your sales representative to determine with which types these are compatible.
Magnesium (Mg) and sulfur (S)

Magnesium-deficient sweet corn is uncommon. To ensure sufficient Mg for sweet corn production, add Mg if soil test Mg is below 120 ppm or 1 meq/100 g soil. Magnesium can be supplied from dolomitic lime or fertilizers such as Sul-Po-Mag and K-Mag. These fertilizer materials also supply sulfur. A band application of 10 to 15 lb Mg/a is sufficient for sweet corn production. This Mg rate supplies 20 to 30 lb S/a, a sufficient amount, as only 15 to 20 lb S/a in the sulfate form is needed at planting time.

Soil test Ca and Mg from 90 sweet corn fields were closely related, as shown in Figure 4. This relationship reflects cation exchange capacity or acidic soil. Sandy soil or fields with a soil pH below 5.5 are most likely to have low soil test Ca and Mg.

Nutrient choices at planting

Nitrogen (N)

A small amount of N, 20 to 40 lb/a, is accumulated before sweet corn has 10 leaves, and adequate N supply is needed for early growth. Unfortunately, routine preplant soil testing for N is not helpful, since available forms of N (ammonium and nitrate) are usually low in western Oregon soils during early spring. To ensure adequate N supply for early growth, band 25 to 35 lb N/a at planting, unless sweet corn is planted after a legume or legume-cereal cover crop. In this case, N is not needed at planting. See “Banding fertilizer at planting” and “Four questions about N management” for more information (pages 5–6).

Banding fertilizer at planting

Any fertilizer material banded with the seed will at least slow germination and emergence by several days and has the potential to reduce the stand. To demonstrate this principle, sweet corn was planted with a variety of banded fertilizer materials. Corn was planted in 32-inch rows on limed and unlimed areas at the rate of 26,000 seeds/a. Three replications each were planted in an area with soil pH of 5.4 (unlimed) and in an area with soil pH of 5.9 (limed). All plants in each plot were counted approximately 1 month after planting.

The average stand was 75 percent of the seeding rate. High rates of rainfall following planting may have ameliorated the effect of fertilizer placed with the seed. After planting, almost 5 inches of rain fell during the remainder of May, approximately 3 inches above the 30-year average.

Adding lime or MAP + lime did not significantly reduce the corn stand, compared to the treatment receiving no lime or fertilizer (Table 2). Changing the P source from MAP to DAP substantially reduced the stand. Banding N as urea with the seed reduced the stand by approximately 50 percent. Both urea and DAP increase pH, liberating water-soluble ammonia, which is toxic to germinating seed.

A band application of 90 lb N + K₂O/a resulted in a stand that was 70 percent of the seeding rate. Increasing the rate to 120 lb N + K₂O/a did not significantly decrease the stand. A rate of 150 lb N + K₂O/a reduced the stand to the lowest of all the treatments.

Our recommendation is to apply less than 90 lb N + K₂O/a in a band 2 inches below and to the side of the seed row. The amount of fertilizer that can be banded with the seed depends on fertilizer source, soil moisture, and distance of the band from the seed. Some fertilizer materials, such as ammonium thiosulfate, urea, and DAP, should not be banded with or near the seed. Banding MAP or K₂SO₄ with or near the seed has little or no detrimental effect on stand establishment. Make your own estimates of how much material to band with the seed as you consider the material, distance the seed is separated from the fertilizer, and the soil moisture that will be present through germination, emergence, and early growth.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Rate (lb/a)</th>
<th>Stand (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No fertilizer</td>
<td>—</td>
<td>90</td>
</tr>
<tr>
<td>MAP (11-52-0)</td>
<td>100 lb P₂O₅</td>
<td>86</td>
</tr>
<tr>
<td>DAP (18-46-0)</td>
<td>100 lb P₂O₅</td>
<td>63</td>
</tr>
<tr>
<td>Urea</td>
<td>45 lb N</td>
<td>43</td>
</tr>
<tr>
<td>N + K₂O³ (90 lb)</td>
<td>30 lb N + 60 lb K₂O</td>
<td>70 —</td>
</tr>
<tr>
<td>N + K₂O³ (120 lb)</td>
<td>45 lb N + 75 lb K₂O</td>
<td>64 —</td>
</tr>
<tr>
<td>N + K₂O³ (150 lb)</td>
<td>60 lb N + 90 lb K₂O</td>
<td>44 —</td>
</tr>
</tbody>
</table>

³Fertilizer was banded with the seed by placing drop tubes for seed and fertilizer behind furrow “openers,” a practice not recommended for commercial production (Hyslop Field Research Laboratory, Corvallis, OR, 1988).
Four questions about N management

Most Oregon crops require additions of nitrogen (N) from organic sources or fertilizer to produce top economic yield. Before application of N, growers must determine how much to apply, when the application should be made, a method for application, and the source to use. This section addresses these decisions for processing sweet corn grown in western Oregon.

Rate

On a farm with similar rotations, soil, and management, sweet corn yield increased predictably in relation to N application rate (Figure 5). Yield varied somewhat from year to year, but the rate of N required for top yield was approximately 150 lb N/a. Additional N usually depressed yield.

Crop rotations vary in sweet corn production systems, making prediction of N need difficult without a measurement of N supplied from the soil. The pre-sidedress soil nitrate test (PSNT) measures soil N supply, allowing growers to estimate the N application rate needed. PSNT samples are collected during the growing season, before corn begins rapid growth and nutrient accumulation. More information on the PSNT is found under “Midseason N application” (page 10), “Directions for PSNT” (page 11), and “PSNT creation and limitations” (page 11).

Timing

Time of application is based on crop uptake. Corn requires little N during the first month to 6 weeks of growth, before it develops five or six leaves. However, N deficiency at early development stages sacrifices yield that cannot be recovered with additional N later. After development of six leaves, both growth and N use rapidly increase.

The entire amount of N for a season can be applied at planting if a rate can be determined and if rainfall is low. Table 3 shows that in “wet” years (1979 and 1980), corn yield was lower when all N was applied at planting, compared to applying a small amount at planting and most of the N at sidedress time. In these years, some N was probably lost by leaching below the root zone or through denitrification. In “dry” years, no advantage existed for split N application.

Table 3.—Influence of N timing, seasonal rainfall, and N rate on sweet corn yield.

<table>
<thead>
<tr>
<th>Year</th>
<th>N source</th>
<th>N rate (lb/a)</th>
<th>Yield (t/a)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Single c</td>
<td>Split d</td>
</tr>
<tr>
<td>1979</td>
<td>Ammonium nitrate</td>
<td>120</td>
<td>7.6a 11.3b</td>
</tr>
<tr>
<td>1980</td>
<td>Ammonium nitrate</td>
<td>120</td>
<td>5.3a 8.3b</td>
</tr>
<tr>
<td>1984</td>
<td>Ammonium nitrate</td>
<td>130</td>
<td>9.8a 9.3a</td>
</tr>
<tr>
<td>1985</td>
<td>Ammonium nitrate</td>
<td>100</td>
<td>6.4a 7.5a</td>
</tr>
<tr>
<td>1985</td>
<td>Ammonium nitrate</td>
<td>160</td>
<td>6.9a 7.4a</td>
</tr>
<tr>
<td>1985</td>
<td>Ammonium nitrate</td>
<td>220</td>
<td>7.5a 7.5a</td>
</tr>
<tr>
<td>1986</td>
<td>Ammonium nitrate</td>
<td>100</td>
<td>8.8a 8.7a</td>
</tr>
<tr>
<td>1986</td>
<td>Ammonium nitrate</td>
<td>200</td>
<td>9.9a 9.6a</td>
</tr>
<tr>
<td>1986</td>
<td>Urea</td>
<td>100</td>
<td>9.7a 8.9a</td>
</tr>
<tr>
<td>1986</td>
<td>Urea</td>
<td>200</td>
<td>9.8a 9.8a</td>
</tr>
</tbody>
</table>

a North Willamette Research and Extension Center, Aurora, OR.
b By application method. Statistical difference (p=0.05) in yield within a row is designated by unlike letters.
c Single application at planting.
d Small amount of N applied at planting; most N applied at sidedress time.

