## Results field book Nigeria, rainy season 2011

In Nigeria, cowpea, groundnut and soybean were disseminated. The trials that were carried out by the farmers were:

* Soybean: 4 treatments – no inputs, inoculation only, SSP only, inoculation + SSP; or 2 treatments: local variety compared to improved TGX variety with inoculation and SSP.
* Groundnut: varieties (RMP 12, RMP 14 RMP 4 and RMP 91, and Samnut 21, Samnut 22 and Samnut 23). All treatments received SSP. In 3 trials a local variety without inoculation was compared to Samnut 22/23 with inoculation.
* Cowpea: varieties (IT89KD-288, IT90K-277-2, IT93K-452-1, IT97K-499-35, IT97K573-1-1, IT98K-205-8). All treatments received SSP. In 6 trials a local variety without inoculation was compared to an improved variety with inoculation.

Yields were reported in either shelled or unshelled yields. Unshelled yields were converted to shelled yields by applying a conversion factor of 0.5 for groundnut, and 0.7 for cowpea and soybean. All yields are reported as fresh weight.

Data was gathered from a total number of 229 farmers, divided over two states in Nigeria. Soybean was distributed in all states, while cowpea and groundnut were only used in Kaduna North and Kano (Table 1).

Table : Number of trials with cowpea, groundnut and soybean per state

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Cowpea | Groundnut | Soybean | Total |
| Kaduna North | 10 | 16 | 52 | 78 |
| Kaduna South | 1 | 0 | 51 | 52 |
| Kano | 37 | 22 | 40 | 99 |
| Total | 48 | 38 | 143 | 229 |

**General information**

The majority of farmers who filled in the book was male, and had a role a lead farmer in the project (Table 2).

Table : Number of farmers, percentage male/ female, average age and role in project

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | No of farmers | Gender | | Role in project | |
|  |  | Female | Male | Lead farmer | Satellite farmer |
| Kaduna North | 78 | 6% | 94% | 81% | 19% |
| Kaduna South | 52 | 29% | 71% | 79% | 21% |
| Kano | 99 | 14% | 86% | 83% | 17% |
| Total/ average | 229 | 15% | 85% | 81% | 19% |

The average age of the farmers who filled in the book was 45 years old. Land ownership was for 83% family land and 17% hired land. Even though 15% of the farmers interviewed were female, only 4% of the women farmers control the management of the plot and the harvest. Three quarters of the farmers indicated that the husband controls this, and in about 20% both husband and wife are responsible.

There are large differences in average farm sizes between states and districts within states, in terms of average farm size and livestock kept (Table 3). The average farm size is 5.2 ha in Nigeria, but while farmers in Bunkure have an average of 11.4 ha, in Igabi this is only 1.7 ha. The median farm size is lower in most cases. The average number of tropical livestock units is also highest in Bunkure with an average of 9.6 TLU. In Igabi very few livestock are kept.

Table : Average and median farm size and number of TLU per district

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | N | Average farm size | Median farm size | Average TLU | Median TLU |
| *Kaduna North* | *78* | *3.6* | *4.3* | *1.6* | *0.2* |
| Giwa LGA | 26 | 6.0 | 5.0 | 3.2 | 2.4 |
| Igabi LGA | 26 | 1.7 | 1.5 | 0.5 | 0.0 |
| Soba LGA | 26 | 3.1 | 3.0 | 1.2 | 0.6 |
| *Kaduna South* | *52* | *6.2* | *3.0* | *1.8* | *0.3* |
| Kachia LGA | 26 | 6.7 | 4.0 | 1.5 | 0.9 |
| Zango Kataf LGA | 26 | 5.8 | 4.8 | 2.1 | 1.8 |
| *Kano* | *99* | *6.0* | *5.0* | *4.9* | *0.7* |
| Bichi LGA | 23 | 5.0 | 5.0 | 3.0 | 1.5 |
| Bunkure LGA | 21 | 11.4 | 10.0 | 9.6 | 9.0 |
| Dawakin Kudu LGA | 5 | 3.3 | 3.3 | 9.4 | 3.9 |
| Garko LGA | 16 | 3.4 | 3.0 | 2.0 | 1.5 |
| Gaya LGA | 15 | 2.7 | 2.5 | 1.8 | 2.3 |
| Ungogo LGA | 19 | 4.8 | 5.0 | 5.9 | 5.0 |
| Total/ Average | 229 | 5.2 | 4.0 | 3.1 | 1.6 |

