Varietal Trial of Crops for Conservation Agriculture Production Systems

Agustin R. Mercado, Jr.[1], Don Immanuel A. Edralin[1], Gill Arcinal [1], Manuel R. Reyes[2], Victor Ella[3]

[1] World Agroforestry Center-ICRAF, [2] North Carolina Agricultural and Technical State University, [3] University of the Philippines Los Baños

Introduction

Conservation Agriculture Production Systems 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 Conservation Agriculture Production Systems (CAPS). This is done in order to provide good soil cover and 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. Both *Stylosanthes* and *Arachis* were already integrated in the wider evaluation, but not the Crotolaria juncea which showed good performance under acid soil environment. This can also be integrated in wider experimentation to exploit its potential. Among the forage grasses evaluated, *Pennisetum purpureum* was top performer for both plant height and total aboveground biomass, and is followed by *Setaria splendida*. These two forage grass are erect type and are suitable for cut-and-carry system or 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 which is also adapted to acid soil. These promising forage grasses can be integrated in CAPS which would generate high biomass for soil fertility regeneration. (Table 2)

Among the sweet potato cultivars evaluated, newly introduced PSB16 and Lingatos yielded better in both aboveground biomass and roots compared to local check varieties Ka Alma and Miracle cultivars which are also performing well under acid upland soils (Figure 1). These 4 varieties are now planted in wider scale to be able to produce cutting planting materials for possible inclusion in the CAPS experimentation.

Under acid poor soil, IR55419-04 and NCIRC9 upland rice cultivars were having comparable grain yield and total dry matter yield against IR30716-B-1-B-1-2 which is currently used in CAPS experiments (Figure 2).

IT2D-889 outperformed NOMIARC cultivar in acid soil particularly in aboveground biomass which is also important criteria in selecting cowpea cultivars for inclusion in CAPS (Figure 3). IT82D-889 is now currently used in CAPS experimentation both at researcher- and farmer-managed plots. Because it has a good eating quality, we now conducted seed production to cater the needs of farmers who are excited to plant the crop on their own fields.

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.

IPB 13 and IPB 6 out yielded the traditional varieties such as "tinigib" and "senorita" This open pollinated maize varieties are better for the farmers for they can collect seeds for subsequent cropping (Figure 4). Choosing maize varieties that have both high grain yield and stalks would provide benefits for the soil as well as for the farmer's income.

ICSU 93034 and IC93046 sorghum cultivars showed better adaptation in acid soils as opposed to other entries. We are currently using these two cultivars in our farmer's-managed plots (Figure 5). Rayong 72 accession from Thailand and Lakan showed faster stem growth among the cassava cultivars evaluated. 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. This experiment is yet to be harvested this May 2011 (Figure 6).