Rainfall, of course, is unpredictable. Furthermore, estimation of N rate at planting is difficult, since an unknown amount of plant-available N will be released via decomposition of soil organic matter during the growing season. Thus, our recommendation is to apply a minimal amount of N at planting (30 lb N/a) and to apply additional N at sidedress time based on the PSNT.

If all of the N fertilizer is applied at planting and early-season rainfall is likely to total several inches, a risk of N loss exists. In this case, a nitrification inhibitor can be added to ammonium fertilizers such as urea. Nitrification inhibitors slow microbial conversion of ammonium-N to nitrate-N in soil. They may be beneficial in situations where nitrate-N can be removed from the surface soil by leaching. When rainfall or irrigation match crop water use, addition of a nitrification inhibitor with preplant or sidedress N was not advantageous (Table 4, page 6).

continues on page 6
Method of application

Method of sidedress N application made no difference in yield, as shown in Table 5. Topdressed urea should be incorporated with irrigation water the day it is applied.

Table 5.—Comparison of sweet corn yield with band or broadcast application of N.

<table>
<thead>
<tr>
<th>Year</th>
<th>Site</th>
<th>N source</th>
<th>N rate (lb/a)</th>
<th>Yield (t/a)</th>
<th>No inhibitor</th>
<th>Plus inhibitor</th>
<th>Inhibitor*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td>Lane</td>
<td>Aqua ammonia preplant</td>
<td>115</td>
<td>10.9</td>
<td>11.5</td>
<td>N-Serve</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chehalis sicl⁶</td>
<td>Aqua ammonia preplant</td>
<td>150</td>
<td>11.3</td>
<td>11.5</td>
<td>N-Serve</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Newberg sl⁷</td>
<td>Aqua ammonia preplant</td>
<td>120</td>
<td>14.2</td>
<td>13.9</td>
<td>N-Serve</td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td>NWREC</td>
<td>Urea preplant</td>
<td>100</td>
<td>9.7</td>
<td>9.4</td>
<td>DCD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Urea preplant</td>
<td>200</td>
<td>9.8</td>
<td>10.8</td>
<td>DCD</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Urea sidedress</td>
<td>100</td>
<td>8.9</td>
<td>10.1</td>
<td>DCD</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Urea sidedress</td>
<td>200</td>
<td>9.8</td>
<td>8.7</td>
<td>DCD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>Linn⁸</td>
<td>Urea sidedress</td>
<td>75</td>
<td>13.2</td>
<td>11.3</td>
<td>NSN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rogers 1477</td>
<td>Urea sidedress</td>
<td>75</td>
<td>11.4</td>
<td>11.9</td>
<td>NSN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Basin</td>
<td>Urea sidedress</td>
<td>75</td>
<td>11.1</td>
<td>11.2</td>
<td>NSN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coho</td>
<td>Urea sidedress</td>
<td>75</td>
<td>12.7</td>
<td>11.1</td>
<td>NSN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Golden Jubilee</td>
<td>Urea sidedress</td>
<td>75</td>
<td>12.7</td>
<td>11.1</td>
<td>NSN</td>
<td></td>
</tr>
</tbody>
</table>

*No significant statistical differences were measured (p=0.05) for within-row comparisons.

*⁶N-Serve® = nitrapyrin; DCD = dicyandiamide; NSN (Nutrisphere-N⁷) is a maleic-itaconic acid copolymer.

*⁷Chehalis silty clay loam

*⁸Newberg sandy loam

*Varieties used at one site in Linn County

N source

Sweet corn yield increased with increasing N rate (Table 6), but no yield difference was measured for different sources applied at the same rate. Commonly available fertilizer N sources supply N equally for sweet corn production. Choose N fertilizer based on cost per pound of N and ease of application.

Table 6.—Influence of N source and rate on yield.

<table>
<thead>
<tr>
<th>Year</th>
<th>Site</th>
<th>Nitrogen source</th>
<th>N application rate (lb N/a)</th>
<th>Yield (t/a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td>Lane</td>
<td>Urea</td>
<td>60</td>
<td>7.6</td>
</tr>
<tr>
<td></td>
<td>Ammonium nitrate</td>
<td>8.7</td>
<td>9.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CAN-17</td>
<td>8.6</td>
<td>10.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UAN 32</td>
<td>7.6</td>
<td>9.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rate average</td>
<td>8.1</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>Linn³</td>
<td>Urea</td>
<td>60</td>
<td>7.6</td>
</tr>
<tr>
<td></td>
<td>Ammonium nitrate</td>
<td>8.7</td>
<td>9.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CAN-17</td>
<td>8.6</td>
<td>10.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UAN 32</td>
<td>7.6</td>
<td>9.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rate average</td>
<td>8.1</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

*³North Willamette Research and Extension Center, 1992.

*⁶60 or 180 lb N/a applied at sidedress time (40 days after planting) in a subsurface band or broadcast.

*²By application method. Yield did not differ for application method or N source (p=0.05).
Phosphorus (P)

Determination of P sufficiency is difficult, since the ability of sweet corn to obtain P from the soil is influenced by soil temperature, biological activity, and root diseases. Ensuring an adequate P supply for sweet corn production is complicated by the insolubility and immobility of biologically available P forms. In contrast to N, P movement is slight. In a growing season, P may move only a distance similar to the thickness of your thumbnail.

Phosphorus deficiency in young corn plants sometimes decreases yield. It is also linked to delayed maturity. Sweet corn is harvested when kernel moisture is 70 to 75 percent, a relatively immature stage of development when kernels contain only a small portion of dry matter. Uniform maturity is required so that kernel removal or “cut-off” can be maximized. Phosphorus application is associated with shortening the time needed for sweet corn to reach harvest conditions and remain at an acceptable stage of maturity.

The influence of P on maturity is illustrated in Figure 6. Corn was harvested at a 4-day interval, and yield from treatments receiving a band application of 65 lb P2O5/a was compared to that of treatments receiving no P. The yield increase from P application was less for the second harvest than for the first harvest. In addition, increased yield from P addition decreased as soil pH increased.

Young corn plants sometimes exhibit a purple color, which is associated with P deficiency. Silage corn research in British Columbia showed that young corn plants can exhibit a purple color and P deficiency even when the Bray soil test for P is above 50 ppm, a level considered adequate for corn production.

This problem is seen most often with early planting dates and cool, wet spring weather and in compacted areas, such as those used for field entry and exit. Development of purple color is not predictable, as it varies yearly and with corn variety.

Low soil temperature in spring contributes to P deficiency in corn. Since P doesn’t move to plant roots, plant roots must grow so they can encounter biologically available P. Root growth is governed by temperature and can be minimal early in the season, limiting P uptake.

Low soil temperature also reduces the rate at which organic P is converted to soluble plant-available P. Research from California showed a 40 percent reduction in available P with a 20°F decrease in soil temperature. In western Oregon, the minimum soil temperature at the 4-inch depth increases approximately 20°F between mid-April and early July. Thus, soil P is less available at early planting dates.

Band application of P fertilizer at planting can increase yield, but does not completely overcome the effect of low soil temperatures. However, research at North Willamette Research and Extension Center (NWREC) showed no consistent advantage to P application when corn was planted in early May and soil test P was approximately 100 ppm (McAndrew 1983). Regardless of soil temperature, no fertilizer P is needed when soil test P is above 50 ppm.

