Varietal Trial of Crops for Conservation Agriculture Production Systems

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Introduction

Conservation Agriculture Production Systems (CAPS) optimizes use of land, labor and capital and aims to reverse soil degradation through minimum soil disturbance, continuous soil cover and planting of diverse crop species. As such, it is important to select high yielding varieties in both biomass and marketable yield to obtain maximum benefits in CAPS. Varieties of several crops are tested as to its yield and biomass performance for CA.

Objective

Crops with high biomass and marketable yield were aimed to be identified to be used in CAPS. Crops with high biomass provide good soil cover and those with high arketable yield gives farmers high profitability at the same time.

Methodology

Varieties of maize, upland rice, sorghum, cassava, sweetpotato, herbaceous legumes and forage grasses were assessed as to its biomass and marketable yield. The treatments are laid-out in randomized complete block design (RCBD) with 3to 4 replications depending on the crop being tested. .

Results

Stylosanthes guianensis and *Crotolaria juncea* out performed the rest of the herbaceous legumes evaluated (Table 1). *Arachis pintoi* yielded approximately 3 times lower than the Stylosanthes 5 months after planting. Crotolaria juncea, may be incorporated in a broader evaluation since it showed good performance under acid soil along with *Stylosanthes guianensis* and *Arachis pintoi.* Among the forage grasses evaluated, *Pennisetum purpureum* obtained the greatest height and produced the greatest total aboveground biomass followed by *Setaria splendida* (Table 2). These two forage grasses are erect type and are suitable for cut-and-carry system and to be planted as grass strips for soil conservation measures on sloping lands. *Brachiaria rhuzinensis* is another alternative forage grass which is creeping type and adapted to acid soil. These promising forage grasses can be integrated in CAPS which would generate high biomass for soil fertility regeneration.

Table 1. Aboveground biomass of herbaceous legumes, 5 months after planting. Claveria, Misamis Oriental, Philippines.

Herbaceous legumes species	Biomass (t/ha)
1. *Arachis pintoi*	1.38[b]
2. *Calopogonium mucunoides*	0.33[b]
3. *Centrosema hemata*	0.71[b]
4. *Crotolaria juncea*	3.82[a]
5. *Stylosanthes guianensis*	4.64[a]
Mean	2.05
SED	0.43
CV (%)	42

Means having the same letter are not significantly are not significantly different from each other by DMRT at 5% level.

Table 2. Biomass and Aboveground biomass of forage grass cultivars 3 months from pruning. Claveria, Misamis Oriental, Philippines.

Forage grasses	Biomass (t/ha)	Plant height (cm)
Brachiaria decumbens	1.15c	73.80 c
Brachiaria rhuzinensis	5.05abc	68.20 c
Panicum maximum	3.13bc	95.80 c
Pennisetum purpureum	9.12a	160.75 a
Setaria nandi	4.23abc	61.47 c
Setaria splendida	7.97ab	106.15 b
Mean	5.13	94.36
CV (%)	62.89	22.24
SED	2.15	13.99

Means having the same letters are not significantly different from each other by DMRT at 5% level.

Local sweet potato varieties, Ka Alma and Miracle, performed well under acid soil but the newly introduced PSB16 and Lingatos varieties yielded better (Figure 1). Among rice cultivars tested, IR55419-04 and NCIRC9 obtained comparable grain yield and total dry matter yield to IR30716-B-1-B-1-2 which is currently used in CAPS experiments (Figure 2). These 3 cultivars have high potential to be used in CAPS. In the cowpea evaluation, IT2D-889 outperformed NOMIARC cultivar in acid soil particularly in aboveground biomass which is an important criteria in selecting cowpea cultivars for inclusion in CAPS (Figure 3). Among the open pollinated maize tested, IPB 13 and IPB 6 out yielded the traditional varieties "tinigib" and "senorita" (Figure 4). Open pollinated maize are better for the farmers as they can collect and no longer have to buy seeds for subsequent cropping (Figure 4).

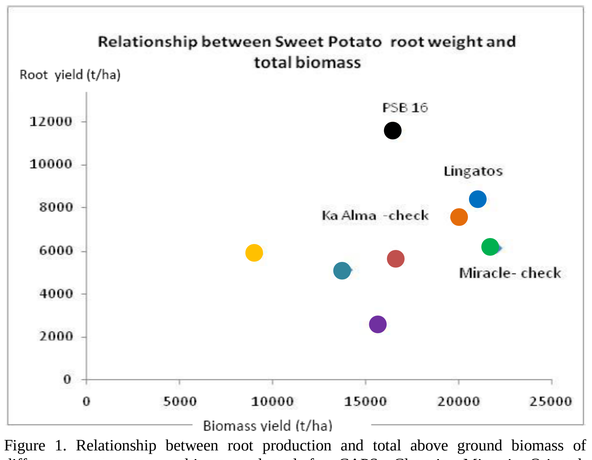

Figure 1. Relationship between root production and total above ground biomass of different sweet potato cultivars evaluated for CAPS. Claveria, Misamis Oriental, Philippines. Means of 3 replications.

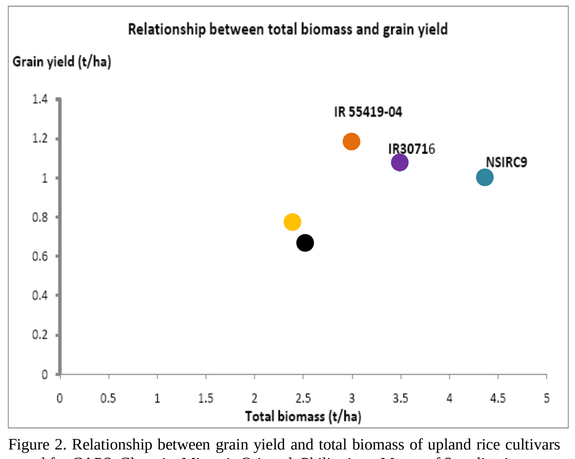

Figure 2. Relationship between grain yield and total biomass of upland rice cultivars tested for CAPS. Claveria, Misamis Oriental, Philippines. Means of 3 replications.

