Introduction and justification

Legume production has the potential to increase soil fertility, household food security, nutrition, and income for smallholder farmers in Zimbabwe. Multiple nutrient deficiencies which usually occur in sandy soils impede optimum growth and yields especially in the granite derived sandy soils. Farmers in Zimbabwe traditionally allocate fertilizers and manure to the staple maize crop on fertile soil while legumes grow unfertilized on less productive soils (Zingore et al., 2007). But BNF requires proper targetting, input use and management: i.e. successful BNF = (L X R) X E X M (Legume genotype X Rhizobium strain) X Environment X Management. In this study improved legumes varieties and matching rhizobium strains were used for soyabean in different environments.

Materials and Methods

A number of fertilization options were tested for soybean, cowpea and groundnut production under smallholder conditions in Zimbabwe. Compound L (N, P, K, S), Single super phosphate (P, S) and dolomitic lime (Ca, Mg) were used solely and in combinations to determine the best nutrient requirements for the different legumes.

Location: Mhondoro (30.64253E 18.28134S)
Murewa (31.6986E, 17.72303S)
Crops grown: soyabean, cowpea, groundnuts
SSP - P at a rate of 20 kg/ha.
Dolomite - Ca and Mg at 27 kg/ha and 15 kg/ha respectively.
Compound L - N, P and K at 13kg/ha, 20 kg/ha and 21 kg/ha respectively.

Table 1. Soil characteristics of some fields in Mhondoro and Murewa

<table>
<thead>
<tr>
<th>Location</th>
<th>pH (H2O)</th>
<th>Total C</th>
<th>Total N</th>
<th>Olsen P</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>Sand</th>
<th>Silt</th>
<th>Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murewa</td>
<td>4.23</td>
<td>0.40</td>
<td>0.05</td>
<td>16.70</td>
<td>0.08</td>
<td>0.50</td>
<td>0.11</td>
<td>92</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Mhondoro</td>
<td>4.97</td>
<td>0.50</td>
<td>0.04</td>
<td>10.60</td>
<td>0.16</td>
<td>2.20</td>
<td>0.40</td>
<td>90</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Mhondoro 2</td>
<td>4.59</td>
<td>0.80</td>
<td>0.10</td>
<td>10.38</td>
<td>0.61</td>
<td>7.45</td>
<td>3.75</td>
<td>64</td>
<td>18</td>
<td>18</td>
</tr>
</tbody>
</table>

Results and discussion

Soyabean grain yield was very low in Murewa (Fig 1) because of the poor soils which limit soyabean growth.

Cowpeas responded positively to fertilizers in a poor soil (Fig 2) but negatively in a fairly well managed soil. The higher fertility lead to vegetative growth (Fig 3B) at the expense of reproductive growth (Fig 3A). Cowpeas is also promiscuous in its rhizobial association hence yields fairly in poor soils. Groundnuts yield was affected by moisture stress at pod formation but stover yield indicated a positive response to P application.

Conclusion

Proper nutrient management is central to optimum yield gains in the highly leached granitic sandy soils in Zimbabwe.

References


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