A more effective approach is to encourage colonization of corn roots by mycorrhizal fungi. These fungi assist plants in extracting nutrients from soil. Crop rotation and tillage are the best management choices. Addition of mycorrhizal fungi to soil for corn production has not been demonstrated to be practical or successful.

Mycorrhizal fungi will be present if the previous crop was a host. Most crops support mycorrhizal fungi. Crops to avoid are in the beet and brassica family (e.g., sugar beets, Swiss chard, spinach, cabbage, broccoli, and mustard). Planting corn after fallow provides few mycorrhizal fungi for root colonization.

In research trials conducted in lower mainland British Columbia, minimum tillage (e.g., disking) was superior to plowing in reducing the incidence of purple color in young corn plants. Mycorrhizal fungi must be kept intact and growing on a host to function. Tillage disrupts the fungal network in the soil.

**Recommendation**: Apply P based on a Bray P1 soil test (Table 7) and consider using the following management practices:

- Plant corn after a crop that hosts mycorrhizal fungi.
- Avoid crops in the beet and brassica family.
- Reduce tillage, and avoid plowing entirely.

![Figure 6.—Sweet corn ear yield increase following P and lime application. Yield of treatments that did not receive P was compared to yield of treatments receiving a banded application of 65 lb P2O5/a. Second harvest was 4 days after first harvest. Source: Hemphill and Jackson 1983.](image-url)

<table>
<thead>
<tr>
<th>Soil test P (ppm)</th>
<th>Apply this amount of P2O5 (lb/a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–15</td>
<td>120–150</td>
</tr>
<tr>
<td>16–50</td>
<td>60–120</td>
</tr>
<tr>
<td>Over 50</td>
<td>0–30</td>
</tr>
</tbody>
</table>

*Bray soil test method.

*When soil test P is above 50 ppm, the need for P application is determined by tillage, soil temperature, and the previous crop. Roots of juvenile corn plants have difficulty obtaining sufficient P from cold soil. Apply the lowest P rate feasible with your planter.*
Potassium (K)

A sweet corn crop will accumulate as much, and usually more, K than N. Between 250 and 350 lb K/a is a common range for western Oregon sweet corn. Approximately 40 percent (120 to 150 lb/a) is in stalks, and about 25 percent (75 lb/a) is removed with ears at harvest. Potassium in crop residue is readily available to the next crop.

Potassium supplied as KCl (0-0-60) is a very soluble fertilizer salt. Corn, especially at germination, is sensitive to salt damage from fertilizer. To minimize fertilizer salt concentration near the seed, band no more than 50 lb K2O/a when the band is at least 2 inches from the seed. The total of N and K2O banded 2 inches from the seed should not exceed 90 lb/a. When fertilizer is banded within 1 inch of corn seed, the total of N + K2O in the band should not exceed 40 lb/a. If additional K is needed, broadcast and incorporate it before planting. For information about reduced germination from fertilizer salts, see “Banding fertilizer at planting” (page 4).

The K recommendations in Table 8 should be adequate for sweet corn production. As shown in Figure 7, leaf K concentration did not increase with increasing soil test K when the K soil test was above 150 ppm.

<table>
<thead>
<tr>
<th>Soil test K (ppm)</th>
<th>Apply this amount of K2O (lb/a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–100</td>
<td>100–150</td>
</tr>
<tr>
<td>101–200</td>
<td>50–100</td>
</tr>
<tr>
<td>Over 200</td>
<td>None</td>
</tr>
</tbody>
</table>

Table 8.—Fertilizer potassium rate recommendations for western Oregon using the ammonium acetate soil test.

Zinc (Zn)

Routine soil testing for Zn is recommended to identify Zn deficiencies. When the Zn soil test is less than 0.8 ppm, a yield increase from Zn application is expected on all soils. Zinc application increased sweet corn yield in the Stayton area even at higher Zn soil test levels, especially on gravelly, dark-colored soil such as the Sifton and Salem series. Apply Zn based on DTPA extractable soil Zn using the recommendations in Table 9.

If Zn is required, broadcast 10 lb Zn/a and incorporate before planting to meet crop requirements for 2 or 3 years. An alternative method is to band 3 to 4 lb Zn/a at planting.

<table>
<thead>
<tr>
<th>Soil test Zn (ppm)</th>
<th>Apply this amount of Zn (lb/a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1</td>
<td>3 to 4 banded or 10 broadcast</td>
</tr>
<tr>
<td>More than 1</td>
<td>None except Stayton area</td>
</tr>
</tbody>
</table>

Table 9.—Fertilizer zinc rate recommendations for western Oregon using the DTPA soil test.

Other micronutrients

The need for addition of micronutrients other than Zn has not been demonstrated for sweet corn production in western Oregon.

Interruption of adequate boron (B) supply, even for a short time, can disrupt plant growth. Boron enters plants with water flow; if transpiration is slow, B uptake is slow. After entering the plant, B is immobile, so developing areas such as growing points and ears will exhibit B deficiency.

Speculation exists that lack of sufficient B is the cause of incomplete ear fill, especially at the tip (Figure 8). Boron application to corn grown on a Woodburn soil increased kernel fill on cobs. However, it is difficult to predict whether yield or cob fill will increase following B application. In western Oregon, the B soil test level in fields not receiving B for several years is usually 0.25 to 0.35 ppm. At this soil test level, application of 1.8 lb B/a from Solubor increased B plant tissue concentration in sweet corn, but did not increase yield.

When the B soil test is below 0.25 ppm, a trial application of 2 lb B/a could be considered. Do not band B fertilizer, since it is toxic to plants even at low concentration.
Nitrogen management during the season

Understanding corn growth and N uptake
Sweet corn growth and nutrient accumulation can be divided into three segments, each lasting approximately 1 month: (1) planting to the five-leaf stage, (2) the five-leaf stage to silk emergence, and (3) from silk emergence to harvest.

Planting to the five-leaf stage
For the first month, sweet corn grows slowly, and root development is limited. Fortunately, only small quantities of nutrients are used during this period. When the corn is 12 inches tall, both N uptake (5 to 15 lb/a) and biomass production (150 to 250 lb/a) are small. Early-season N uptake precedes dry matter accumulation (Figure 9).

Although growth and N uptake are minimal during the first month, this period sets the stage for future leaf and ear development. By the time corn is 12 inches tall, all leaf and ear shoot initiation is complete, and a small tassel is present. The corn plant is ready to grow and reproduce. Thus, sufficient N during this stage is extremely important. About 20 to 30 lb N/a is needed in the surface foot of soil. Soil N supply is best supplemented by band application that places N near roots.

Five-leaf stage to silk emergence
Leaf number and height begin to increase rapidly after the appearance of six leaves (growth stage V6). After 10 leaves are produced, sweet corn growth accelerates, with new leaves appearing every 2 or 3 days until silk emergence, or when the sweet corn is about waist high. N uptake is at its maximum, more than 5 lb/a/day, at this time. Although this period of growth and development is short (approximately 30 days), new varieties such as Basin accumulate most of their N (approximately 150 to 200 lb/a/day) during this time.

Nitrogen accumulation precedes growth, as shown in Figures 10 and 11. When corn is planted at the end of May, silk emergence occurs at the end of July. For newer varieties, seasonal accumulation of N is almost complete by silk emergence, but less than half the dry matter has been accumulated (Figure 9).

Silk emergence to harvest
Older sweet corn varieties such as Golden Jubilee and Silver Queen accumulate 15 to 35 percent of their total N after silk appearance (Figure 10).

At harvest, a sweet corn crop contains between 175 and 225 lb N/a in the above-ground biomass. In a 10-ton yield, about 75 lb of the N (40 percent of the total above-ground N) is in the ears. To estimate the amount of N removed at harvest, multiply yield (t/a) by 7.5 lb N/ton. Sweet corn also contains 30 to 40 lb P/a (70 to 90 lb P2O5) and 200 to 300 lb K/a (240 to 360 lb K2O) in the above-ground biomass at harvest.