A majority of farmers in Nigeria already grows legumes outside the N2Africa trial plot (Table 4). Cowpea and groundnut are the most popular, although in Kaduna North a relatively large number of farmers also grows soybean.

Table : Percentage farmers that grow legumes outside N2Africa and type of legumes grown

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Grow legumes  outside N2Africa | Groundnut | Soybean | Cowpea |
| Kaduna North | 71% | 64% | 74% | 74% |
| Kaduna South | 73% | 79% | 62% | 71% |
| Kano | 97% | 87% | 48% | 78% |
| Average | 83% | 77% | 60% | 75% |

**Crop yields**

*Soybean*

On some plots, unrealistically high yields of ≥5 t/ha fresh grain weight were reported. These plots were left out in the analysis (32 out of 523 individual plots, or 6%). In general, the highest yields were achieved in Kaduna North (Table 5). In all states, the control yields were lower than the soybean yields where either P or inoculation was applied. The combination of inoculation and P fertilizer had the largest impact, although in Kaduna North, on average, the treatments with inoculation only gave the best yield.

Table : Effect of treatments on soybean grain yield (fresh weight in kg/ha)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | - I / - P | - I/ + P | + I/ - P | + I/ + P | Average |
| Kaduna North | 1032 | 1296 | 1585 | 1489 | 1373 |
| Kaduna South | 755 | 1109 | 1132 | 1507 | 1129 |
| Kano | 519 | 929 | 998 | 1161 | 919 |
| Average | 752 | 1154 | 1174 | 1418 | 1159 |

Germination on most soybean plots was reasonable, between 75 and 90% or above, and there is not much difference between the treatments (Table 6). Only the control treatment showed some plots with very low germination percentages of 25 to 50%. This may partly explain low yields for this treatment. The treatments with inoculation and P-fertilizer generally had the highest germination percentages.

Table : Germination percentages on % of plots per treatment

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | N | - I / - P | - I / + P | + I / - P | + I / + P | Average |
| 25-50% | 2 | 7% | 0% | 0% | 0% | 2% |
| 50-75% | 14 | 7% | 19% | 23% | 5% | 12% |
| 75-90% | 52 | 45% | 50% | 41% | 46% | 46% |
| >90% | 46 | 41% | 31% | 36% | 49% | 40% |
| Total | 114 | 100% | 100% | 100% | 100% | 100% |

The trials on almost every farm gave a response to the inputs applied (Figure 1). The impact on yield of inoculation and P was limited in some fields where control yields were around 0.5 t/ha. On other fields with the same control yield, however, a large improvement was achieved whereby yields increased of up to 1.5 t/ha. Both inoculation only and P-fertilizer only also led to large increases in yield.

Figure : Response to inoculation and P-fertilizer on soybean grain yield (fresh weight in kg/ha)

In some of the trials, two different varieties and input levels were compared: a local variety without P or inoculation was compared to an improved variety (a TGX-line) where P and inoculants were applied (Figure 2). Only on farm with very low yields these inputs did not show an increase in yield, but in all other farms yields improved compared to the control. In most cases, yields even (more than) doubled.

Figure : Effect of variety, inoculation and P-fertilizer on soybean grain yield (fresh weight in kg/ha)

Half of the plots were in late July or August, which is too late for soybean. On average, the yields of the crops that were planted in June or early July were about double those planted in Late July or August (Table 7).

