## Results agronomy trials Kenya short rains 2011

***General comments***

* 1 climbing beans input trial (variety: Kenya Tamu)
* 2 soybean input trials (variety: SB19)
* 1 climbing bean variety trial (blanket application of TSP/KCl)
* 1 bush bean variety trial (blanket application of TSP/KCl)
* 1 soybean variety trial (blanket application of TSP/KCl)
* 3 soybean rust evaluations (blanket application of TSP/KCl/Urea and inoculation)

*Climbing bean*

Grain yields in the climbing bean input trial were quite low for most plots, on average only 650 kg/ha. Fertilizer inputs generally improved yields, only the application of rock phosphate was less effective. Grain yields did not benefit from inoculation, with or without the addition of lime. Only in the treatment with DAP, grain yields increased from 600 to 800 with inoculation and lime. In the variety trial, varieties RWV 51348 and Umubano had the highest average grain yields, with and without inoculation. Variety Kenya Tamu also achieved high yields with application of urea. In general, both grain and stover yields did not show a response to inoculation.

*Bush bean*

Bush bean varieties Okwodho, Kenya Umoja and KK15 had the highest grain and stover yields. Most of the varieties did not show a clear response to inoculation; only variety KK8 did. Kenya Umoja did not benefit from inoculation, but grain yields increased considerably after application of urea. Varieties New Roscoco, KK071 and KK072 all had very low yields.

*Soybean*

All fertilizer inputs enhanced soybean grain yields compared to the control, and there was not much difference between the different fertilizer types. Grain yields for all treatments showed a (strong) response to inoculation, only the control did not benefit in one of the two trials. The combination of lime and inoculation generally did not enhance yields much further, although in one of the trials the treatments with TSP and Sympal seemed to benefit from the addition of lime. The latter two achieved grain yields of about 1250 kg/ha, compared to 600 to 800 kg in the treatments without fertilizer. Also in the variety trial, all soybean varieties responded well to inoculation, except variety EAI3600. A comparison with application of urea to variety SB19 showed that grain yields were lower than when inoculants were applied.

Evaluations of soybean rust showed that varieties Maksoy, Namsoy and SB19 had high rust scores in most trials. Even after spraying, their rust score was relatively high, which indicates a high susceptibility to rust. The other varieties had considerably lower scores, even without spraying. The varieties with high rust scores benefitted from spraying in terms of grain yield. Varieties with lower rust scores generally also benefitted less. The average grain and stover yields for the soybean varieties varied largely between the trials. Varieties Nyala, S823-6-16, Sequel and Squire all performed well in one of the trials. Most plots were harvested late January, but some also late February. Generally, this had a negative impact on grain yield, with yields in January being up to twice or four times as high as yields from February.

***Climbing bean input trial***

Location: Migori

GPS: E 34.48219; S 0.953222; Elevation: 1397 m

Planting date: 28-9-2011

Harvest date: 26-1-2012

Variety: Kenya Tamu

Remarks:

Germination on most plots was reasonable, between 70% and 95%. Only on the plot with DAP without lime and with inoculation germination was only 58%. The treatments with Sympal and MRP Dust had the highest average germination. The average nodule score (from 10 plants) was lowest for the control plots without fertilizer, and there is little difference between the treatments with and without inoculation. Application of lime and inoculants, however, increased the nodule score. The climbing beans with MRP-Pallets and TSP/KCl had a higher nodule number when inoculated, whereas the plots with DAP all had a relatively high nodule.

Grain yields for most plots were quite low, but fertilizer inputs improved yields. Only the application of rock phosphate was less effective. Grain yields did not benefit from inoculation only, nor from the combination with lime. Only in the treatment with DAP, grain yields increased from 600 to 800 with inoculation and lime. The same was found for stover yields: most inputs improved yields, but inoculation only had an effect on the treatment with DAP and lime.

