Introduction
Since December 31, 2001, the state has required Maryland cut flower growers to have a nutrient management plan in place for producing their crop. University of Maryland Extension compiled the fertilizer recommendations that follow to serve as general guidelines for the nutrient management of commercial cut flower production. In developing nutrient management plans, growers should follow the recommended rates of fertilization provided here.

Using Nitrogen for Cut Flower Production
Nitrogen applications are needed annually for producing most cut flower species. The rate of application varies according to plant species. We have divided plant nitrogen requirements into three categories: low, medium and high. Cut flower plants started in the fall and harvested in the spring generally require less nitrogen than plants harvested in summer and fall. We have created a list of common cut flowers grown in Maryland with a rating assigned for “low”, “medium”, and “high” nitrogen requirements.

If you are using the higher rates of nitrogen on crops that flower over a long period of time, it may be beneficial to split the applications into two or more, especially if you are using water-soluble forms of nitrogen such as ammonium nitrate or urea. If you are using controlled-release nitrogen sources, make a single application early in the season.

Table 1. Nitrogen Application Rate Recommendations

<table>
<thead>
<tr>
<th>Nitrogen Range</th>
<th>Rate (lb N per 1,000 sq ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>1.0 - 1.5</td>
</tr>
<tr>
<td>Medium</td>
<td>1.5 - 2.0</td>
</tr>
<tr>
<td>High</td>
<td>2.0 - 3.0</td>
</tr>
</tbody>
</table>

Table 2. Cover Crops That Add Nitrogen

<table>
<thead>
<tr>
<th>Crop</th>
<th>Pounds per acre</th>
<th>Pounds per 1,000 sq ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perennial Crops</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alfalfa</td>
<td>100 - 150(^a)</td>
<td>2.3 - 3.4(^a)</td>
</tr>
<tr>
<td>Ladino clover</td>
<td>60</td>
<td>1.4</td>
</tr>
<tr>
<td>Red clover</td>
<td>40</td>
<td>0.9</td>
</tr>
<tr>
<td>Birdsfoot trefoil</td>
<td>40</td>
<td>0.9</td>
</tr>
<tr>
<td>Winter Annual Crops</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hairy Vetch</td>
<td>75 - 150(^b)</td>
<td>1.7 - 3.4(^b)</td>
</tr>
<tr>
<td>Crimson clover</td>
<td>50 - 100(^b)</td>
<td>1.2 - 2.3(^b)</td>
</tr>
<tr>
<td>Austrian winter peas</td>
<td>75 - 150(^b)</td>
<td>1.7 - 3.4(^b)</td>
</tr>
<tr>
<td>Summer Annual Crops</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lespedeza</td>
<td>20</td>
<td>0.5</td>
</tr>
<tr>
<td>Soybeans</td>
<td>15 - 40(^c)</td>
<td>0.3 - 0.9(^c)</td>
</tr>
</tbody>
</table>

If you are rotating leguminous cover crops with your cut flower crop, factor a nitrogen credit into the rate of application; this credit reduces the amount of chemical nitrogen that you have to apply.

\(^a\) Depends on stand; if stand is good (greater than 4 plants per square foot), credit 150 lb; if stand is fair (1.5 to 4 plants per square foot), credit 125 lb; if stand is poor (less than 1.5 plants per square foot), credit 100 lb.

\(^b\) Depends upon planting date and biomass production, kill date, and subsequent tillage.

\(^c\) A minimum of 15 lb. May be as much as 1 pound per bushel of soybeans up to a maximum of 40 lb.

Source: University of Maryland Agricultural Nutrient Management Program
Using Compost for Cut Flower Production
Before applying composted material to your cut flower growing site, find out the nutrient content of your sources of organic nutrients, including composted manure, by having the sources tested by a soil testing lab. Soil testing is available through private testing laboratories. A list is available by going to http://www.hgic.umd.edu/content/documents/HG110SelectingandUsingaSoilTestLab.2011.pdf. By examining the organic nitrogen and ammonium nitrogen content of manures and compost, nutrient management consultants can determine the plant-available nitrogen content.

These nutrient values of manure sources are only averages. Regulations require that growers test the manure and compost for nutrient content. All manure values are based on wet weight.

Nitrogen Rates for Woody Cut Stems
For producing cut woody flowering stems such as forsythia, flowering quince, sparkleberry, pussy willow, and flowering cherry, use nitrogen rates of 2 to 4 lb/1,000 sq ft for optimum rates of growth. Phosphorus and potassium recommendations are the same as those for cut herbaceous plant materials.

Using Phosphorus and Potassium for Cut Flower Production
University of Maryland Extension’s relative crop categories describe crop availability of a given nutrient as: low, medium, optimum, and excessive.