Table : Effect of planting date on soybean grain yield (fresh weight in kg/ha)

|  |  |  |
| --- | --- | --- |
|  | N | Average grain yield (kg/ha) |
| June | 14 | 1277 |
| Early July | 220 | 1589 |
| Late July | 199 | 893 |
| August | 58 | 412 |
| Total/ average | 491 | 1159 |

Surprisingly, the yields of farmers who applied some form of organic fertilizer (e.g. farm yard manure or cow dung) were lower than of those who did not apply organic fertilizers at all (Table 8). Farmers who applied organic fertilizer had an average of about 6 TLU, whereas farmers who did not apply organic fertilizer had on average 2 TLU.

Table : Effect of organic fertilizer on soybean grain yield (fresh weight in kg/ha)

|  |  |  |  |
| --- | --- | --- | --- |
|  | N | Average grain yield (kg/ha) | Number of TLU |
| Organic fertilizer | 83 | 904 | 6.2 |
| No organic fertilizer | 408 | 1211 | 2.0 |
| Total/ average | 491 | 1159 | 2.8 |

Generally, the plots which were managed by men achieved higher yields than the plots managed by women (Table 9). These could be plots of female headed households, or plots where women own a small piece of land next to the household plot. The plots where men were responsible had generally larger farm sizes and more livestock than where women managed the plots, which could indicate that the latter households were poorer as these type of households are found in all three regions. The plots where both partners managed the plot together had the highest farm size and number of TLU. The role of the farmer in the project as lead or satellite farmer did also influence grain yields. Remarkably, satellite farmers had higher grain yields, but a lower average farm size and number of livestock.

Table : Effect of plot management and role in project on soybean grain yield (fresh weight in kg/ha)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | N | Grain yield (kg/ha) | Farm size (ha) | Number of TLU |
| *Plot managed by* |  |  |  |  |
| Husband | 306 | 1155 | 5.0 | 2.4 |
| Wife | 28 | 851 | 2.8 | 0.8 |
| Both | 140 | 1178 | 6.8 | 4.2 |
| Not specified | 17 | 1591 | 4.9 | 1.7 |
| Total/ average | 491 | 1159 | 5.4 | 2.8 |
| *Role in project* |  |  |  |  |
| Lead farmer | 430 | 1113 | 5.7 | 3.0 |
| Satellite farmer | 61 | 1482 | 2.7 | 1.5 |
| Total/ average | 491 | 1159 | 5.4 | 2.8 |

*Cowpea*

In the cowpea trials, an improved variety was compared to a local control. Unrealistically high yields of ≥3 t/ha were left out of the analysis (22 out of 144 plots, or 15%).

Most of the trials showed reasonable germination percentages of 75-90% or higher. Only some trials with local varieties had lower germination percentages of e.g. 25-50%.

Table 10 provides an overview of the yields achieved for the different varieties in the three districts. Average cowpea yields in Kano were higher than in Kaduna North. In Kaduna South only three farmers tested cowpea, and they all achieved very low yields. The highest grain yield was reached in Kano with variety IT 90K-277-2. In Kaduna North, variety IT 89KD-391 achieved the highest average grain yield.

Table : Cowpea grain yield (fresh weight in kg/ha) per variety and district

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Kaduna North | Kaduna South | Kano | Average |
| Local | 504 (n=8) | 210 (n=1) | 626 (n=37) | 596 (n=46) |
| IT 89KD -288 | 650 (n=1) |  |  | 650 (n=1) |
| IT 89KD-391 | 788 (n=3) |  | 606 (n=2) | 715 (n=5) |
| IT90K-277-2 | 424 (n=4) |  | 869 (n=41) | 830 (n=45) |
| IT93K-452-1 |  | 298 (n=2) | 656 (n=4) | 537 (n=6) |
| IT97K-499-35 | 291 (n=3) |  | 634 (n=5) | 505 (n=8) |
| IT97K-573-1-1 | 656 (n=4) |  | 813 (n=2) | 709 (n=6) |
| IT98K-205-8 |  |  | 391 (n=5) | 391 (n=5) |
| Average | 532 (n=23) | 268 (n=3) | 723 (n=96) | 676 (n=122) |

The yields of the improved varieties plotted against the yield of local varieties shows that in most cases the improved varieties achieved higher yields (Figure 3). Only variety IT90K-277-2 has several yields below the local control, but this variety also has the largest number of observations. Generally, also this variety achieved higher yields than the control.