Figure 9.—Basin sweet corn above-ground biomass (dry matter) and nitrogen accumulation. Corn was planted May 27 in 30-inch rows, and a stand of 26,000 plants/a was achieved. The V5 to V6 development stage occurred on July 1, and silk emergence was noted July 29. Corn was harvested August 31, 2009.

Figure 10.—Golden Jubilee sweet corn daily above-ground biomass (dry matter) and nitrogen accumulation.

Figure 11.—Coho sweet corn daily above-ground biomass (dry matter) and nitrogen accumulation.
Midseason N application

Adequate N supply is extremely important between the 10-leaf stage and the time silk appears. A shortage of N during rapid growth and N uptake cannot be overcome by adding fertilizer N late in the growing season. An adequately fertilized sweet corn crop will not produce additional yield if fertilized with N after the appearance of silk. Late-season N fertilization increases the risk of N loss before the next cropping season.

To ensure adequate N during the period of rapid growth, apply N, if needed, shortly after the corn has five or six leaves. Use plant development (not the calendar) to determine when to apply N.

The need for midseason N application depends on the soil’s supply of plant-available N (PAN) at this time. As the soil warms, microbes convert organic N to the plant-available nitrate (NO₃-N) form through a process known as mineralization. Because this process depends on a number of soil and environmental factors, preplant soil testing is usually not an accurate predictor of midseason PAN supply.

To predict the need for midseason N application, the N that becomes available early in the growing season should be measured. This measurement can be made with the pre-sidedress nitrate test (PSNT). It measures NO₃-N during the growing season, after some N has become plant-available, but before the period of the crop’s greatest need. In western Oregon, using the PSNT when sweet corn has five or six leaves is an excellent indicator of the need for additional N (Table 10).

The PSNT is a good indicator of “rotation effects” on PAN supplied from crop residues. Higher PSNT values are typically found in sweet corn fields following previous legume or grass seed crops, and lower PSNT values are found following cereals. For example, the PSNT can be used in western Oregon when sweet corn is planted following grass grown for seed. Perennial ryegrass roots contain approximately 75 lb N/a, and decomposing grass crowns and roots can provide a substantial amount of the sweet corn N requirement.

When using the PSNT to guide sidedress N fertilizer rate, you do not need to “credit” the N provided or immobilized by a previous crop, as recommended in older fertilizer guides and some industry handbooks. The more accurate PSNT test eliminates the need for “credits” by directly measuring PAN.

Unfortunately, the PSNT often overestimates N supply when sweet corn is planted in western Oregon soils such as Newberg and Cloquato. See “PSNT creation and limitations” (page 11) for more information.

To perform the PSNT, collect a soil sample between the rows to a depth of 12 inches when corn has five or six leaves (whorl center is approximately 12 inches high; see Figure 12) and send to a laboratory for nitrate-N analysis. See “Directions for PSNT” (page 11) for sampling instructions.

The sidedress N application can be “split” by applying N immediately before more than one irrigation. No advantage was measured for this practice. See “Four questions about N management of sweet corn” (pages 5–6) for more information.

Table 10.—Sidedress N rate for sweet corn grown in western Oregon based on the pre-sidedress nitrate soil test (PSNT).

<table>
<thead>
<tr>
<th>PSNT (lb N/a)</th>
<th>Sidedress N rate (lb N/a)</th>
<th>PSNT (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>165</td>
<td>3</td>
</tr>
<tr>
<td>20</td>
<td>155</td>
<td>6</td>
</tr>
<tr>
<td>30</td>
<td>145</td>
<td>9</td>
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<tr>
<td>40</td>
<td>135</td>
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<td>50</td>
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<td>60</td>
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<td>90</td>
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<td>100</td>
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<tr>
<td>130</td>
<td>45</td>
<td>37</td>
</tr>
<tr>
<td>140</td>
<td>40⁴</td>
<td>40</td>
</tr>
<tr>
<td>150</td>
<td>40⁴</td>
<td>43</td>
</tr>
<tr>
<td>160</td>
<td>40⁴</td>
<td>46</td>
</tr>
<tr>
<td>170</td>
<td>40⁴</td>
<td>49</td>
</tr>
<tr>
<td>180</td>
<td>40⁴</td>
<td>51</td>
</tr>
</tbody>
</table>

Table 10.—Sidedress N rate for sweet corn grown in western Oregon based on the pre-sidedress nitrate soil test (PSNT).

aTest results are preferred in pounds per acre (lb/a) but also expressed in parts per million (ppm). Assumed bulk density of 1.3 g/cm³ so that ppm x 3.5 = lb/acre-foot.

bMinimum rate to ensure sufficient N. No N may be needed with this PSNT value if N fertilizer was applied at planting. The recommended minimum sidedress N fertilizer rate (40 lb/a) is to ensure an adequate supply of N while growers are developing experience with the combination of field, year, and variety.

Figure 12.—Collect soil samples for the PSNT when corn has five or six leaves (whorl center is approximately 12 inches high). Collect the soil sample between rows, away from fertilizer bands.
Directions for PSNT

1. Sample soil when the corn has five collared leaves or at least a week before planned sidedressing. This usually coincides with a plant height of about 12 inches at the center of the whorl.
2. Collect the soil sample between rows, away from fertilizer bands. Avoid irregular areas, such as low areas or field entrances.
3. Sample soil to a depth of 12 inches.
4. Collect a composite sample of 15 to 20 cores. The more cores you collect, the better your chance of getting an accurate measurement.
5. Mix the sample thoroughly in a clean container. Fill a soil sample bag with a subsample of the mixed soil.
6. Send the sample to a soil testing laboratory to be analyzed for nitrate-N (NO₃-N). Deliver the sample immediately. To avoid shipping delays over the weekend, do not mail samples on Thursday or Friday. Changes in results are likely to occur when the soil is warmed.
7. Request results in pounds per acre (lb/a).
8. Use Table 10 (page 10) to determine midseason ( sidedress) N application rate.

PSNT creation and limitations

The PSNT was created in Vermont to determine whether silage corn fields with repeated manure applications provided ample amounts of N for corn production. It was designed to answer the question, “Do I need topdress N?” The answer was “yes” or “no.” If N was not sufficient, no recommended rate was provided.

Use of the PSNT has moved beyond fields regularly receiving manure; the test is now used as a reliable predictor of sidedress N rate for silage and grain corn in eastern and midwestern states and in western Oregon, as well as for fresh-market sweet corn in New Jersey, pumpkins and squash in Connecticut, and lettuce in California.

The PSNT was evaluated in western Oregon fields of Jubilee sweet corn from 1995 through 1998 and in 2009 with Coho, Basin, Rogers 1477, and Jubilee varieties. The testing from 1995 through 1998 (30 fields, with highest yield of 14 t/a) showed that when the PSNT soil test was less than 135 lb NO₃-N/a, sweet corn yield always increased from addition of sidedress N. When the PSNT was above 175 lb NO₃-N/a, sidedress N increased yield less than 2.5 percent compared to no sidedress N application. When the PSNT was between 135 and 175 lb/a, sidedress N increased yield 50 percent of the times it was applied.

In 2009, the PSNT value did not exceed 50 ppm (approximately 175 lb NO₃-N/a) in any of our trials. Since a mature sweet corn crop at harvest contains 175 to 225 lb N/a in the above-ground biomass, an application of some sidedress N is prudent at this soil test level.

Limitations

The PSNT incorrectly predicted that no additional N fertilizer was needed in 2 of 30 field-scale tests from 1995 to 1998. Both fields had a sandy or gravelly soil and were Newberg or Cloquato series. The PSNT should be used with extreme caution on these soils. The PSNT also incorrectly predicted the need for additional fertilizer in six fields. These situations, however, represent little risk to the grower, as the test called for about the same amount of N that would have been applied in the absence of a soil test.