*Average nodule score*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | None | DAP | MRP-DUST | MRP-PALLETS | TSP | TSP/KCl | SYMPAL | Average |
| Without lime | - inoc | 2.0 | 2.8 | 2.5 | 2.2 | 2.4 | 2.5 | 2.3 | 2.4 |
| + inoc | 1.9 | 2.8 | 3.1 | 2.5 | 2.6 | 2.1 | 2.7 | 2.5 |
| With lime | - inoc | 2.6 | 2.9 | 2.7 | 2.5 | 2.9 | 2.5 | 2.5 | 2.6 |
| + inoc | 2.7 | 2.8 | 2.7 | 2.6 | 3.1 | 3.0 | 2.6 | 2.8 |
|  | Average | 2.3 | 2.8 | 2.7 | 2.5 | 2.8 | 2.5 | 2.5 | 2.6 |

*Grain yield*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | None | DAP | MRP-DUST | MRP-PALLETS | TSP | TSP/KCl | SYMPAL | Average |
| Without lime | - inoc | 537 | 608 | 601 | 605 | 982 | 836 | 936 | 730 |
| + inoc | 356 | 620 | 601 | 497 | 554 | 657 | 636 | 560 |
| With lime | - inoc | 507 | 929 | 548 | 471 | 515 | 706 | 652 | 618 |
| + inoc | 437 | 810 | 734 | 633 | 716 | 820 | 860 | 716 |
|  | Average | 459 | 742 | 621 | 552 | 692 | 755 | 771 | 656 |

*Stover yield*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | None | DAP | MRP-DUST | MRP-PALLETS | TSP | TSP/KCl | SYMPAL | Average |
| Without lime | - inoc | 731 | 789 | 1056 | 784 | 1887 | 1178 | 1376 | 1114 |
| + inoc | 732 | 1237 | 781 | 846 | 797 | 1061 | 1137 | 942 |
| With lime | - inoc | 912 | 1763 | 722 | 823 | 1294 | 901 | 1132 | 1078 |
| + inoc | 690 | 1102 | 1100 | 856 | 1161 | 1047 | 1245 | 1029 |
|  | Average | 766 | 1223 | 915 | 827 | 1285 | 1047 | 1223 | 1041 |

***Soybean input trial***

Location: Butere

GPS: E 34.44417; N 0.152167; Elevation: 1343 m

Planting date: 20-9-2011

Harvest date: 13-1-2012

Variety: SB19

Remarks:

Germination was low, with percentages varying between 36% and 57%. The plots with DAP had the lowest average germination, which could be the result of contact between the fertilizer and the seed. The average nodule score for all treatments improved considerably as a result of inoculation, and especially for the treatment with TSP. The combination of lime and inoculation did not further increase the number of nodules, except for the treatments with MRP-Pallets and TSP/KCl.

All fertilizer inputs enhanced grain yields, with not much difference between the different types. Grain yields for all treatments showed a response to inoculation, only the control did not benefit. The addition of lime and inoculation had a considerable advantage in the treatments with TSP and Sympal. The latter two achieved grain yields of about 1250 kg/ha, compared to 600 to 800 kg in the treatments without fertilizer.

Soybean stover yields did not benefit much from the application of DAP, but as grain yield did, DAP seemed to improve the harvest index. The other fertilizer types all had higher stover yields than the control. Inoculation with and without lime further increased stover yields, and again the highest yields were achieved by TSP and Sympal with lime and inoculation.

*Average nodule score*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | None | DAP | MRP-DUST | MRP-PALLETS | TSP | TSP/KCl | SYMPAL | Average |
| Without lime | - inoc | 3.7 | 3.3 | 3.6 | 3.8 | 3.3 | 3.7 | 4.5 | 3.7 |
| + inoc | 4.8 | 4.1 | 4.6 | 4.1 | 5.0 | 4.1 | 4.6 | 4.5 |
| With lime | - inoc | 3.2 | 3.4 | 3.7 | 3.6 | 3.9 | 4.0 | 3.6 | 3.6 |
| + inoc | 4.2 | 4.1 | 4.5 | 4.7 | 4.9 | 4.8 | 4.5 | 4.5 |
|  | Average | 4.0 | 3.7 | 4.1 | 4.1 | 4.3 | 4.1 | 4.3 | 4.0 |