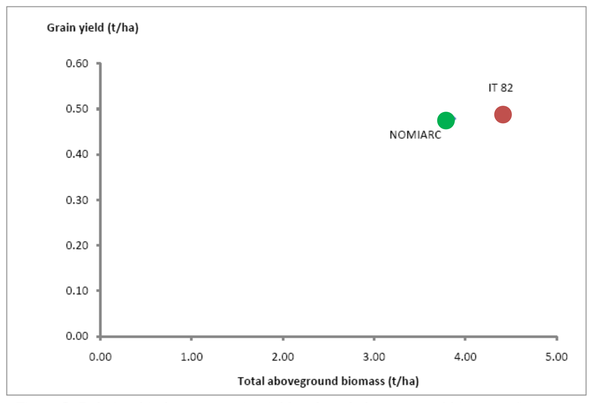

Figure 3. Relationship between grain yield and total above ground biomass of cowpea cultivars. Claveria, Misamis Oriental, Philippines. Means of 3 replications.

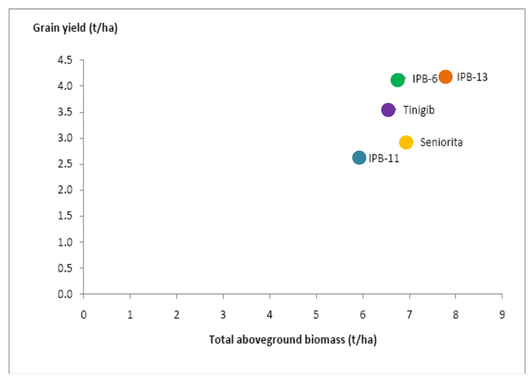

Figure 4. Relationship between grain yield and total above ground biomass of different maize cultivars. Claveria, Misamis Oriental, Philippines. Means of 3 replications.

Sorghum cultivars ICSU 93034 and IC93046 showed better adaptation in acid soils compared to other entries as suggested by its high yield and biomass production (Figure 5). On the other hand the Rayong 72 accession from Thailand and Lakan showed faster stem growth among the cassava cultivars evaluated (Figure 6). The popular KU-50 from Thailand and VISCA 4 which is a selection from Visayas State University in the Philippines were also showing good performance. Locally available cultivars like local dwarf yellow and local yellow gold were outperformed in height and diameter but harvest data are not yet available since they are still to be harvested.

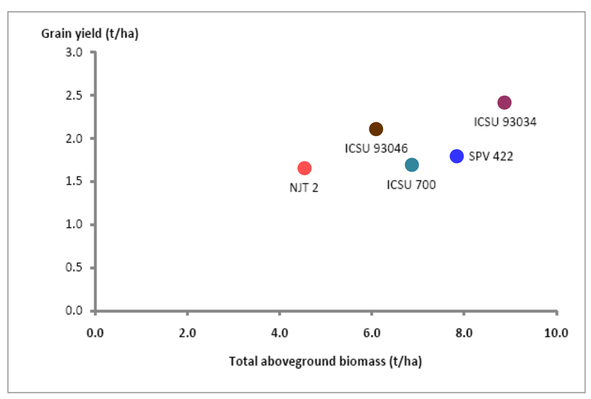

Figure 5. Relationship between grain yield and total aboveground biomass of sorghum cultivars. Claveria, Misamis Oriental, Philippines. Means of 3 replications.

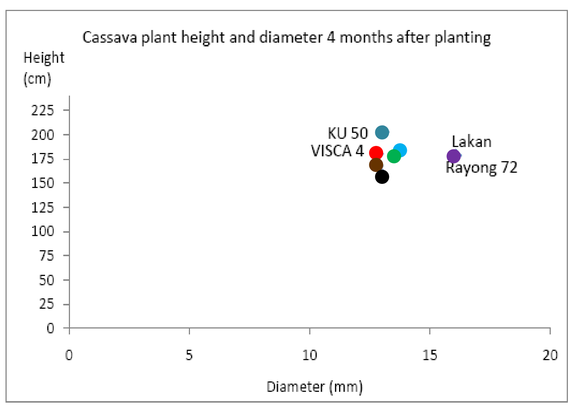

Figure 6. Relationship between plant height and stem diameter of different cassava cultivars. Claveria, Misamis Oriental, Philippines. Means of 3 replications.

Conclusion

Stylosanthes guianensis, *Crotolaria juncea* and *Arachis pintoi* are promising herbaceous legumes to be incorporated in CAPS. Forage grasses *Pennisetum purpureum* and *Stylosanthes guianensis* are ideal for CAPS due to its high biomass production and erect nature for cut and carry forage production. *Bracharia rhuzinensis* could be an alternative which is a creeping type and also adapted to acid soils. Sweet potato local varieties Ka Alma and Miracle are adapted to acid soils but newly introduced PSB 16 and Lingatos varieties are more adapted. Either of the 4 could be incorporated in CAPS for better yield. Cowpea IT2D-889 is an option to be used in CAPS due to its good performance in acid soil. IPB13 and IPB6 open pollinated maize offers better yield than traditional varieties. Sorghum cultivars ICSU 93034 and IC93046 showed better adaptation in acid soils thus could be a better option when incorporated in CAPS. In terms of height and diameter, Rayong 72 accession from Thailand and Lakan showed faster stem growth among the cassava cultivars evaluated including KU-50 from Thailand and VISCA 4 from VSU.

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