If you have a field in which the PSNT is not expected to adequately predict a sidedress N rate, you can estimate N rate by the following approach:

- At harvest, a sweet corn crop contains between 175 and 225 lb N/a in the above-ground biomass. Soil will supply at least 50 lb N/a, with 75 to 100 lb N/a being typical. The remainder, an average of 100 lb N/a, should be supplied with fertilizer.
- To supply 100 lb N/a to the crop, apply a maximum of 200 lb N/a. A lower rate is usually adequate. A rate of 200 lb N/a was not needed to produce top yield in any research work and is likely necessary only when management changes (e.g., fertilizer application timing or irrigation) are made. Figure 5 (page 5) shows that even in a very N-deficient situation, only 150 lb N/a is usually necessary.
- Reduce N fertilizer rates when corn follows a winter legume cover crop. Table 14 (page 16) gives estimates of N fertilizer replacement value of winter cover crops.
Managing PAN from organic amendments and cover crops

Organic amendments (manures, composts, and other by-products) are applied to sweet corn in both conventional and organic production systems. The nutrient-supplying capability of amendments is similar in all sweet corn cropping systems. USDA Organic and other certification programs restrict the type of amendments allowed for sweet corn production. Check with your certifier before introducing new amendments to your cropping system.

When organic amendments and cover crops are included in a sweet corn rotation, the need for N fertilizer is reduced. Plant-available nitrogen (PAN) is the end product of organic material decomposition in soil. All soils contain the microbial life needed to transform organic N to plant-available forms (ammonium-N and nitrate-N), regardless of whether conventional or organic management is practiced.

Not all of the organic N applied to soil becomes plant-available. Some of it remains in organic forms (soil organic matter) for years, and some can be lost to leaching or as gas. The timing of PAN release following amendment application or cover crop termination depends on the kind of organic material and its decomposition rate in soil.

Many organic materials strongly affect PAN immediately after application, as decomposition is most rapid at that time (short-term effects). Three to 5 years of increased organic inputs are usually required to “build soil” to a higher baseline level of PAN (long-term effects). Higher baseline PAN results from higher N mineralization rates throughout the growing season (not just a “bump” in PAN several weeks after a one-time application) and is usually associated with increased soil organic matter.

See the “Organic summary” sidebar for a practical approach to nutrient applications when organic amendments are used. The following sections describe in detail how to account for the effect of organic material addition on PAN supply for sweet corn. This information can help you fine-tune your nutrient management practices.

Credits for PAN provided by organic inputs

To determine how much N fertilizer is needed, you must take into account the amount of N supplied by organic inputs. Three general approaches are used for “crediting” or “accounting for” PAN from organic amendments applied before seeding sweet corn:

- Credits based on manure type and amount applied
- Credits based on laboratory analysis of amendments
- In-season soil testing (PSNT)

The “manure type” or “laboratory analysis” methods are valuable in choosing among options to increase short-term PAN from organic sources. The PSNT measures changes in both short-term and long-term PAN in response to organic amendment input rate, type, and time of application.

Organic summary

Lime
- Maintain pH between 5.8 and 6.2.

Nitrogen
- Cropping systems that use exclusively organic sources (legume cover crops, manures, and composts) to supply plant-available N (PAN) typically require preplant N management decisions.
- Sweet corn under conventional management (no organic inputs) requires 100 to 150 lb PAN per acre (from N fertilizer).
- During the first years of organic management, use the OSU Cover Crop and Organic Fertilizer Calculator (or other PAN estimation method) to supply 100 to 150 lb PAN from winter cover crops and organic fertilizers.
- Collect midseason soil samples following the PSNT sampling instructions (page 11) to determine whether N supply was deficient, adequate, or excessive for sweet corn production.
- Gradually reduce N inputs in successive years as you gain confidence that organic inputs are meeting crop N needs. After 3 to 5 years of organic management, annual inputs equivalent to 50 to 75 lb PAN/acre are typically adequate for sweet corn production.

Other nutrients
- Compost or manure applications provide P, K, S, and micronutrients. The nutrient value of P, K, and micronutrient inputs can be monitored via soil testing. (Soil testing for S is not recommended.) Winter legume cover crops (or legume + cereal cover crops) can be used to provide additional PAN without increasing the levels of other nutrients in soil to excessive levels.
- All of the P, K, and S in composts and manures is considered plant-available (equivalent to fertilizer nutrients). Inorganic sources of nutrients (rock phosphate, greensand, etc.) are less than 100 percent plant-available.

OSU Organic Fertilizer and Cover Crop Calculator

http://smallfarms.oregonstate.edu/calculator
Credits based on manure type and amount applied

Table 11 shows N analyses for amendments available for use on sweet corn in western Oregon. These organic amendments fall into three groups: specialty products, “fresh” manures, and compost.

Specialty products sold for organic farming include fish by-products, seed meals, and feather meal. These materials typically contain more than 6 percent total N (dry weight basis) and have a low C:N ratio (less than 10:1). Decomposition in soil is rapid, and full-season PAN is more than 75 percent of the total N applied.

“Fresh” (not composted) solid animal manures and high-N crop residues vary considerably in PAN release, depending on source and storage/handling methods. They usually contain 3 to 5 percent total N and have full-season PAN of 25 to 50 percent of total N applied. Local research with sweet corn showed that PAN for broiler litter averaged 40 to 50 percent of total N applied. Decomposition and PAN release were rapid for both fresh and “composted” litter.

Note that about 10 to 25 percent of the total N in fresh solid manures is ammonium-N. To “trap” the ammonium-N in the soil (prevent ammonia loss to the atmosphere), till immediately following application.

Composted manures or plant materials increase soil organic matter because they are resistant to decomposition, but they typically release only small amounts of PAN (5 to 10 percent of total N) during the first growing season (Figure 13).

Credits based on laboratory analysis

The OSU Cover Crop and Organic Fertilizer Calculator can be used to estimate PAN for a variety of solid organic amendments. To use the Calculator, you’ll need to indicate whether the material is composted or fresh and provide an estimate of dry matter (percent) and total N (percent of dry weight) in the organic amendment.

The Calculator estimates PAN release as a function of total N (percent dry weight, Figure 14a, page 14). Predicting PAN based on C:N ratio yields similar results (Figure 14b). The Calculator uses total N percentage as the predictor because this analysis is routinely provided as part of a fertilizer guarantee or laboratory N analysis, and because amendment C percentage is similar (35 to 45 percent) across many kinds of fresh organic amendments.

Liquid or slurry manures are rarely

Table 11.—Characteristics of organic amendments available in western Oregon and Washington.*

<table>
<thead>
<tr>
<th>Organic amendment</th>
<th>Dry matter (%)</th>
<th>Total N (%)</th>
<th>C:N ratio</th>
<th>NH₄-N (%)</th>
<th>Decomposition (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialty products</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canola meal</td>
<td>98</td>
<td>6</td>
<td>8</td>
<td>0.0</td>
<td>82</td>
</tr>
<tr>
<td>Feather meal</td>
<td>95</td>
<td>14</td>
<td>4</td>
<td>0.2</td>
<td>92</td>
</tr>
<tr>
<td>Pelleted fish by-product</td>
<td>96</td>
<td>9</td>
<td>5</td>
<td>0.1</td>
<td>99</td>
</tr>
<tr>
<td>Manure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broiler litter</td>
<td>75</td>
<td>4</td>
<td>10</td>
<td>0.6</td>
<td>57</td>
</tr>
<tr>
<td>Bagged broiler litter</td>
<td>78</td>
<td>4</td>
<td>8</td>
<td>0.6</td>
<td>39</td>
</tr>
<tr>
<td>Broiler litter “compost”</td>
<td>66</td>
<td>4</td>
<td>9</td>
<td>0.7</td>
<td>47</td>
</tr>
<tr>
<td>Dairy solids</td>
<td>20</td>
<td>2</td>
<td>27</td>
<td>0.2</td>
<td>62</td>
</tr>
<tr>
<td>Rabbit manure</td>
<td>25</td>
<td>3</td>
<td>12</td>
<td>0.8</td>
<td>66</td>
</tr>
<tr>
<td>Compost</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Dairy solids compost</td>
<td>23</td>
<td>2</td>
<td>21</td>
<td>0.1</td>
<td>27</td>
</tr>
<tr>
<td>Rabbit manure compost</td>
<td>43</td>
<td>2</td>
<td>10</td>
<td>0.0</td>
<td>9</td>
</tr>
<tr>
<td>Yard trimmings compost</td>
<td>57</td>
<td>2</td>
<td>17</td>
<td>0.1</td>
<td>11</td>
</tr>
</tbody>
</table>

*Source: Gale 2005.

