## Agronomy trials in Zimbabwe: results achieved and the way forward

The agronomy trials in the 2010-2011 season in Zimbabwe did not run quite as anticipated, but nevertheless yielded interesting results. The results led to a change in planning and responsibility for the next season, as well as additional research activities.

Of the 33 trials originally planned for the 2010-2011 growing season, 23 trials were eventually established and only 10 gave yield data. Over-ambitious planning and a failed partnership caused this large difference between the plan and the actual achievements. Yield data were collected from one bean, two cowpea, two groundnut and five soyabean trials. Five of these trials (including all groundnut trials) were located in a particular region of Murewa, a few km apart from each other. As an example, we give results from a soyabean input in Murewa, Kadadi field.

### Results from a soyabean input trial in Murewa

Yields achieved in this trial were overall rather poor. The field used was a sandy outfield with a poor soil structure and low fertility status. The very sandy soil texture, a low pH, and low C and N concentrations in the soil indicate that soil conditions were far from ideal for growing soyabean (Table 3). In addition, rainfall distribution was very poor throughout the season. Nevertheless soyabean grain and stover yields showed very strong responses to application of P-based fertilisers (Fig 3). Compound L (NPKS) as well as single super phosphate (P, Ca and S) were used as P sources at a rate of 20 kg P/ha. An effect of the additional nutrients in Compound L was not visible, despite the low K status of the soil. Dolomite provided both Mg and Ca at 15 kg/ha and 27 kg/ha, respectively, and their addition did not improve yield in comparison with the control. Response to inoculation was strong in this poor soil, implying low effective numbers of rhizobium in the soil. Thus, even though yields were low due to the combination of poor soils and poor rainfall, the use of P-based fertiliser and inoculants led to a several fold increase in yield. Even without P there was a strong response to inoculation, and with P the response was very large.

### Why such low yields?

The legume yields achieved in the 2010-2011 agronomy trials were generally poor for a number of reasons. Most trials were located in Murewa, where the bulk of the soils are granite derived sandy soils with a very poor inherent soil fertility. Institutional challenges led to delayed field selection for experiments, and late planting. The delay in field selection meant that most of the fields selected were outfields because farmers plant their home fields first. Although these outfields are thought to be generally unsuitable for legume production without organic amendments, they represent a large proportion of the cropping land (estimates at ~60% of the available cropped land from earlier work) in the area. Work by other scientists (e.g. Zingore et al., 2008) also reported comparable, poor soyabean yields in this area, especially in the sandy outfields. Low pH and low organic matter content are characteristic of these soils and this means that soyabean production, especially without P application and without inoculation (Fig. xxx). Poor rainfall distribution throughout the season (prolonged drought periods especially at flowering) also reduced yields. Nevertheless, the trials clearly demonstrate that without inoculation and P there was virtually no yield (<0.1 t/ha), but even on these poor soils, in a season with poor rainfall distribution, inoculation and P have major impacts on soyabean yields. Use of inputs can turn crop failure into an economically significant yield of 0.6 to 1 t/ha.

Table 3. Soil characteristics in the trial in Murewa.

| **pH (H2O)** | **Total C** | **Total N** | **P (Olsen)** | **K** | **Ca** | **Mg** | **Sand** | **Silt** | **Clay** |
|---|---|---|---|---|---|---|---|---|---|
| | % | % | ppm | cmol/kg | cmol/kg | cmol/kg | % | % | % |
| 4.2 | 0.4 | 0.05 | 16.7 | 0.077 | 0.50 | 0.108 | 86 | 8 | 6 |

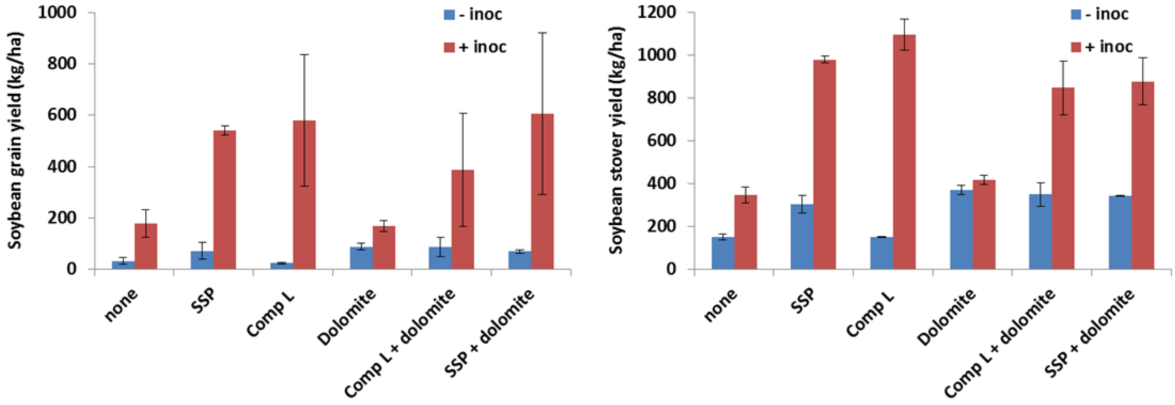


Fig 3. Soyabean grain and biomass yield with different fertilizer applications in the trial in Murewa.

**Way forward**

In the coming season, we will ensure that technologies are tested on soils with different fertility characteristics, including soils with a high potential for legume production. When trials are established on poor sandy soils, cattle manure will be applied at a rate of 5 t/ha. Moreover, the set-up of the agronomy trials will not be the large factorial trials with three replications per site as was done last season. Instead, the same experiments are going to be repeated but with one replication per site, but on a larger number of sites to better cover the diversity of soils. These trials will be managed by the N2Africa researchers to ensure good management of the trials.

In addition, agronomic data will be collected from D&D trials. These are simple trials (e.g. soyabean without Phosphorus or Inoculant; + Inoculant; + Phosphorus; + Phosphorus + Inoculation) that are implemented by farmers and conducted in many sites with one replication per farm. The vast scale at which these trials are carried out will cover the diversity of soils and management better than the agronomy trials, giving key information on which technology works where, and why it does or does not work. To achieve this, the agronomy team will work closely with the D&D team in designing such trials and assist with the collection of soils and data from experimental fields, trial management by farmer, as well as final crop yield. To add to this a Field Book for technology Evaluation will be administered this season to collect information from lead and satellite farmers.
Moreover, trials on forages will be established across three districts in Zimbabwe coming season. Finally, to better understand the factors that limit legume growth on the very poorly fertile soils, a series of pot trials will be carried out to identify missing nutrients other than nitrogen and phosphorus.

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