*Grain yield (kg/ha)*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | None | DAP | MRP-DUST | MRP-PALLETS | TSP | TSP/KCl | SYMPAL | Average |
| Without lime | - inoc | 803 | 960 | 1036 | 1000 | 901 | 1044 | 960 | 958 |
| + inoc | 622 | 1182 | 1184 | 1028 | 1062 | 1039 | 864 | 997 |
| With lime | - inoc | 787 | 885 | 1024 | 839 | 1087 | 773 | 753 | 878 |
| + inoc | 668 | 1080 | 1127 | 1131 | 1253 | 1074 | 1238 | 1082 |
|  | Average | 720 | 1027 | 1093 | 999 | 1076 | 983 | 954 | 979 |

*Stover yield (kg/ha)*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | None | DAP | MRP-DUST | MRP-PALLETS | TSP | TSP/KCl | SYMPAL | Average |
| Without lime | - inoc | 1068 | 1058 | 1256 | 1238 | 1154 | 1290 | 1179 | 1178 |
| + inoc | 1059 | 1319 | 1290 | 1290 | 1228 | 1295 | 928 | 1201 |
| With lime | - inoc | 1030 | 939 | 1176 | 1130 | 1283 | 1062 | 1195 | 1117 |
| + inoc | 1024 | 1080 | 1329 | 1411 | 1491 | 1316 | 1451 | 1300 |
|  | Average | 1045 | 1099 | 1263 | 1267 | 1289 | 1241 | 1188 | 1199 |

***Soybean input trial***

Location: Migori

GPS: E 34.57100; S 1.012861; Elevation: 1464 m

Planting date: 29-9-2011

Harvest date: 25-1-2012

Variety: SB19

Remarks:

No information on germination.

Inoculation enhanced the number of nodules tremendously, and especially in combination with lime the average nodule score increased from 0.3 to 4.1. This difference was much more distinctive than the differences between fertilizer inputs. Grain yields did improve with application of fertilizer, however, but again inoculation had a much more pronounced effect. The combination with lime did not further enhance yields. The highest average grain yields were obtained by the treatments with MRP-Dust and TSP.

Application of fertilizer also increased stover yields compared to the control. The effect of inoculation was less pronounced. In combination with lime, stover yields were even lower than without lime and inoculation. As grain yields did increase, the harvest index became more favourable as a result of lime and inoculation.

*Average nodule score*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | None | DAP | MRP-DUST | MRP-PALLETS | TSP | TSP/KCl | SYMPAL | Average |
| Without lime | - inoc | 0.3 | 0.2 | 0.4 | 0.2 | 0.4 | 0.2 | 0.5 | 0.3 |
| + inoc | 3.4 | 3.4 | 4.0 | 3.4 | 3.3 | 2.5 | 3.5 | 3.3 |
| With lime | - inoc | 0.2 | 0.2 | 0.4 | 0.4 | 0.5 | 0.3 | 0.4 | 0.3 |
| + inoc | 3.8 | 3.9 | 4.4 | 3.9 | 4.4 | 4.6 | 3.5 | 4.1 |
|  | Average | 1.9 | 1.9 | 2.3 | 2.0 | 2.1 | 1.9 | 2.0 | 2.0 |

*Grain yield (kg/ha)*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | None | DAP | MRP-DUST | MRP-PALLETS | TSP | TSP/KCl | SYMPAL | Average |
| Without lime | - inoc | 610 | 874 | 899 | 732 | 953 | 930 | 907 | 844 |
| + inoc | 731 | 1211 | 1742 | 1676 | 1398 | 1762 | 1018 | 1363 |
| With lime | - inoc | 564 | 674 | 534 | 683 | 947 | 481 | 753 | 662 |
| + inoc | 641 | 1007 | 1826 | 1600 | 1507 | 1109 | 1119 | 1259 |
|  | Average | 637 | 942 | 1250 | 1173 | 1201 | 1071 | 949 | 1032 |