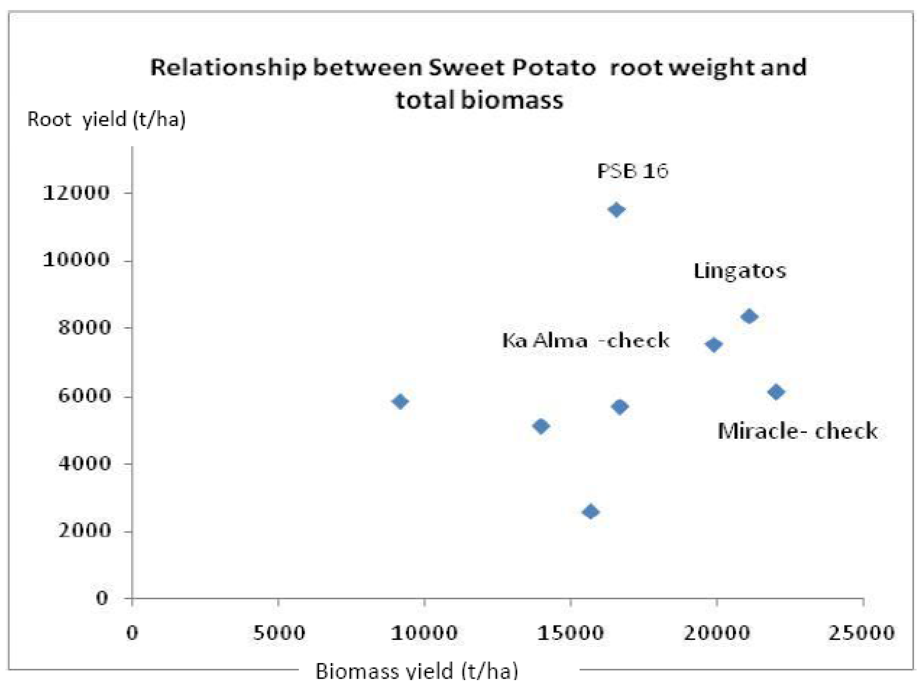

Figure 1. Relationship between root production and total above ground biomass of different sweet potato cultivars evaluated for CAPS. Claveria, Misamis Oriental, Philippines. Means of 3 replications.

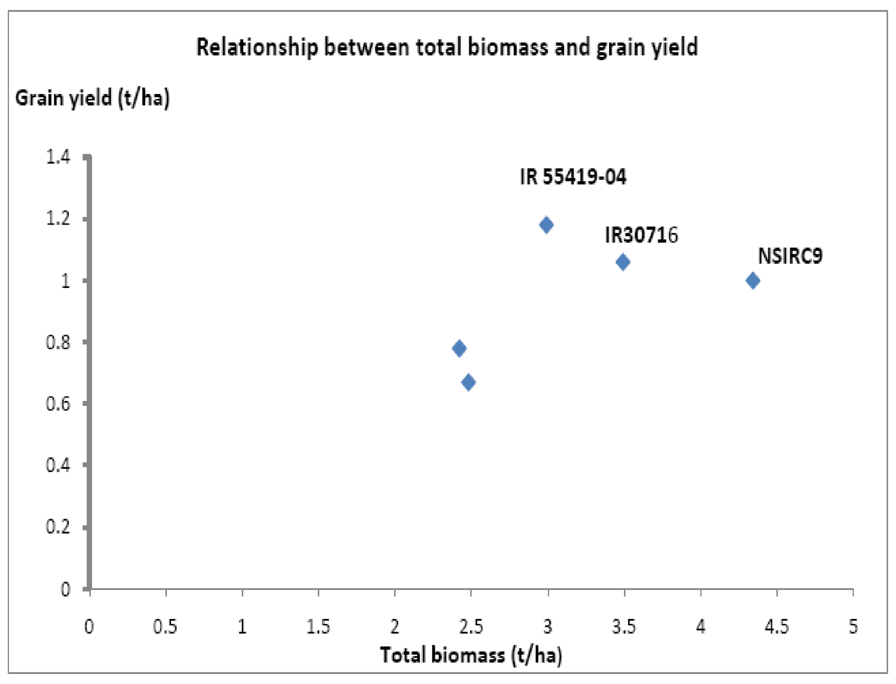

Figure 2. Relationship between grain yield and total biomass of upland rice cultivars tested for CAPS. Claveria, Misamis Oriental, Philippines. Means of 3 replications.

