**Overview agronomy trial results Ghana, 2010**

***In total:***

* 5 cowpea input trials, variety Songotura
* 5 cowpea variety trials (one not analysed), blanket application of phosphorus and potassium
* 5 groundnut input trials, variety Chinese
* 4 groundnut variety trials, blanket application of phosphorus and potassium
* 3 soybean input trials (one not analysed), variety Jenguma
* 2 soybean variety trials, blanket application of phosphorus and potassium

Error bars in graphs represent standard error of means.

***General conclusions:***

In cowpea, application of P-fertilizer led to significant increases in grain yield in two out of five trials. Yields were almost doubled by the application of P fertiliser. Additional K or N did not improve yields any further. Variety Omondao showed highest grain yields, but differences with other varieties are limited. In two out of four variety trials, a strong response to NPK fertiliser applications can be observed. Due to the trial set up it is unclear which of the nutrients is responsible for this response.

Yields for groundnut are generally low, which is attributed to the late planting date. There is no, or even a negative effect of fertilizer application at 4 out of 5 sites It is likely that fertiliser application delayed crop maturation. In combination with late planting, groundnut with fertiliser was possibly less advanced with grain filling at harvest than groundnut without fertiliser. At one site, there is a clear response of groundnut to P application, and not to K or N. Only one trial shows improved yields after P application. Varieties Samnut 2 and 3 clearly performed much better than Chinese, even when NPK was applied to the latter. The ‘Chinese variety’, the only variety in these trials tested with NPK fertiliser, did clearly respond to nutrient applications.

Generally, soybean did not respond to inoculation in any of the treatments (with and without fertilizer). Grain yields improved, however, through P fertiliser applications. At one site, only combined K and P applications led to higher yields. Differences between varieties are not very pronounced, only TGX 1835-10E shows lower grain and stover yields.

***Cowpea: Input trial***

Code: GHA003\_INP\_CP\_2010

Location: Karaga

GPS: N09°57.724'; W000°29.826'; Elevation: 184 m

Planting date: 24-7-2010

Harvest date: 7-10-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: Only final yield data.

Grain yields are highest with P only, but TSP in combination with other fertilisers does not perform better than the treatment without fertiliser. Stover yields in the TSP treatment are similar to other treatments.

***Cowpea: Input trial***

Code: GHA004\_INP\_CP\_2010

Location: Andonyamanu, Chereponi

GPS: N 10° 09.273'; E 000° 15.981''; Elevation: 181 m

Planting date: 4-8-2010

Harvest date: 13-10-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: Only final yield data.

In general high grain yields. Fertiliser application did not result in significant increases in grain or stover yield. Application of P fertiliser only resulted in relatively high grain and low stover yields.

***Cowpea: Input trial***

Code: GHA001\_INP\_CP\_2010

Location: Zebilla, Bawku West, Sakom

GPS: N 10° 55.713'; W 000° 27.340'; Elevation: 716 ft

Planting date: 27-7-2010

Harvest date: 10-10-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: Only ‘above ground biomass (calculated)’; no data for ‘haulm yield’. Application of P fertiliser (alone or in combination with other fertilisers) greatly increased grain yield. The input of NPK leads to the highest grain yields. All input types give higher grain yields than the control, but effects on stover yields are less pronounced.

***Cowpea: Input trial***

Code: GHA002\_INP\_CP\_2010

Location: Kasena Nankana, Naaga

GPS: N 10° 36.336'; W 001°.01.654'; Elevation: 541 ft

Planting date: 28-7-2010

Harvest date: 10-10-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | Ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: Only ‘above ground biomass (calculated)’; no data for ‘haulm yield’. Treatment NPK, replicate no. 2: I changed the value ‘ total fresh weight of all pods in the net plot’ from 9.3 to 0.3!

The input of P+K has the strongest impact on grain yield. Both grain and stover yield are highest for P+K.

***Cowpea: Input trial***

Code: GHA005\_INP\_CP\_2010

Location: Nyankpala

GPS: N 09°23.325'; W 001° 00.131'; Elevation: 658 ft

Planting date: 20-7-2010

Harvest date: 24-9-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | Ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: Only final yield data.

In general, cowpea grain and stover yields are high. The different fertilizer inputs do have effects on grain yields, while stover yields are not (or negatively) affected. The increase in grain yield compared to the control is highest for the NPK input.