Figure : Cowpea grain yields (fresh weight in kg/ha) of local control compared to improved variety

In six trials, a local variety without inoculation was compared to an improved variety with inoculation. In all except two trials yields increased with the improved variety and inoculation (Figure 4). Only with variety IT 90K-277-2 yield increases were considerable, however.

Figure : Cowpea grain yields (fresh weight in kg/ha) of local control without inoculation compared to improved variety with inoculation

Planting date did not influence grain yields much (Table 11).

Table : Effect of planting date on cowpea grain yield (fresh weight in kg/ha)

|  |  |  |
| --- | --- | --- |
|  | N | Average grain yield (kg/ha) |
| June | 14 | 662 |
| Early July | 39 | 737 |
| Late July | 45 | 679 |
| August | 22 | 572 |
| September | 2 | 625 |
| Total/ average | 36 | 676 |

More than half of the farmers applied some form of organic fertilizer on their cowpea field, but again, these farmers achieved lower yields than those who did not apply organic fertilizer (Table 12). The farmers who applied organic fertilizer have a much higher average number of livestock.

Table : Effect of organic fertilizer on cowpea grain yield (fresh weight in kg/ha)

|  |  |  |  |
| --- | --- | --- | --- |
|  | N | Average grain yield (kg/ha) | TLU |
| Organic fertilizer | 64 | 534 | 8.0 |
| No organic fertilizer | 58 | 832 | 1.8 |
| Total/ average | 122 | 676 | 4.7 |

All cowpea fields were either managed by the husband, or by both husband and wife (Table 13). Gender did not affect grain yields. The role that the farmer played in N2Africa did have influence on cowpea yields, with lead farmers obtaining higher yields (on average more than 100 kg/ha more). Lead farmers also had a larger farm size and number of livestock, which could indicate that these farmers are richer than satellite farmers.

Table : Effect of plot management and role in project on cowpea grain yield (fresh weight in kg/ha)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | N | | Grain yield (kg/ha) | Farm size (ha) | Number of TLU |
| *Plot managed by* |  | |  |  |  |
| Husband | 27 | | 663 | 5.4 | 10.1 |
| Both | 95 | | 679 | 5.4 | 3.3 |
| Average | 122 | | 676 | 5.4 | 4.7 |
| *Role in project* | |  |  |  |  |
| Lead farmer | 112 | | 686 | 5.6 | 5.0 |
| Satellite farmer | 10 | | 564 | 3.9 | 2.7 |
| Average | 122 | | 676 | 5.4 | 4.7 |

*Groundnut*

Yields in Kano were slightly higher than Kaduna North (Table 14). Of the Samnut lines, variety Samnut 23 performed best in both states. Of the RMP lines, RMP 4 gave very high yields in Kano (but measured on only 2 plots), followed by RMP 91. RMP 12 and 14 did not improve yields compared to the control in Kano, and the same result was found for varieties Samnut 21 and 22.

Table : Groundnut grain yield (fresh weight in kg/ha) per variety and district

|  |  |  |  |
| --- | --- | --- | --- |
|  | Kaduna North | Kano | Average |
| Local variety | 1063 (n=15) | 913 (n=22) | 974 (n=37) |
| RMP 12 | 2400 (n=1) | 450 (n=1) | 1425 (n=2) |
| RMP 14 |  | 283 (n=2) | 283 (n=2) |
| RMP 4 |  | 2538 (n=2) | 2538 (n=2) |
| RMP 91 |  | 1213 (n=22) | 1213 (n=22) |
| Samnut 21 | 1004 (n=2) | 679 (n=3) | 809 (n=5) |
| Samnut 22 | 938 (n=8) | 592 (n=6) | 790 (n=14) |
| Samnut 23 | 1323 (n=17) | 1538 (n=6) | 1379 (n=23) |
| Average | 914 (n=43) | 1007 (n=66) | 974 (n=109) |

About one third of the trials had a relatively low germination percentage of between 50 and 75% (Table 15). Especially many trials with local varieties and Samnut 21 and 23 had a low germination percentage. Germination of RMP 91 and Samnut 22 was generally good; for RMP 91 even almost half of the trials had a germination percentage of more than 90%.