*b Decomposition of organic amendment in soil measured in laboratory incubation for 70 days at 72°F. Most of the organic matter in composts does not decompose readily and is not immediately available to plants. The amount of PAN released from rapidly decomposing amendments depends on C:N ratio or total N percentage. PAN is released from rapidly decomposing amendments with a C:N ratio of less than 15 or amendment total N greater than 2 percent. See Table 12 (page 14) for PAN estimates.

*c Composts are stable organic materials with low decomposition rates. They have an earthy odor with no discernable ammonia odor.
used on sweet corn. When this type of manure is used, test for both ammonium-N and total N content. Liquid or slurry manure typically contains 30 to 90 percent of its total N as ammonium-N at application and is managed more like an inorganic N fertilizer than manure.

**In-season soil testing (PSNT)**

The most efficient use of N from organic amendments is to combine amendment application with use of the PSNT. Use the organic amendment to supply approximately 50 percent of the crop N requirement, and use the PSNT to determine additional N need (see “Midseason N application,” page 10). This approach provides sufficient N for early crop growth, while minimizing the opportunity for PAN loss via leaching or denitrification. The PSNT is an integrated, site-specific measurement of N mineralized from all sources (soil organic matter + organic amendment + cover crop), and it has been validated locally with sweet corn in field trials where organic amendments were used (Figure 15).

Nitrogen management based on the PSNT is difficult to implement within certification systems such as USDA Organic, which prohibit application of urea and other inorganic N fertilizers. A few pelleted high-N specialty products (e.g., fish meal, feather meal) can be used as a sidedress N fertilizer under USDA Organic rules, but N release is slower than that from urea, and these products are expensive.

**Timing of PAN release from organic amendments**

Specialty products and high-N manure (e.g., broiler litter) release PAN quickly after application (Table 12, page 15). In field trials with sweet corn, organic amendments were applied on approximately May 1 for a June 1 corn seeding. Typical PAN release from these materials was 50 percent of full-season release 3 weeks after application (May 24) and 75 percent of full-season release at the six- to eight-leaf stage (June 30).

Some manures, such as separated dairy solids or horse manure + bedding, are relatively low in N (less than 2 percent total N). They typically cause a temporary decrease in PAN for 4 to 6 weeks following spring application, as PAN is consumed by soil microbes during the decomposition process. These products provide only a small amount of PAN during the first growing season (Table 12). Apply these materials at least 4 weeks prior to spring planting. They can also be fall applied, as they do not increase the risk of nitrate leaching.

For example, in western Oregon/Washington sweet corn trials, preplant application of 15 dry ton/a of separated dairy solids resulted in PSNT values of less than 10 ppm nitrate-N. The crop was N-deficient at the four- to six-leaf stage. To avoid early-season N deficiency when using dairy solids (or other amendments having total N concentrations less than 2 percent), we recommend additional preplant N fertilizer application.

![Figure 14](image1.png)

Figure 14.—Relationship between plant-available N (PAN) and total N (Figure 14a) or C:N ratio (Figure 14b) in organic amendments applied before planting. Each point represents one site-year in field studies with sweet corn. PAN was determined by fertilizer equivalency method using sidedress urea as the “equivalent” N source (Gale 2005). The “calculator” line in Figure 14a represents the prediction equation for full-season PAN used in the OSU Cover Crop and Organic Fertilizer Calculator (Andrews et al. 2010).

![Figure 15](image2.png)

Figure 15.—Relationship between PSNT soil test and sweet corn ear yield (North Willamette Research and Extension Center, Aurora, OR). Each data point represents average for a preplant organic amendment treatment. Treatments included broiler litter, dairy solids, rabbit manure, peppermint hay, fresh yard trimmings from urban landscapes, and various composts. Results were consistent over 2 years. Source: Gale 2005.
Compost PAN is small and usually can be ignored when compost application rates are less than 5 dry ton/a. Typical estimates for PAN from compost are 5 to 10 percent of its total N content. Thus, a compost with 2 percent total N (dry matter basis) supplies about 2 to 4 lb PAN/dry ton. Testing compost for C:N ratio and inorganic N (ammonium + nitrate-N) can assist in determining PAN. Figure 14b shows that composts with C:N ratios near 10 supply up to 20 percent PAN during the first growing season. When the compost C:N ratio is above 20, first-year PAN is near zero.

Cumulative effects of organic amendment additions

Organic N not mineralized during the first season following manure or compost application contributes to an increase in the potential for long-term soil N mineralization. When organic inputs are applied annually, soil N mineralization potential increases to a new “equilibrium” value that is typically two to three times greater than that in comparable soils fertilized with inorganic N fertilizers.

In a sweet corn field trial at Aurora, OR, N mineralized in the year following solid compost or solid manure application was equivalent to approximately 6 percent of the total organic N applied (Table 13). A 10- to 15-t/a dry matter application rate supplied approximately 500 lb/a of organic N, and 6 percent was plant-available in year 2 (30 lb N/a). Mineralization of organic N continues for at least 3 to 5 years after application of a high rate of compost or solid manure.

Crediting PAN from cover crops

Winter cover crops (Figures 16 and 17, page 16) are sometimes planted in rotation with sweet corn to improve soil quality, reduce soil erosion during winter, or provide other benefits. Depending on management goals, growers

<table>
<thead>
<tr>
<th>Organic amendment</th>
<th>Number of field trials</th>
<th>Preplant PSNT (lb/dry ton)</th>
<th>Midseason PSNT (lb/dry ton)</th>
<th>At harvest (full season) (lb/dry ton)</th>
<th>At harvest (full season) (lb/wet ton)</th>
<th>At harvest (full season) (% of total N applied)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Specialty products</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Canola meal</td>
<td>1</td>
<td>37</td>
<td>62</td>
<td>62</td>
<td>61</td>
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<tr>
<td>Feather meal</td>
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<td>114</td>
<td>117</td>
<td>256</td>
<td>242</td>
<td>99</td>
</tr>
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<td>Pelleted fish by-product</td>
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<td>119</td>
<td>140</td>
<td>160</td>
<td>153</td>
<td>77</td>
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<tr>
<td><strong>Manure</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broiler litter</td>
<td>4</td>
<td>15</td>
<td>22</td>
<td>31</td>
<td>23</td>
<td>42</td>
</tr>
<tr>
<td>Bagged broiler litter</td>
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<td>10</td>
<td>18</td>
<td>40</td>
<td>31</td>
<td>47</td>
</tr>
<tr>
<td>Broiler litter “compost”</td>
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<td>19</td>
<td>18</td>
<td>29</td>
<td>19</td>
<td>38</td>
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<tr>
<td>Dairy solids</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Rabbit manure</td>
<td>2</td>
<td>6</td>
<td>10</td>
<td>16</td>
<td>4</td>
<td>27</td>
</tr>
<tr>
<td><strong>Compost</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dairy solids compost</td>
<td>5</td>
<td>0</td>
<td>-1</td>
<td>1</td>
<td>0.3</td>
<td>3</td>
</tr>
<tr>
<td>Rabbit manure compost</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>22</td>
</tr>
<tr>
<td>Yard trimmings compost</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

aIn-season PAN determined by soil sampling approximately 20 days after applying and tilling in amendments (preplant, May 24) and after 60 days (midseason, PSNT, June 30). Full-season PAN at harvest (120 days, September 7) determined via fertilizer equivalency method, using sidedress urea application as the “equivalent” N fertilizer. Field trials conducted at Aurora, OR and Puyallup, WA. Source: Gale 2005.

