ESTIMATING EFFICIENCY OF COMMERCIAL FERTILIZERS IN INCREASING YIELDS OF GRASS AND LEGUME SEED

The use of commercial fertilizer in the production of grass and legume seed has been increasing in recent years. With a favorable price ratio between the seed and fertilizer, there has been little need for efficiency estimates. Nearly all reasonable fertilizer applications were profitable. Now with lower prices, efficiency estimates are more essential.

The efficiency estimate suggested is the ratio between the actual increase in seed yield from the use of commercial fertilizers, or equivalent, and the ideal increase. If the actual increase is equal to the ideal, the efficiency will be 100%; if greater, more than 100%; and if less, below 100%.

The ideal increase from the direct effect of a properly balanced commercial fertilizer is assumed to be a constant increment proportional to the supply of the “most needed” element. The ideal increment for many small seeded domestic grasses is estimated as 5.6 pounds of seed per pound of nitrogen in a balanced commercial fertilizer properly used. This is 20% of the ideal increment for corn, i.e., one-half bushel (28 lbs. seed) per pound nitrogen. When other sources of nitrogen are used, as manure or legume cover crops, the amounts of nitrogen furnished by these can be estimated.

The following formula indicates the efficiency of commercial fertilizers or equivalent for many common grasses:

\[ E_g = \frac{I_n}{5.6 \times N} \]

where \( E_g \) is the efficiency of commercial fertilizers for grass seed production; \( I_n \), the actual increase in pounds per acre of seed due to commercial fertilizer or equivalent; and \( N \), pounds of nitrogen per acre in a properly balanced, properly used commercial fertilizer or equivalent.

This formula can be used for the total application of nitrogen or for various fractions of the total if the actual increases of seed from the total and fractional applications are known.

For small-seeded domesticated legume crops in the humid areas, the “most needed” element is assumed to be phosphorus. For efficient use, it must be balanced with other required elements including nitrogen in some instances. The ideal increment is estimated as 5 pounds of seed per pound of \( P_2O_5 \) per acre. This is 33\( \frac{1}{3} \)% of the estimated ideal increment for soybean seed.

The efficiency formula for the small-seeded legumes may be given as follows:

\[ (2) \ El = \frac{I_n}{5P_2O_5} \]

when \( El \) is the efficiency of commercial fertilizers for increasing seed yields; \( I_n \) is actual increase in pounds of seed per acre from use of commercial fertilizer or its equivalent; and \( P_2O_5 \) is the number of pounds per acre \( P_2O_5 \) balanced with other required elements and properly used.

1952 Efficiency Estimates, Soil Conservation Service Nurseries, Southeastern United States

Seed of several soil conserving crops have been increased in nurseries of the Soil Conservation Service in the southeastern United States. Moderate rates of commercial fertilizer have been used and the best known systems of management followed. The fertilizer treatments, actual yields, estimated percent total seed harvested and estimated increases due to fertilizer treatment have been furnished by nursery managers W. H. Mann, Sandy Level, Va.; W. H. Rhodes, Rock Hill, S. C.; W. C. Young, Thorsby, Ala.; J. D. Powell, Americus, Ga.; and C. B. Blickensderfer, Brooksville, Fla.

Use of Fertilizer Efficiency Estimates

A low efficiency estimate on poor or moderately fertile soil indicates serious single, double, or multiple limitations. If the limitations can be determined and practical remedial measures found, the efficiency of fertilizers used can be raised. A continued low efficiency may be the signal to abandon seed production on such a site.

Fertilizer efficiency estimates can be expanded to include increased yields of corn, cotton, tobacco, small grains, and forages. A common measure, combining both quantity and quality, is needed for some of these crops.—PAUL TABOR, U. S. Soil Conservation Service, Spartanburg, S. C.

Table 1.—Harvested yields of various grass and legume seeds, fertilizers used, estimated (a) percent seed harvested, (b) yields without fertilizer, and (c) fertilizer efficiency in Soil Conservation Nurseries, Southeastern United States, 1952.

<table>
<thead>
<tr>
<th>Crop</th>
<th>SCS Nursery</th>
<th>Harvested yield lbs. per A.</th>
<th>“Most needed” element used lbs. per A.</th>
<th>Percent total seed harvested</th>
<th>Yield per acre without fertilizer 1952 lbs. per A.</th>
<th>Fertilizer efficiency</th>
<th>Estimated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tall fescue</td>
<td>Sandy Level, Va.</td>
<td>568.0</td>
<td>83.4</td>
<td>75</td>
<td>150</td>
<td>130</td>
<td>90</td>
</tr>
<tr>
<td>Tall fescue</td>
<td>Thorsby, Ala.</td>
<td>160.0*</td>
<td>49.2</td>
<td>98</td>
<td>160</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Sericea lappedea</td>
<td>Rock Hill, S. C.</td>
<td>597.5</td>
<td>70.0</td>
<td>90</td>
<td>300</td>
<td>104</td>
<td>85</td>
</tr>
<tr>
<td>Pennsacela Bahia grass</td>
<td>Americus, Ga.</td>
<td>175.4*</td>
<td>82.5</td>
<td>80</td>
<td>75</td>
<td>31</td>
<td>22</td>
</tr>
<tr>
<td>Argentine Bahia grass</td>
<td>Brooksville, Fla.</td>
<td>270.3</td>
<td>154.4</td>
<td>75</td>
<td>50</td>
<td>48</td>
<td>36</td>
</tr>
</tbody>
</table>

* Drought at time of seed production.