Table : Germination percentages on % of plots per treatment

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | N | Local variety | RMP 91 | Samnut 21 | Samnut 22 | Samnut 23 | Average |
| 50-75% | 33 | 38% | 23% | 40% | 14% | 39% | 31% |
| 75-90% | 53 | 46% | 32% | 40% | 79% | 52% | 50% |
| >90% | 21 | 16% | 45% | 20% | 7% | 9% | 20% |
| Total | 107 | 100% | 100% | 100% | 100% | 100% | 100% |

If the most widely tested varieties (RMP 91, Samnut 22 and Samnut 23) are plotted against the yields of local varieties, it becomes clear that even though the average yield of variety Samnut 22 is lower than the average yield of local varieties in all trials, in individual trials the yields were comparable or slightly higher (Figure 5). Only in two trials yields were lower. Also varieties RMP 91 and Samnut 23 generally gave higher yields than local varieties. Only with very low yields of below 500 kg/ha the improved varieties gave yields comparable to the local ones.

Figure : Groundnut grain yield (fresh weight in kg/ha) of local control compared to improved variety

In three trials, a local variety without inoculation was compared to an improved variety with inoculation. In all three the average grain yield of improved variety with inoculation was higher than the local variety without inoculation.

Groundnut planted in early July gave the highest grain yields; more than double the yields of groundnut planted in June, late July or August (Table 16).

Table : Effect of planting date on groundnut grain yield (fresh weight in kg/ha)

|  |  |  |
| --- | --- | --- |
|  | N | Yield (kg/ha) |
| June | 6 | 529 |
| Early July | 66 | 1390 |
| Late July | 31 | 662 |
| August | 6 | 589 |
| Total | 109 | 1006 |

One third of the famers applied organic fertilizer (Table 17). The yields of farmers who applied some form of organic fertilizer were slightly higher than the yields of those who did not apply organic fertilizer. The farmers who applied organic fertilizer had on average about 5 TLU, compared to 2 TLU among farmers who did not use organic fertilizer.

Table : Effect of organic fertilizer on groundnut grain yields (fresh weight in kg/ha)

|  |  |  |  |
| --- | --- | --- | --- |
|  | N | Grain yield (kg/ha) | Number of TLU |
| Organic fertilizer | 47 | 1130 | 5.4 |
| No organic fertilizer | 62 | 1063 | 2.0 |
| Grand Total | 109 | 1092 | 3.4 |

The groundnut fields managed by the husband attained yields that were more than double the yields of the two plots where the wife was responsible (Table 18). Again, the farm size and number of livestock were also lower at the farms where women were managing the plot. The plots where both husband and wife managed the plot attained lower yields than the ones where the husband only was responsible, but the former farms had a considerable higher average land size and number of livestock. Satellite farmers had slightly higher groundnut yields than lead farmers, but comparable farm sizes and number of livestock.

Table : Effect of plot management and role in project on groundnut grain yields (fresh weight in kg/ha)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | N | | Grain yield (kg/ha) | Farm size (ha) | Number of TLU |
| *Plot managed by* |  | |  |  |  |
| Husband | 96 | | 1150 | 3.6 | 3.2 |
| Wife | 2 | | 475 | 1.5 | 1.3 |
| Both | 11 | | 692 | 7.5 | 5.9 |
| Average | 109 | | 1092 | 3.9 | 3.4 |
| *Role in project* | |  |  |  |  |
| Lead farmer | 90 | | 1065 | 4.1 | 3.5 |
| Satellite farmer | 19 | | 1219 | 3.1 | 3.3 |
| Average | 109 | | 1092 | 3.9 | 3.4 |

**Characteristics of the N2Africa plots**

The majority of the legume plots are located in the lowlands (Table 19). Groundnut yield on these plots is also higher than plots on foot slopes or plateaus. For cowpea and soybean, the highest yields are achieved on the plots located on slopes.