Table 13.—Nitrogen fertilizer replacement value of solid organic amendments during second growing season after application.

<table>
<thead>
<tr>
<th>Amendment</th>
<th>Application rate, 2003 (dry ton/a)</th>
<th>Total N applied, 2003 (lb/a)</th>
<th>Fertilizer N replacement value, 2004 (lb urea-N/a) (%) of total N applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy solids</td>
<td>15</td>
<td>550</td>
<td>31</td>
</tr>
<tr>
<td>Rabbit manure</td>
<td>7</td>
<td>310</td>
<td>11</td>
</tr>
<tr>
<td>Yard trimmings</td>
<td>10</td>
<td>390</td>
<td>30</td>
</tr>
<tr>
<td>Pepperminta</td>
<td>9</td>
<td>620</td>
<td>30</td>
</tr>
</tbody>
</table>

aAveraged across fresh and composted amendments at two field locations (Aurora, OR and Puyallup, WA). N fertilizer replacement value determined in field trial, relative to sidedress urea application. Source: Kusonwiriyawong 2005.

bPeppermint at Aurora, OR location only.
sometimes kill winter cover crops in late March or allow growth to continue until mid-May (boot stage for cereals). The amount of cover crop biomass varies considerably, depending on cover crop species and the date of cover crop termination.

The effect of a cover crop on N fertilizer requirements for the sweet corn crop can be estimated using the OSU Organic Fertilizer and Cover Crop Calculator (see Table 14 and Andrews and Sullivan 2010). The Calculator predicts PAN provided by cover crop decomposition at approximately 10 weeks following spring cover crop termination via spraying, rolling, or flailing.

The quantity of PAN release increases with cover crop N concentration. Predicted PAN is lowest for mature cereal cover crop residues (1 percent N) and highest for leafy legume residues (3 to 4 percent N).

The rate of PAN release following cover crop termination also increases with cover crop N concentration. Legume cover crops (3 percent N or more) release most of their PAN during the first 4 weeks after the spring kill date. Cereal-legume cover crop mixes usually contain 2 to 3 percent total N and release PAN more slowly. Because cover crops decompose rapidly in soil, most of the effect of a winter cover crop on PAN supply for sweet corn is reflected in the soil nitrate-N value observed at PSNT sampling time in late June or early July.

Winter cereal cover crops without a legume typically contain less than 2 percent total N when grown to boot stage. They usually require extra preplant or sidedress N fertilizer application to compensate for N consumed by microbes (N immobilization).

Recent research demonstrated that an oat cover crop grown to reproductive stage (mid-May) improved corn yields by suppressing root rot (Miyazoe 2007). However, the oat cover crop (5 ton dry matter/a, total N = 0.9 percent, C:N=50:1) reduced PAN. This trial demonstrated that an additional 40 lb/a of sidedress N fertilizer was required to compensate for N immobilized by decomposition of the cover crop.

### Table 14.—Predicted plant-available N release at 4 and 10 weeks after cover crop termination.\(^a\)

<table>
<thead>
<tr>
<th>Cover crop residue</th>
<th>Predicted PAN from cover crop decomposition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 week</td>
</tr>
<tr>
<td></td>
<td>(% of residue total N)</td>
</tr>
<tr>
<td>Total N (% N, dry wt)</td>
<td>Approximate C:N(^b)</td>
</tr>
<tr>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
</tr>
</tbody>
</table>

\(^a\)Predictions based on correlations between cover crop total N concentration and PAN release. PAN estimate for 4 weeks based on laboratory incubation and Willamette Valley field data (Andrews and Sullivan, unpublished). PAN estimates for 10 weeks after kill date made via Vigil and Kissel (1991) prediction equation. This equation is used by the OSU Organic Fertilizer and Cover Crop Calculator: PAN (% of cover crop total N) = -53.44 + 16.98 (cover crop \%N x 10)\(^1\).

\(^b\)Approximate C:N ratio for cover crop residue containing 40 percent C (typical value).
Mixed species cover crops with a significant legume component (greater than 20 percent of cover crop dry matter) typically contain more than 2 percent total N. They usually do not require extra preplant N application to compensate for N consumed by microbes (N immobilization).

**Example: Rapid PAN release from legume cover crop**

Winter cover crops (clover/vetch + phacelia) in an on-farm trial were killed in April. In early June, soil (0- to 4-inch depth) was collected and placed in open-top tubes (microplots). The microplot tubes were then replaced in the field to measure nitrate-N accumulation in the absence of root growth and leaching. Measurements were taken at 2-week intervals throughout the summer (Figure 18). This trial demonstrated the following:

- The winter cover crop (containing legumes) increased soil nitrate-N measured at the first sampling in June.
- Soil continued to mineralize N (convert N from organic forms to nitrate-N) throughout the summer.
- The winter cover crop did not affect the rate of soil N mineralization (slope of the lines in Figure 18) during summer.

**Conclusion:** The effect of a cover crop on N supply for sweet corn can be measured using the PSNT test (typically taken in late June).

**Winter cover crops following sweet corn reduce N leaching**

Fall-planted cereal cover crops (following sweet corn) can capture some of the soil nitrate that would otherwise be leached out of the root zone during the winter.

The beneficial effect of cereal rye or tritcale + common vetch cover crops in reducing N loss via leaching has been demonstrated in a long-term field trial (Table 15). At a high N fertilizer rate for sweet corn, annual leachate loss of nitrate-N was reduced by 25 lb N/a with a winter cereal cover crop. At fertilizer N rates that provided for efficient crop use of fertilizer N (50 lb N/a), the cover crop reduced annual postharvest N leaching by 6 lb N/a. Some nitrate-N was lost in leachate (annual loss of 12 lb N/a) even when the field did not receive N fertilizer for 12 consecutive years and corn was followed with a winter cover crop.

This long-term trial illustrated:

- Nitrate-N concentrations in leachate under sweet corn were close to the public health limit for drinking water (10 mg N/L).
- Winter cereal cover crops removed some of the nitrate from the soil, reducing the amount of nitrate-N leached.
- Nitrate leaching increased with N fertilizer application rate. Only two N fertilizer rates were evaluated: low (50 lb N/a) and high (200 lb N/a).

**Table 15.—Effect of fertilizer N application rate and winter cover crop on N loss via leaching following sweet corn.**

<table>
<thead>
<tr>
<th>Fertilizer N rate for sweet corn (lb/a)</th>
<th>Leachate nitrate-N concentration (mg/L or ppm)</th>
<th>No winter cover crop</th>
<th>Cover cropb</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>50</td>
<td></td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>200</td>
<td></td>
<td>15</td>
<td>9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Annual nitrate-N loss via leaching (lb/a)</th>
<th>No winter cover crop</th>
<th>Cover cropb</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>20</td>
<td>12</td>
</tr>
<tr>
<td>50</td>
<td>28</td>
<td>22</td>
</tr>
<tr>
<td>200</td>
<td>60</td>
<td>35</td>
</tr>
</tbody>
</table>


bCover crop following sweet corn was cereal rye (1992–1998) or tritcale + common vetch (2000–2002). Winter cover crop was seeded in late September/early October following corn and was killed in late March/early April. Corn ear yield response to N fertilizer was the same with or without a winter cover crop.
Crop N uptake response curves from other N fertilizer rate trials conducted at the same location (NWREC, Figure 19) suggest that nitrate leaching for N fertilizer rates from 50 to 150 lb N/a would be comparable, because sweet corn takes up N efficiently with N fertilizer application rates up to 150 lb/a.