Low: nutrient concentration in the soil is inadequate for optimum growth of cut flowers and all other crops.

Optimum: nutrient concentration in the soil is adequate for optimum growth of all cut flowers.

Excessive: nutrient concentration exceeds what is adequate for optimum growth of cut flowers and most other crops.

Greenhouse Production of Cut Flower Transplants for Farm Use Only
Preventing runoff from your greenhouse depends on where you site the building(s) and how you manage the operation. If you produce any plants for sale off the farm, you must have a nutrient management plan and a risk assessment for the greenhouse.

If you use your greenhouse to start transplants for use only on the farm, you must record the following information; however, your plan need only include the total amount of fertilizer used for transplant production:

- Production season
- Number of greenhouses used in transplant production
- Total square feet of greenhouse space in production
- Transplant species grown
- Substrate (components and percentage) used
- Production months
- Flats or container size

Irrigation methods used:

- Hand watering with hose
- Subirrigation
- Overhead sprinklers
- Other methods

Fertilizer analysis used:

- Amount of fertilizer used per season
- Injector setting
Table 3. Compost Nutrient Values

<table>
<thead>
<tr>
<th>Manure type</th>
<th>N</th>
<th>NH₄</th>
<th>P₂O₅</th>
<th>K₂O</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poultry</td>
<td>2.88</td>
<td>0.73</td>
<td>3.17</td>
<td>2.05</td>
<td>0.40</td>
</tr>
<tr>
<td>-broiler</td>
<td>2.22</td>
<td>0.69</td>
<td>2.91</td>
<td>1.89</td>
<td>0.26</td>
</tr>
<tr>
<td>-caged layer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dairy</td>
<td>0.61</td>
<td>0.12</td>
<td>0.37</td>
<td>0.61</td>
<td>0.08</td>
</tr>
<tr>
<td>-solid</td>
<td>0.31</td>
<td>0.11</td>
<td>0.17</td>
<td>0.26</td>
<td>0.03</td>
</tr>
<tr>
<td>-liquid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swine</td>
<td>1.05</td>
<td>0.26</td>
<td>1.12</td>
<td>0.64</td>
<td>0.12</td>
</tr>
<tr>
<td>-solid</td>
<td>0.47</td>
<td>0.18</td>
<td>0.29</td>
<td>0.18</td>
<td>0.04</td>
</tr>
<tr>
<td>-liquid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horse</td>
<td>0.51</td>
<td>0.03</td>
<td>0.36</td>
<td>0.42</td>
<td>0.09</td>
</tr>
</tbody>
</table>

Table 4. Phosphorus Ranges

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>Medium</th>
<th>Optimum</th>
<th>Excessive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphorus lb/a P₂O₅</td>
<td>0-61</td>
<td>62-102</td>
<td>103-205</td>
<td>&gt;205</td>
</tr>
<tr>
<td>Phosphorus index value</td>
<td>0-25</td>
<td>26-50</td>
<td>51-100</td>
<td>&gt;100</td>
</tr>
<tr>
<td>Potassium lb/a K₂O</td>
<td>0-84</td>
<td>85-160</td>
<td>161-320</td>
<td>&gt;320</td>
</tr>
<tr>
<td>Potassium index value</td>
<td>0-25</td>
<td>26-50</td>
<td>51-100</td>
<td>&gt;100</td>
</tr>
</tbody>
</table>

A starter fertilizer may be used even on those soils testing excessive in phosphate and/or potash, and where no P₂O₅ & K₂O is recommended by a soil test. A good starter fertilizer should supply 20-30 lbs/A of N, P₂O₅, and K₂O.

Table 5. Recommendations of Phosphorus (P₂O₅) and Potassium (K₂O) (in lb per acre per 1,000 sq ft)

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>Medium</th>
<th>Optimum</th>
<th>Excessive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphorus</td>
<td>4.0 lb</td>
<td>2.0 lb</td>
<td>1.0 lb</td>
<td>0</td>
</tr>
<tr>
<td>Potassium</td>
<td>4.0 lb</td>
<td>3.0 lb</td>
<td>2.0 lb</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 6. Limestone Recommendations (50% oxides) for Cut Flowers.
Target pH = 6.5 (in pounds of limestone per 1,000 sq ft)