Table : Location of plot in the landscape

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Soybean | | groundnut | | cowpea | |
|  | N | yield (kg/ha) | N | yield (kg/ha) | N | yield (kg/ha) |
| Foot slope | 112 | 881 | 5 | 790 | 7 | 1006 |
| Lowland | 340 | 1222 | 94 | 1176 | 97 | 651 |
| Plateau | 8 | 983 | 10 | 451 | 15 | 602 |
| Slope | 23 | 1493 |  |  | 3 | 1078 |
| Total/ average | 483 | 1152 | 101 | 1092 | 122 | 676 |

Farmers generally characterized the drainage of their plot as good or moderate (Table 20). Only in soybean some farmers indicated that drainage was poor, and on these fields the yields were lower compared to the plots with better drainage. In groundnut and cowpea drainage did not seem to play an important role, as the yields are similar, or in groundnut even higher with moderate drainage.

Table : Soil drainage of the plot

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | soybean | | groundnut | | cowpea | |
|  | N | yield (kg/ha) | N | yield (kg/ha) | N | yield (kg/ha) |
| Good | 225 | 1154 | 39 | 845 | 67 | 682 |
| Moderate | 256 | 1171 | 70 | 1229 | 55 | 667 |
| Poor | 10 | 980 |  |  |  |  |
| Total/ average | 491 | 1159 | 109 | 1092 | 122 | 676 |

Plots were also judged on whether there were visible signs of soil erosion. In the majority of plots, this was not the case (Table 21). Only in groundnut it appears that the plots with signs of soil erosion had lower yields, for the other two legumes yields on both type of plots are comparable.

Table : Signs of soil erosion on the plot

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | soybean | | Groundnut | | cowpea | |
|  | N | yield (kg/ha) | N | yield (kg/ha) | N | yield (kg/ha) |
| No | 356 | 1187 | 94 | 1146 | 99 | 696 |
| Yes | 84 | 1112 | 10 | 716 | 12 | 716 |
| Total/ average | 440 | 1173 | 98 | 1105 | 111 | 698 |

Most farmers apply soil conservation measures, with tied riding being the most popular (on about 50% of the soybean, groundnut and cowpea fields) (Table 22). An analysis per state (data not presented) shows that tied ridges are applied by farmers in all states, whereas bench terraces, ditches and grass strips are mainly only applied in Kano (only on some soybean plots in Kaduna North and South they are applied as well). The fact that yields are relatively high on the fields with ditches is therefore as much a reflection of yields in the state as of the measure per se. Soybean yields on the plots where no conservation measures were applied are considerably lower than on the fields with structures. In groundnut and cowpea, yields on plots without conservation measures were relatively high.

Table : Presence of soil conservation structures

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | soybean | | groundnut | | cowpea | |
|  | N | yield (kg/ha) | N | yield (kg/ha) | N | yield (kg/ha) |
| Bench terrace | 10 | 1771 | 3 | 903 | 4 | 389 |
| Ditches | 28 | 1787 | 11 | 1810 | 16 | 1122 |
| Grass strips | 44 | 1102 | 3 | 500 | 23 | 449 |
| Tied ridges | 258 | 1240 | 58 | 878 | 77 | 653 |
| Tree lines | 14 | 1039 | 10 | 291 |  |  |
| No structures | 137 | 864 | 24 | 1709 | 2 | 1150 |
| Total/ average | 491 | 1159 | 109 | 1092 | 122 | 676 |

Soil fertility of the N2Africa plot is perceived as moderate to (very) fertile by most farmers (Table 24). Only some soybean plots were judged to have a poor soil fertility status. Soybean yields on these plots were not remarkably lower than on the more fertile plots, however. In groundnut, the plots that were perceived very fertile gave the highest grain yield, but in cowpea the yields did not differ according to the soil fertility judgments.