Keep in mind that cover cropping as a nitrate “scavenging” strategy has an important practical limitation—the date of corn harvest. Cover crops establish best when seeded in September or early October. Cover cropping is difficult to implement as a nitrate trapping strategy when corn harvest occurs after October 1.

Postharvest N monitoring

Two approaches have been evaluated in Oregon for postharvest N testing: stalk nitrate-N and soil nitrate-N testing. Both tests are designed to assess whether the overall plant-available N supply for the crop (from organic inputs, fertilizer, irrigation water, and N mineralized from soil organic matter) was excessive. Of the two end-of-season tests, the postharvest soil nitrate test is the most useful and reliable.

Postharvest tests will not indicate whether N supply was deficient or adequate. When building an N monitoring program, we recommend that you start with the pre-sidedress nitrate test (see pages 10–11). The PSNT gives more useful information than do postharvest tests.

Postharvest testing has the most value where organic inputs supply N because accurate predictions of the timing and amount of plant-available N supply are difficult with these materials.

Postharvest soil nitrate-N

The postharvest nitrate test is used to diagnose accumulation of excess N at the end of the season. Excess N accumulates when plant-available N supplied from all sources exceeds crop capacity for N uptake.

Collect soil (0- to 12-inch depth) immediately following harvest. When rainfall follows harvest and substantial crop residue decomposition occurs, soluble N may move from decomposing leaves into soil. This soluble N may add nitrate-N not present at harvest time, confounding test interpretation.

The effect of N fertilizer application rate on postharvest nitrate-N has been measured in a number of on-farm and experiment station field trials.

Based on these trials, we can say that when a NO$_3$-N test for the top foot of soil is above 15 ppm (50 lb/a), N supply from all sources was probably greater than needed for maximum ear yield.

An example of the relationship between N fertilizer rate, crop N uptake, and postharvest soil nitrate is shown in Figure 19. Maximum ear yields occurred with 100 to 200 lb N/a in these trials. At N fertilizer rates of 0 to 150 lb N/a, sweet corn was efficient in N uptake, and postharvest nitrate-N was less than 50 lb N/a (15 ppm N). At the highest N fertilizer rate (200 lb N/a), postharvest nitrate-N averaged 75 lb/a and had the most variability (range of 43 to 123 lb/a).

Although a relationship has been shown between N fertilizer rate or N supply and postharvest soil NO$_3$-N, keep in mind that soil NO$_3$-N is linked with irrigation practices. Low NO$_3$-N values at harvest may be a result of excess irrigation.

Stalk nitrate test

Trials specifically designed to calibrate the end-of-season stalk nitrate test have not been performed in Oregon. Some stalk nitrate-N data have been collected for Golden Jubilee as part of field experiments designed to evaluate the PSNT or other aspects of N management. Stalk nitrate in other varieties has not been evaluated.

For Golden Jubilee, end-of-season NO$_3$-N in a 6-inch section of stalk beginning about 6 inches from the soil was evaluated at NWREC in 1995 and 1996 and in grower fields during 1997 and 1998. In these trials, end-of-season stalk NO$_3$-N above 8,000 ppm was necessary to produce top yield in most fields. In a few fields, top yields were produced with postharvest stalk nitrate values below 8,000 ppm. These data illustrate the difficulty and lack of utility of the postharvest stalk nitrate-N test for assessment of N adequacy. Stalk NO$_3$-N concentration above 8,000 ppm seemed to be adequate, but a value lower than 8,000 ppm also sometimes appeared to be sufficient.

Because stalk nitrate decreases as a corn plant matures, interpretive values for silage or grain corn are not valid for sweet corn. Optimum values listed for sweet corn stalk nitrate-N from other regions are probably not useful in Oregon. For example, trials in New Jersey demonstrated that sweet corn receiving sufficient N fertilizer had 16,000 to 22,000 ppm NO$_3$-N in the lower stalk at harvest.

Figure 19.—Above-ground crop N uptake (at ear harvest) and postharvest soil nitrate-N for Golden Jubilee sweet corn. Combined data from 4 site-years: Puyallup, WA and Aurora, OR in 2003 and 2004. Nitrogen fertilizer (urea) was applied preplant (50 lb N/a), with the remainder of the N applied via sidedress at PSNT time. Source: Adapted from Gale (2005) and Kusonwiriayawong (2005).
Research on which this guide is based

• In 1964, approximately 90 sweet corn fields in Marion and Polk counties were sampled, and Zn in soil and tissue was measured. This work provided recommendations for Zn application when the soil test for Zn is below 2 ppm.
• From 1963 through 1965, the interaction of lime, P, and Zn was investigated by James Hay and reported in his thesis.
• The effect of N-Serve on sweet corn yields was measured in Lane County during 1977 and 1978. Use of N-Serve did not increase sweet corn yield.
• A soil and plant tissue nutrient survey of sweet corn was conducted for the Willamette Valley in 1978.
• Applications of P, Cu, B, and lime were made from 1980 through 1982, and results are reported in David McAndrew’s dissertation.
• The pre-sidedress soil nitrate test (PSNT) was initiated in 1995 on large plots in Willamette Valley grower fields. This portion of the research concluded in 1998. A small plot measured yield of several varieties in one location during 2009.
• A series of plots at North Willamette Research and Extension Center (NWREC) measured aspects of N for sweet corn production beginning in 1985 and concluding in 1998. The data are available in annual reports on vegetable research at NWREC.
• In 2009, N rate, uptake, nitrification inhibitor, and biomass accumulation were measured for four sweet corn varieties on a small plot at the OSU Horticulture Farm.
• A long-term cover crop trial at NWREC (1991–2002), summarized by Feaga et al. (2010), measured leachate loss of nitrate-N from lysimeter plots. Additional soil and plant data from these trials were published by Richard Dick, John Selker, Del Hemphill, and graduate students in OSU EM 8803-E (Burket et al. 2003). Some of the earlier cover crop research by this group was published as EM 8728-E (Sattell et al. 1999).
• The effect of winter cover crops on root rot and fertilizer N requirement for sweet corn was investigated by Miyazoe (2007), working with Alexandra Stone.
• Research was conducted from 2002 to 2005 at NWREC and WSU-Puyallup to evaluate plant-available N release from a variety of locally available organic materials (manures, composts, crop residues, and specialty products). Results of these trials were published in M.S. theses (Gale 2005, Kusonwiriyawong 2005) and in Gale et al. (2006). Data collected in these studies were used to formulate the “organic fertilizer” portion of the OSU Organic Fertilizer and Cover Crop Calculator (Andrews et al. 2010).
• Field and laboratory data supporting the prediction equations employed within the OSU Organic Fertilizer and Cover Crop Calculator were recently published (Sullivan et al. 2010).

Current research: N response of newer corn hybrids

In 2009, yield from four varieties of sweet corn was measured with sidedress N rates ranging from 0 to 225 lb N/a at one small-plot trial at the OSU Horticulture Department experimental farm in Linn County. The rate recommended by the PSNT was 130 lb N/a. This rate produced optimum yield for Golden Jubilee and Coho (Figure 20). The varieties Basin and 1477 produced the same yield with no sidedress N. For Golden Jubilee, this research replicates earlier results and validates use of the PSNT. It also shows that the PSNT does not underestimate N requirement for any variety, although it overestimated N requirement for two newer varieties, Basin and 1477.

Figure 20.—Effect of sidedress N rate on ear yield for four sweet corn varieties. N rate recommendation (130 lb N/a) was based on PSNT. Source: Peachey and Hart (2009, unpublished).
For more information


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