*Stover yield (kg/ha)*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | None | DAP | MRP-DUST | MRP-PALLETS | TSP | TSP/KCl | SYMPAL | Average |
| Without lime | - inoc | 1367 | 1577 | 1463 | 1441 | 1565 | 1570 | 1573 | 1508 |
| + inoc | 1264 | 1340 | 1754 | 1679 | 1593 | 1957 | 1234 | 1546 |
| With lime | - inoc | 1132 | 1396 | 959 | 1222 | 1491 | 1045 | 1408 | 1236 |
| + inoc | 1025 | 1063 | 1499 | 1430 | 1142 | 1258 | 1050 | 1209 |
|  | Average | 1197 | 1344 | 1419 | 1443 | 1447 | 1457 | 1316 | 1375 |

***Climbing bean variety trial***

Location: Migori

GPS: E 34.57100; S 1.012861; Elevation: 1464 m

Planting date: 30-9-2011

Harvest date: 27-1-2012

Fertilizer: TSP/KCl

Remarks:

Germination for all varieties was good; above 85%. Only variety Kenya Mavuno with inoculation had a lower germination percentage of 75%. The number of nodules of varieties Kenya Mavuno and MAC 49 increased after inoculation; the other varieties showed no response. Lower germination percentage of Kenya Mavuno could explain the lower grain and stover yields with inoculation, as the number of nodules did increase. Varieties RWV 51348 and Umubano had the highest average grain yields, with and without inoculation, together with variety Kenya Tamu when urea was applied. The same was found for stover yields, where the effect of application of urea with Kenya Tamu was even more pronounced. In general, both grain and stover yields did not show a response to inoculation.

***Bush bean variety trial***

Location: Kakamega South

GPS: E 34.66792; N 0.226694; Elevation: 1436 m

Planting date: 7-9-2011

Harvest date: 16-12-2011

Fertilizer: TSP/KCl

Remarks:

Germination for all treatments was reasonably high, around 80%. Only variety New Roscoco had germination percentages of 58% and 71% without and with inoculation respectively. The number of nodules did not seem to increase with inoculation, only variety KK15 showed some response.

Varieties Okwodho, Kenya Umoja and KK15 had the highest grain and stover yields. Kenya Umoja did not benefit from inoculation, but grain yields increased considerably after application of urea. Only variety KK8 showed a good response to inoculation, in both grain and stover yield. Varieties New Roscoco, KK071 and KK072 had very low yields, with and without inoculation.

***Soybean variety trial***

Location: Kisumu West

GPS: E 34.44394; S 0.073444; Elevation: 1314 m

Planting date: 30-9-2011

Harvest date: 23-1-2012

Fertilizer: TSP/KCl

Remarks:

Germination for all treatments was reasonable, between 75% and 85%. Only variety Squire had lower germination percentages of 70% without and 64% with inoculation. The nodule scores of all varieties, except for variety EAI3600 increased considerably with inoculation. Application of urea on variety SB19 did not increase the nodule score for this variety. The same conclusion can be drawn for grain and stover yields, where again only variety EAI3600 showed no response to inoculation. Application of urea did not enhance grain yields so much for variety SB19, but stover yields were higher compared to the treatment with inoculation.

***Soybean rust evaluation***

Location: Migori

GPS: E 34.48247; S 0.969917; Elevation 1396 m

Planting date: 28-9-2011

Harvest date: 26-1, 27-1 and 23-2-2012

Blanket application of: TSP/KCl/Urea and inoculation

Remarks:

One of the sprayed plots with variety Samba was destroyed by squirrels and was not analysed.

Germination varied between 60% and 80%, where varieties Saga and Squire had the lowest averages of 62% and 60% respectively. Variety Sequel had a relatively high germination of on average 83%.