Table : Perception of soil fertility by farmer

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | soybean | | groundnut | | cowpea | |
|  | N | yield (kg/ha) | N | yield (kg/ha) | N | yield (kg/ha) |
| Very fertile | 47 | 1221 | 21 | 1559 | 36 | 667 |
| Fertile | 90 | 1592 | 29 | 925 | 20 | 623 |
| Moderate | 314 | 1063 | 59 | 1007 | 66 | 696 |
| Poor | 28 | 1134 |  |  |  |  |
| Total/ average | 479 | 1182 | 109 | 1092 | 122 | 676 |

It is generally assumed that farmers give their poorer fields to researchers for experiments. According to the farmers, however, the N2Africa plots have the same or an even better soil fertility status than their other fields (Table 25). Only in soybean and cowpea a small percentage indicates that the N2Africa plot has a lower soil fertility status. The plots for which it was indicated that the soil fertility was better than on other fields also had a higher grain yield in soybean and cowpea. In groundnut, yields were a bit higher on the fields that were judged the same as the other fields.

Table : Soil fertility on the N2Africa plot in relation to other fields on the farm

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | soybean | | groundnut | | cowpea | |
|  | N | yield (kg/ha) | N | yield (kg/ha) | N | yield (kg/ha) |
| Better | 200 | 1460 | 26 | 867 | 43 | 711 |
| Same | 246 | 1034 | 80 | 1107 | 64 | 697 |
| Poorer | 21 | 427 |  |  | 8 | 585 |
| Total/ average | 467 | 1189 | 106 | 1048 | 115 | 695 |

**Awareness nodules and inoculation**

All farmers who cultivated soybean had heard about root nodules, and they all indicate that they are beneficial (Table 26). In cowpea and groundnut two third and one third of the farmers respectively has heard about nodules. Most farmers think they are beneficial, but some are uncertain about what they mean.

Table : Farmers’ awareness of and opinion on nodules

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Heard about nodules | | |  | Opinion about nodules | | |  |
|  | No | Yes | Blank | Total | Beneficial | Uncertain | Blank | Total |
| Cowpea | 3% | 65% | 33% | 100% | 86% | 3% | 10% | 100% |
| Groundnut | 5% | 37% | 59% | 100% | 91% | 2% | 7% | 100% |
| Soybean | 0% | 100% | 0% | 100% | 100% | 0% | 0% | 100% |
| Total | 2% | 68% | 30% | 100% | 92% | 2% | 6% | 100% |

**Conclusion**

Many farmers in Nigeria already grow legumes. In Kano this is even 97%. Groundnut and cowpea are the most popular legumes, although many farmers in Kaduna North also grow soybean. Generally, the N2Africa trials in the form of response to inoculants and P-fertilizer or testing of varieties almost all showed a positive response to the introduced technology. In the soybean trials, all treatments (inoculation, P-fertilizer or a combination of both) resulted in an increase in yields. Only at very low yield levels, these treatments gave the same yields as the control. The trials in which a local variety was compared to an improved variety with inoculation and P all showed yield increases as well. Early planting (June or early July) resulted in the highest grain yields, but unfortunately half of the trials was planted too late. Other parameters did not show very pronounced differences, although the plots managed by men had higher yields than those managed by women. Manure application did not seem to result in improved yields, but this could also be a sign that manure is applied on poorer fields where the need is highest.

The cowpea trials existed of a comparison between different varieties. On average, the highest grain yield was reached in Kano with variety IT 90K-277-2. In Kaduna North, variety IT 89KD-391 achieved the highest average grain yield. In most trials, the yields of improved varieties were higher than the local control. Planting date as well as other variables tested did not result in pronounced yield differences.

The groundnut varieties RMP91, Samnut 22 and 23 were the varieties most widely tested by farmers. In nearly all trials, yields were higher than the control yield of a local variety. Planting in early July gave the highest yields. Farmers who applied organic fertilizer had higher yields than those who did not, and on plots where men managed the plot yields were higher than where women were responsible.