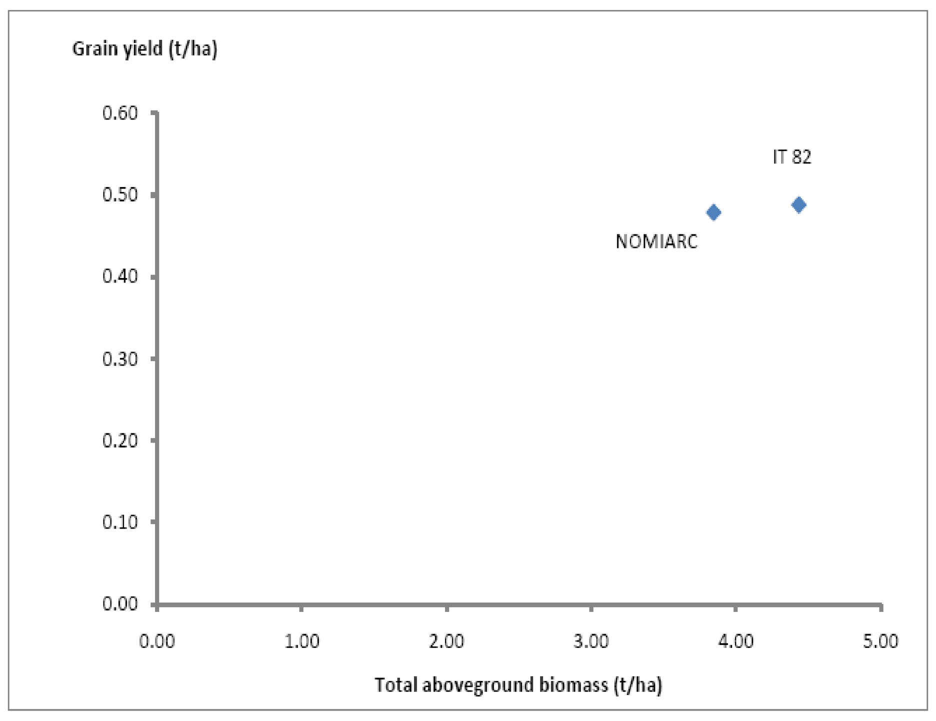

Figure 3. Relationship between grain yield and total above ground biomass of cowpea cultivars. Claveria, Misamis Oriental, Philippines. Means of 3 replications.

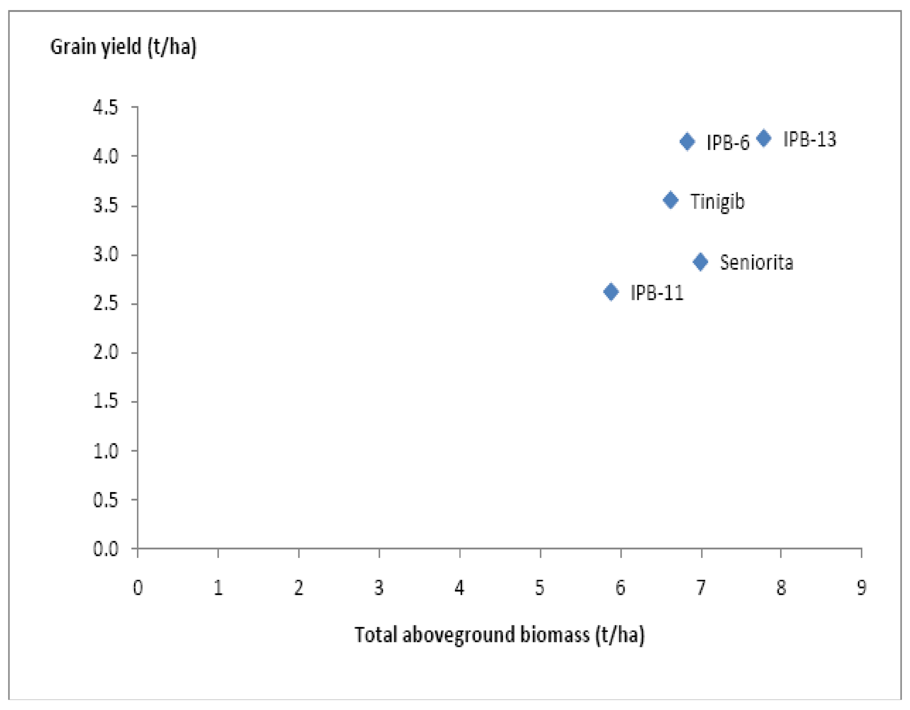

Figure 4. Relationship between grain yield and total above ground biomass of different maize cultivars. Claveria, Misamis Oriental, Philippines. Means of 3 replications.