The rust score measured from 10 plants per plot was much higher without spraying for varieties Maksoy, Namsoy and SB19. And even after spraying, their rust score was relatively high, which indicates a high susceptibility to rust. The number of nodules was comparable for all varieties and treatments.

Grain and stover yields did not benefit much from spraying against rust, although the varieties with the highest rust scores did show a slight increase in yield after spraying, as well as variety Nyala.

Most plots were harvested late January, but some also late February. Generally, this had a negative impact on grain yield, which also explains the low grain yields of variety TGX1987-6F.

*Effect of harvest date on grain yield*

|  |  |  |
| --- | --- | --- |
|  | Harvest late January | Harvest late February |
| Namsoy | 1335 (n=4) | 550 (n=2) |
| Samba | 1257 (n=3) | 997 (n=2) |
| TGx1987-62F | 2185 (n=3) | 834 (n=2) |
| TGx1987-6F |  | 783 (n=6) |

***Soybean rust evaluation***

Location: Mumias

GPS: NA

Planting date: 19-9-2011

Harvest date: 19-1-2012 and 3-2-2012

Blanket application of: TSP/KCl/Urea and inoculation

Remarks:

Germination on all plots was quite low, between 56% (Sequel) and 76% (Saga). Only variety TGX1987-6F had an average germination of 85%. Varieties Maksoy, Namsoy, Nyala and SB19 had the highest rust scores. These scores diminished as a result of spraying, although they were still relatively high compared to other varieties. The number of nodules was comparable for most varieties, with the exception of Nyala which had a much lower nodule score. Spraying against rust barely affected the number of nodules. Grain yields benefitted largely from spraying, with an exception for varieties Saga and TGX1987-62F. Variety S823-6-16 achieved the highest grain yields when sprayed, and also had a relatively low rust score. Stover yields also benefitted from spraying in most cases, with Namsoy, S823-6-16 and Samba showing the strongest increase in yield. The plot of variety Saga and two of TGX1987-62F (all three sprayed), and all plots of TGX1987-6F were harvested early February, whereas the other plots were harvested mid-January. This late harvesting had a negative impact on grain yields, with yields in January being twice to four times as high as yields from February.

*Effect of harvest date on grain yield*

|  |  |  |
| --- | --- | --- |
|  | Mid-January | Early February |
| Saga | 1364 (n=5) | 327 (n=1) |
| TGx1987-62F | 1043 (n=4) | 530 (n=2) |
| TGx1987-6F | - | 577 (n=6) |

***Soybean rust evaluation***

Location: Teso

GPS: E 34.19183; N 0.564333; Elevation: 1185 m

Planting date: 13-9-2011

Harvest date: 11-1-2012 and 9-2-2012

Blanket application of: TSP/KCl/Urea and inoculation

Remarks:

There is a high variability of germination among the different plots. For varieties Maksoy and Namsoy average germination is above 80% (with the sprayed plots showing better germination than the non-sprayed plots). Varieties Saga, Samba and Squire, in contrast, have germination percentages of less than 50%.

The rust score decreased dramatically for all varieties as a result of spraying against soybean rust. Only for variety Sequel the difference is not that big, but this variety had a relatively low score already. Variety Maksoy, in contrast, had a high rust score before spraying.

The number of nodules did not seem to benefit from spraying against rust, but the decrease in rust score was translated in higher grain yields. Varieties Maksoy, Samba and SB19 benefitted the most. The highest grain yield with spraying was obtained by varieties Sequel and Squire. Stover yields generally also increased after spraying. The only varieties that did not, or barely, benefit were Nyala, TGX1987-62F and TGX1987-6F.

The difference in timing of harvest between mid-January and mid-February again resulted in lower soybean yields for the plots harvested in February.

*Effect of harvest date on grain yield*

|  |  |  |
| --- | --- | --- |
|  | Harvest mid-January | Harvest mid-February |
| Namsoy | 546 (n=5) | 417 (n=3) |
| TGx 1987-62F | 1314 (n=4) | 456 (n=4) |
| TGx 1987-6F | 971 (n=4) | 488 (n=4) |