Use of the Nutrient Management Expert System NuMaSS to Improve Management of Nitrogen in Maize-Based Systems in Hillsides of Honduras and Nicaragua.

Background

Nitrogen and Phosphorus are the main soil fertility constraints for improving crop production in hillsides of Honduras and Nicaragua. In 2004 members of the MIS and CRSP-USAID Consortia initiated 2-year trials in Honduras and Nicaragua to generate crop cultivar and soil coefficients for developing improved N fertilizer recommendations using the Nutrient Management Support System (NuMaSS) software. The amount of fertilizer N recommended is the balance between the total amount of N needed by the crop and the N acquired from the soil, plant residues and cover crops, with a subsequent adjustment for the fertilizer N use efficiency by the crop. Although the software provides default values derived from reviews of existing publications for many of these plant factors it is possible to generate specific N recommendations for the prevailing cultivars and soils cropped in the region.

Location of on-farm trials to validate N recommendations generated by the NuMaSS expert system

- 11 on-farms trials
- Determinations to run NuMaSS
  - Grain:Stover ratio
  - Soil N
  - % efficiency of use of N
  - N in the legumes
  - Optimum yields

Hands-on software training with their own soil data, field test results and local crop coefficients

Table 1. NuMaSS default and site/varietal-specific crop and soil coefficients, and associated software fertilizer N recommendations in Honduras and Nicaragua

<table>
<thead>
<tr>
<th>Variable</th>
<th>Default Coefficients</th>
<th>Location Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variety</td>
<td>D. guayusa</td>
<td>HS 15</td>
</tr>
<tr>
<td>Yield w/o N, kg/ha</td>
<td>2468</td>
<td>1700</td>
</tr>
<tr>
<td>Opt. Yield, kg/ha</td>
<td>3320</td>
<td>1900</td>
</tr>
<tr>
<td>N for opt. yield, kg/ha</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>Nitrogen balance</td>
<td>0.24</td>
<td>0.89</td>
</tr>
<tr>
<td>% N grain</td>
<td>1.24</td>
<td>1.47</td>
</tr>
<tr>
<td>% N stover</td>
<td>0.87</td>
<td>0.81</td>
</tr>
<tr>
<td>Soil N supply</td>
<td>0.30</td>
<td>0.30</td>
</tr>
<tr>
<td>% fert. N recovery</td>
<td>44.0</td>
<td>44.0</td>
</tr>
<tr>
<td>N Recom. kg/ha</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

- Determination pending completion of plant tissue N analysis
- NuMaSS fertilizer N recommendations using either the software's default values or the site- and variety-specific values; for purposes of comparison, a target grain yield of 4500 kg ha^-1^ was used for all recommendations.
- Unable to be determined due to lack of yield response to fertilizer N.

NuMaSS2.2: module to enter specific crop information

Recommend N fertilizer by NuMaSS

- Yields without N, (1 ha)^-1^: 5.2, 5.2
- Optimum Yield (1 ha)^-1^: 7.4, 7.4
- Grain:stover ratio: 0.84, 1.34
- % N in grain: 1.24, 1.44
- % N in stover: 0.57, 0.65
- N from the soil (kg ha^-1^): 85, 75
- % N recovery: 44, 49
- Nitrogen recommended rate (kg ha^-1^): 82, 105
- Nitrogen applied in the field: 106 kg ha^-1^

Next Steps

- Further validation with 13 MIS Members, 8 NGOs and 1 fertilizer sector
- Assessment of economic implications to recommendations
- Release of Spanish, Portuguese versions