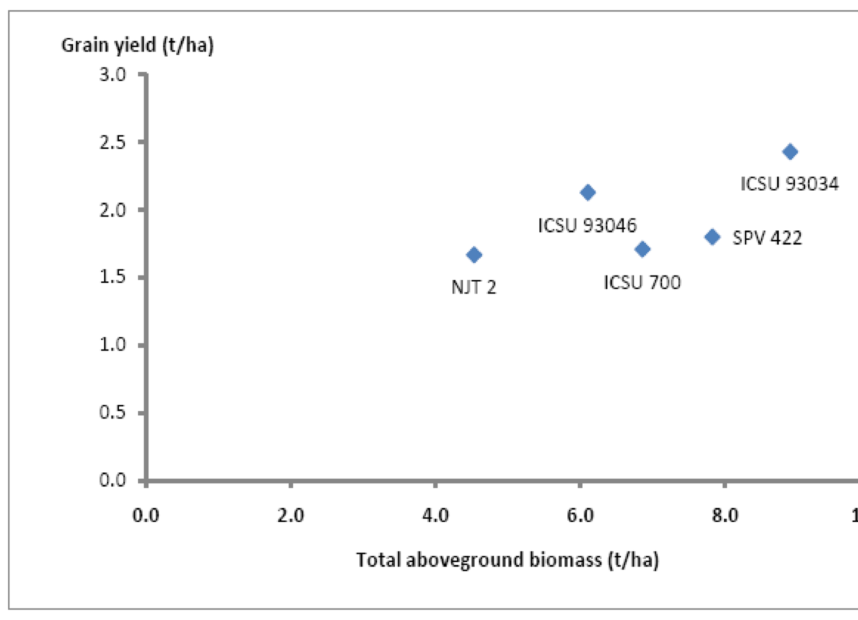

Figure 5. Relationship between grain yield and total aboveground biomass of sorghum cultivars. Claveria, Misamis Oriental, Philippines. Means of 3 replications.

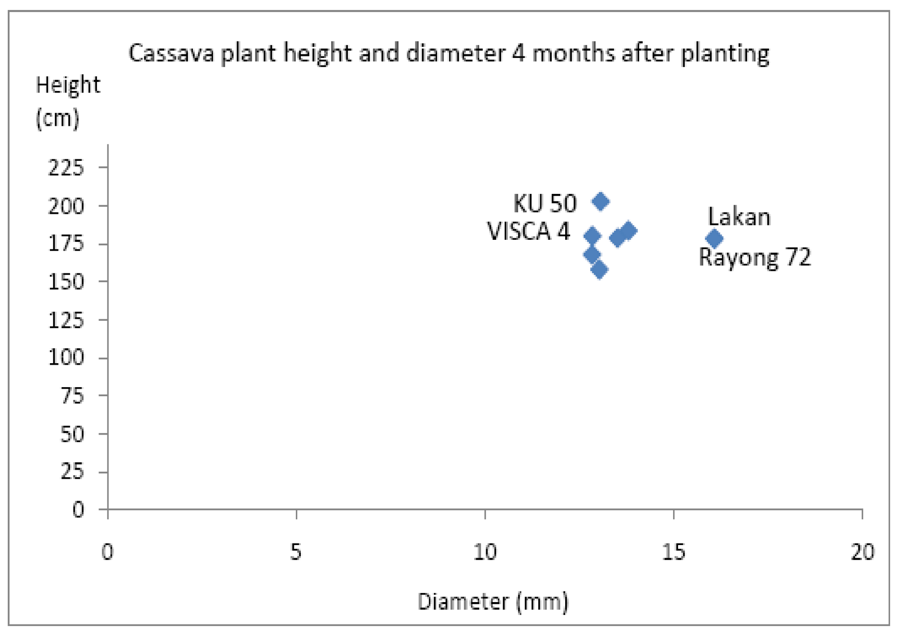

Figure 6. Relationship between plant height and stem diameter of different cassava cultivars. Claveria, Misamis Oriental, Philippines. Means of 3 replications.

This project was made possible through support provided by the United States Agency for International Development (USAID) and the generous support of the American people for the Sustainable Agriculture and Natural Resources Management Collaborative Research Support Program under terms of Cooperative Agreement Award No.EPP-A-00-04-00013-00 to the Office of International Research and Development at Virginia Tech.