***Cowpea: Variety trial***

Code: GHA001\_VAR\_CP\_2010

Location: Tanga, Bawku West

GPS: N09°57.724'; W000°29.826'; Elevation: 184 m

Planting date: 27-7-2010

Harvest date: 10-10-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | Ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: Only ‘above ground biomass (calculated)’; no data for ‘haulm yield’.

All varieties gave low yields with application of P and K only. Additional application of N resulted in an fivefold yield increase. Apparently cowpea yields were severely limited by N constraints that were released in the one treatment where N was applied.

***Cowpea: Variety trial***

Code: GHA002\_VAR\_CP\_2010

Location: Karaga

GPS: N09°57.724'; W000°29.826'; Elevation: 184 m

Planting date: 24-7-2010

Harvest date: 7-10-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | Ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: Only final yield data.

Grain yield of variety Omondao is highest, and comparable to variety Songutura grown with additional N fertilizer. The latter variety without fertilizer has an average performance and grain yield almost doubled with N application. Padi-tuya has the lowest grain yields but the highest stover yields, showing an unfavourable harvest index. The application of fertilizer has an effect on stover yield for Songutura, but compared to the other varieties stover yield is not particularly high.

***Cowpea: Variety trial***

Code: GHA004\_VAR\_CP\_2010

Location: Chereponi

GPS: N 09° 58.275'; E 000° 11.187'; Elevation: 169.5 m

Planting date: 5-8-2010

Harvest date: 13-10-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | Ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: Only final yield data.

Variety Songotura has the highest grain yield, Omondao the lowest. Application of N on Songotura improved grain yields with 500 kg/ha, but this is a relatively low increase compared to grain yields of the other treatments. Stover yield was not affected by fertilizer application. The differences in stover yield between varieties are not very pronounced.

***Cowpea: Variety trial***

Code: GHA005\_VAR\_CP\_2010

Location: Nyankpala

GPS: N 09°23.325'; W 001° 00.131'; Elevation: 658 ft

Planting date: 17-7-2010

Harvest date: 24-9-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | Ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: Only final yield data.

Varieties IT98K-573-1-1 and Omondao have the highest grain yields and Omondao also has the relatively high stover yield. The grain and stover yields of variety Songotura doubled with the application of N fertiliser.

***Groundnut: Input trial***

Code: GHA003\_INP\_GN\_2010

Location: Karaga

GPS: N09°56.186'; W000°32.148'; Elevation: 202 m

Planting date: 26-7-2010

Harvest date: 5-10-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: Only final yield data.

In general, grain yields are very low, presumably due to late planting. The treatment with P only resulted in lower grain and stover yields than the control, and even the combination of NPK did not result in significantly higher grain or stover yields.

***Groundnut: Input trial***

Code: GHA005\_INP\_GN\_2010

Location: Chereponi

GPS: N 10° 09.269'; E 000° 15.996'; Elevation: 180 m

Planting date: 4-8-2010

Harvest date: 29-10-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: Only final yield data.

Grain yields are very low due to late planting. Stover yields were fair, indicating that the crop did not complete pod filling.

***Groundnut: Input trial***

Code: GHA001\_INP\_GN\_2010

Location: Sakom, Bawku West

GPS: N 10° 55.713'; W 000° 27.340'; Elevation: 716 ft

Planting date: 27-7-2010

Harvest date: 27-10-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | Ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: Only ‘above ground biomass (calculated)’; no data for ‘haulm yield’.

There is no effect of the fertilizer input on grain yields. The application of P+K reduced number of nodules per plant, while the other fertilizer treatments show an average number of nodules comparable to the control.

***Groundnut: Input trial***

Code: GHA002\_INP\_GN\_2010

Location: Naaga, Kasena Nankana

GPS: NA

Planting date: 28-7-2010

Harvest date: 25-10-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | Ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: Only ‘above ground biomass (calculated)’; no data for ‘haulm yield’. All type of fertilizer applications had an effect on grain yields compared to the control, in which P appears to be the most limiting nutrient.

***Groundnut: Input trial***

Code: GHA004\_INP\_GN\_2010

Location: Nyankpala

GPS: N 09°23.325'; W 001° 00.131'; Elevation: 658 ft

Planting date: 20-7-2010

Harvest date: 13-10-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | Ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: Only final yield data.

Grain yields are very low in general. Fertilizer inputs had a slightly negative effect on grain yields. In contrast, stover yields are similar or have increased with fertilizer. The treatment with NPK shows the highest stover yield.