<table>
<thead>
<tr>
<th>Initial pH</th>
<th>Loamy Sand</th>
<th>Sandy Loam</th>
<th>Loam</th>
<th>Silt Loam &amp; Clay Loam</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.3</td>
<td>10</td>
<td>20</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>6.0</td>
<td>20</td>
<td>40</td>
<td>50</td>
<td>55</td>
</tr>
<tr>
<td>5.8</td>
<td>30</td>
<td>55</td>
<td>65</td>
<td>80</td>
</tr>
<tr>
<td>5.5</td>
<td>45</td>
<td>75</td>
<td>85</td>
<td>110</td>
</tr>
<tr>
<td>5.3</td>
<td>55</td>
<td>85</td>
<td>100</td>
<td>130</td>
</tr>
<tr>
<td>5.0</td>
<td>70</td>
<td>105</td>
<td>120</td>
<td>165</td>
</tr>
<tr>
<td>4.8</td>
<td>90</td>
<td>120</td>
<td>135</td>
<td>185</td>
</tr>
<tr>
<td>4.5</td>
<td>90</td>
<td>140</td>
<td>160</td>
<td>185</td>
</tr>
<tr>
<td>Group 1: Spring-harvested field cut flowers</td>
<td>Nitrogen fertility requirements</td>
<td>Harvested once or extended harvest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------------------------------</td>
<td>----------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Allium</em>, Flowering onions</td>
<td>Low</td>
<td>Harvested once</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Consolida</em>, Larkspur</td>
<td>Low</td>
<td>Planted in fall and harvested in spring</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Delphinium</em></td>
<td>Low</td>
<td>Planted in fall and harvested in spring</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Iris</em> (perennial)</td>
<td>Low</td>
<td>Harvested in spring. New varieties harvest in late summer and again in early fall</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Lathyrus odoratus</em>, Sweet pea</td>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Lupinus</em> (perennial)</td>
<td>Medium</td>
<td>Harvested in spring over 3- to 4-week period</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Mathiola incana</em>, Stock</td>
<td>Low</td>
<td>Harvested once, in spring</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Narcissus</em>, Daffodil</td>
<td>Low</td>
<td>Harvested once</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Paeonia</em>, Peony</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group 2: Summer/fall-harvested field cut flowers</th>
<th>Nitrogen fertility requirements</th>
<th>Harvested once or extended harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Achillea</em>, Yarrow</td>
<td>Low</td>
<td>Once</td>
</tr>
<tr>
<td><em>Ageratum</em></td>
<td>Medium</td>
<td>Repeated harvest during summer</td>
</tr>
<tr>
<td><em>Alcea</em>, Hollyhock</td>
<td>Low to medium</td>
<td></td>
</tr>
<tr>
<td><em>Ammi majus</em></td>
<td>Low</td>
<td>Once</td>
</tr>
<tr>
<td><em>Alstroemeria</em></td>
<td>Medium to high</td>
<td>Repeated harvest from May to July</td>
</tr>
<tr>
<td><em>Antirrhinum majus</em></td>
<td>Medium</td>
<td>Repeated harvest during summer</td>
</tr>
<tr>
<td><em>Aquilegia</em></td>
<td>Low</td>
<td>Once</td>
</tr>
<tr>
<td><em>Artemisia</em></td>
<td>Low</td>
<td>Repeated harvest over summer</td>
</tr>
<tr>
<td><em>Asclepias</em></td>
<td>Low</td>
<td>Repeated harvest August to September</td>
</tr>
<tr>
<td><em>Baptisia australis</em>, Blue wild indigo (perennial)</td>
<td>Low</td>
<td>Once</td>
</tr>
<tr>
<td><em>Celosia</em> [crested, wheat-type, and plume-type]</td>
<td>Medium to high</td>
<td>Repeated harvest July to September</td>
</tr>
<tr>
<td><em>Centaurea</em>, Cornflower</td>
<td>Low</td>
<td>Harvested over several months</td>
</tr>
<tr>
<td><em>Callistephus chinensis</em>, China aster</td>
<td>Medium to high</td>
<td>Harvested July through September</td>
</tr>
<tr>
<td><em>Chrysanthemum</em></td>
<td>Medium to high</td>
<td>Harvested over several months</td>
</tr>
<tr>
<td><em>Chrysanthemum parthenium</em></td>
<td>Medium</td>
<td>Harvested over several months</td>
</tr>
<tr>
<td><em>Convalaria</em>, lily of the valley</td>
<td>Low</td>
<td>Harvested in early summer</td>
</tr>
<tr>
<td><em>Cosmos</em></td>
<td>Low to medium</td>
<td>Harvested from July through October</td>
</tr>
<tr>
<td><em>Crocosmia</em> (corm)</td>
<td>Low</td>
<td>Harvested in summer</td>
</tr>
<tr>
<td><em>Dahlia</em></td>