***Groundnut: Variety trial***

Code: GHA001\_VAR\_GN\_2010

Location: Tanga, Bawku West

GPS: N 10° 54.486'; W 000° 26.069'; Elevation: 640 ft

Planting date: 27-7-2010

Harvest date: 25-10-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | Ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: No data for haulm yield. Varieties Samnut 2 and 3 perform better than Chinese, even when N fertiliser was applied to the latter treatment.

***Groundnut: Variety trial***

Code: GHA002\_VAR\_GN\_2010

Location: Kasena Nankana, Manyoro

GPS: N 10° 59.247'; W 000° 59.529'; Elevation: 641 ft

Planting date: 28-7-2010

Harvest date: 27-10-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | Ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: No data for haulm yield. Very low grain yields in general. Varieties Samnut 2 and 3 perform better than Chinese, even when N fertiliser was applied to the latter treatment.

***Groundnut: Variety trial***

Code: GHA003\_VAR\_GN\_2010

Location: Karaga

GPS: N09°56.186'; W000°32.148'; Elevation: 202 m

Planting date: 26-7-2010

Harvest date: 5-10-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | Ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: Only final yield data.

Varieties Samnut 2 and 3 perform much better than Chinese, even when N fertiliser was applied to the latter treatment. Samnut 3 has slightly higher grain yields, while Samnut 2 has the highest stover yield (Samnut 2 has a lower harvest index).

***Groundnut: Variety trial***

Code: GHA004\_VAR\_GN\_2010

Location: Nyankpala

GPS: N 09°23.325'; W 001° 00.131'; Elevation: 658 ft

Planting date: 17-7-2010

Harvest date: 13-10-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | Ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: Only final yield data.

No significant differences in grain and stover yield between the varieties.

***Soybean: Input trial***

Code: GHA002\_INP\_SB\_2010

Location: Andonyamanu, Chereponi

GPS: N 10° 09.524'; E 000° 15.792'; Elevation: 185 m

Planting date: 4-8-2010

Harvest date: 9-11-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: Only final yield data.

No clear impact from inoculation on grain and stover yields. The application of K-fertiliser stimulated grain and stover yield, whereas the application of TSP fertiliser alone did not.

***Soybean: Input trial***

Code: GHA003\_INP\_SB\_2010

Location: Nyankpala

GPS: N 09°23.325'; W 001° 00.131'; Elevation: 658 ft

Planting date: 19-7-2010

Harvest date: 20-11-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: Only final yield data.

No impact or slightly positive impact from inoculation on grain yield. Stover yields appeared to be negatively affected by inoculation. Inoculation resulted in a more favourable harvest index. Application of P fertilizer (alone or in combination with K and N) results in yield increase compared to the control.

***Soybean: Input trial***

Code: GHA001\_INP\_SB\_2010

Location: Sakom, Bawku West

GPS: NA

Planting date: NA

Harvest date: NA

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | Ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: “Soybean was not planted due to an uncooperative attitude of the selected farmer.”

***Soybean: Variety trial***

Code: GHA001\_VAR\_SB\_2010

Location: Tanga, Bawku West

GPS: N 10° 54.889'; W 000° 25.792'; Elevation: 650 ft

Planting date: 27-7-2010

Harvest date: 11-11-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | Ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: No data for haulm yield.

Low grain yields in general, with the exception of the treatment with additional N fertiliser, indicating an N shortage in the other treatments. The response to inoculation is not pronounced. Fertilizer application shows a more important response than inoculation. Variety Jenguma performs best, with and without inoculation.

***Soybean: Variety trial***

Code: GHA005\_VAR\_SB\_2010

Location: Nyankpala

GPS: N 09°23.325'; W 001° 00.131'; Elevation: 658 ft

Planting date: 17-7-2010

Harvest date: 20-11-2010

Soil characteristics:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| pH (H2O) | Total C | Total N | P (Olsen) | C.E.C | K | Ca | Mg | Na | Sand | Silt | Clay |
|  | % | % | Ppm | cmol/kg | cmol/kg | cmol/kg | cmol/kg | cmol/kg | % | % | % |
|  |  |  |  |  |  |  |  |  |  |  |  |

Remarks: Only final yield data. Inoculation does not affect grain or stover yields. The application of N fertilizer does have impact. There is not much difference in yields between varieties, only TGX 1835-10E has considerably lower grain and stover yields.