<td>Medium</td>
<td>Harvested from July through frost</td>
</tr>
<tr>
<td><em>Daucus carota</em>, Queen Anne’s lace</td>
<td>Low</td>
<td>Harvested once</td>
</tr>
<tr>
<td><em>Dianthus</em>, Sweet William</td>
<td>Medium to high</td>
<td>Harvested from July through August</td>
</tr>
<tr>
<td><em>Echinacea</em></td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td><em>Echinops</em></td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Group 2: Summer/fall-harvested field cut flowers</td>
<td>Nitrogen fertility requirements</td>
<td>Harvested once or extended harvest</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>--------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td><strong>Eucalyptus</strong></td>
<td>Low to medium</td>
<td></td>
</tr>
<tr>
<td><strong>Eustoma grandiflorum, Lisianthus</strong></td>
<td>Low to medium</td>
<td>Harvested over 3- to 4-week period</td>
</tr>
<tr>
<td><strong>Gerbera</strong></td>
<td>Medium to high</td>
<td>Harvested over several months</td>
</tr>
<tr>
<td><strong>Gladiolus</strong> (bulb)**</td>
<td>Low</td>
<td>Harvested once</td>
</tr>
<tr>
<td><strong>Gomphrena globosa, Globe amaranth</strong></td>
<td>Medium</td>
<td>Harvested either once or repeated harvest over time</td>
</tr>
<tr>
<td><strong>Grasses and grains</strong></td>
<td>Low</td>
<td>Harvested in late summer, early fall</td>
</tr>
<tr>
<td><strong>Gypsophila, Baby’s breath</strong> (perennial)</td>
<td>Low</td>
<td>Harvest once</td>
</tr>
<tr>
<td><strong>Helenium</strong></td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td><strong>Helianthus annuus, Sunflower</strong></td>
<td>Low to medium</td>
<td>Harvested over several months, July to September</td>
</tr>
<tr>
<td><strong>Helichrysum, Strawflower</strong></td>
<td>Low to medium</td>
<td>Harvested over several months</td>
</tr>
<tr>
<td><strong>Kniphofia, Red hot poker</strong></td>
<td>Low</td>
<td>Harvested in midsummer over 1 month period</td>
</tr>
<tr>
<td><strong>Lavendula, Lavender</strong></td>
<td>Low</td>
<td>Harvested over summer</td>
</tr>
<tr>
<td><strong>Lilium</strong> (bulb)**</td>
<td>Low</td>
<td>Harvested once</td>
</tr>
<tr>
<td><strong>Limonium sinuatum Statice</strong></td>
<td>Low to medium</td>
<td>Harvested once in early summer</td>
</tr>
<tr>
<td><strong>Limonium tataricum, German statice</strong> (perennial)</td>
<td>Low to medium</td>
<td></td>
</tr>
<tr>
<td><strong>Monarda, Bee balm</strong> (perennial)**</td>
<td>Low to medium</td>
<td>Harvested over 1 to 2 months in summer</td>
</tr>
<tr>
<td><strong>Nigella</strong></td>
<td>Low to medium</td>
<td></td>
</tr>
<tr>
<td><strong>Papaver, Poppy</strong></td>
<td>Low to medium</td>
<td>Harvested once in early summer</td>
</tr>
<tr>
<td><strong>Penstemon</strong></td>
<td>Low to medium</td>
<td></td>
</tr>
<tr>
<td><strong>Phlox</strong> (perennial)**</td>
<td>Low to medium</td>
<td>Harvested over 3 to 4 weeks in summer</td>
</tr>
<tr>
<td><strong>Physostegia virginiana, Obedient plant</strong> (perennial)</td>
<td>Low</td>
<td>Harvested over 3 to 4 weeks</td>
</tr>
<tr>
<td><strong>Ranunculus</strong></td>
<td>Medium to high</td>
<td></td>
</tr>
<tr>
<td><strong>Rudbeckia</strong></td>
<td>Medium to high</td>
<td>Harvested over 3 to 6 weeks in summer</td>
</tr>
<tr>
<td><strong>Salvia</strong></td>
<td>Medium to high</td>
<td>Harvested over several weeks</td>
</tr>
<tr>
<td><strong>Scabiosa</strong></td>
<td>Low to medium</td>
<td></td>
</tr>
<tr>
<td><strong>Sedum</strong> (perennial)**</td>
<td>Low</td>
<td>Harvested from August through early October</td>
</tr>
<tr>
<td><strong>Symphyotrichum ericoides, White heath aster</strong></td>
<td>Medium to high</td>
<td>Harvested over several months</td>
</tr>
<tr>
<td><strong>Veronica</strong></td>
<td>Low to medium</td>
<td>Harvested over 3 to 4 weeks</td>
</tr>
<tr>
<td><strong>Zinnia</strong></td>
<td>Medium to high</td>
<td>Harvested July through early October</td>
</tr>
</tbody>
</table>
Reference:
Soil Fertility Management Mimeo SFM-3. Department of Natural Resource Sciences and Landscape Architecture, University of Maryland, August 1996.


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