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Effect of banana leaf pruning on banana and legume yield under intercropping in farmers' fields in eastern Democratic Republic of Congo

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Banana-legume intercropping systems are commonly practiced in the highland zones of the eastern Democratic Republic of Congo to maximize land use and intensify crop production. Banana leaves are often pruned during legume intercropping to improve sunlight penetration for the legume. On-farm experiments were conducted in South Kivu province to determine the effect of banana leaf pruning on banana (*Musa* sp.), bush and climbing beans (*Phaseolus vulgaris* L) and soybean (*Glycine max* L) yield. Legumes were planted in existing farmers' fields of East African highland beer banana genotype 'Nshikazi' (*Musa* sp., AAA-EA) during four cropping seasons covering 30 months. The experiments were established using a split-plot design, with the main plot treatments consisting of two levels of banana leaf canopy pruning (leaving only seven leaves or leaving all leaves) and the split plot treatments consisting of improved or local leguminous crop cultivars (the bush bean 'MLB49', the climbing bean 'AND10' and soybean 'SB24') planted in the banana plot. Each farmer's banana plot was a replicate. A total of 24 replicates, each of improved and local soybean, improved and local climbing bean and improved and local bush bean were planted in established farmers' fields located in four sites. Bean yields were assessed during four consecutive cropping seasons (2010B, 2011A and B, 2012A) and one cycle of banana cultivation. Banana leaf pruning did not have a significant effect on banana bunch weight or yield, but legume type affected banana fruit weight and yield in Burhale and Lurhala, which have poor soil fertility. Banana leaf pruning enhanced legume grain yield for the four seasons at all sites.

Key words: Bunch weight, legume type, number of banana leaves.

INTRODUCTION

On the African continent, with the exception of areas where banana production is characterized by large plantations for export, intercropping is a common practice. In Kenya, for example, 94% of beans are grown in association with maize (Stoffels, 1948; Davis et al., 1987). Intercropping aims at maximizing productivity and minimizing risks related to, for example, climate change, pests and diseases (Nyabyenda, 2006) and gives a greater overall farm yield stability compared with monoculture. Furthermore, it often provides a higher economic and monetary return and total production per hectare com-pared with monoculture and ensures greater resource use efficiency (Ouma, 2009). Land use efficiency of smallholder farms in east and central Africa can be increased by incorporating food and/or fodder legumes into banana cropping systems (Sileshi et al*.,* 2007). In addition, intercropping with legumes may also be a strategy to offset the depletion of soil fertility (Chakeredza et al., 2007).

Banana-bean intercropping is widespread across Eastern and Central Africa, including Uganda, Rwanda, Burundi, the Democratic Republic of Congo (DR Congo) and north-western Tanzania (Wortmann and Sengooba, 1993).

Crop production is primarily the conversion of solar energy to stored food energy (Pimentel and Pimentel, 2008) and a reduction in intercepted sunlight reduces crop production (Nyambo et al., 1982). Light competition is an important factor influencing yield of smaller-sized plants grown under partial shade in an intercropping system: it is clear that large plants (e.g., banana) will provide substantial levels of shade and could thus influence the growth and yield of smaller-sized intercrops (Davis et al., 1987).

In the eastern DR Congo, banana-legume intercropping is widely practiced (Dowiya et al., 2009). Some farmers practice banana leaf pruning when planting beans (Katungu, 2011; Mirindi, 2011). This practice enhances light penetration to ground level and thus positively influences legume growth and yield due to increased in interception of light (Ntamwira et al., 2013). There are, however, no quantitative data available on the effect of banana leaf pruning during the months of legume intercropping on growth and yield of banana and legumes.

The objective of this study was to evaluate whether banana leaf pruning affects legume grain yield without reducing banana yield.

MATERIALS AND METHODS

Study area

In the highlands of South Kivu, banana, cassava and common beans are the main food crops, traditionally cultivated in mixed cropping systems (CIALCA, 2010). Common beans (*Phaseolus vulgaris* L*)* are the predominant legume intercrop but, to a lesser extent, soybean (*Glycine max* L) is also grown. The region has long been deprived of new research and development initiatives due to civil strife and utilization of improved crop cultivars has been rather limited mostly due to unavailability.

South Kivu's average annual rainfall is 1500 mm, distributed over two rainy seasons (April to July and September to December). The study was conducted in the territory of Kabare, "groupements" of Kabamba (2.184°S, 28.852°E, 1595 m above sea level (masl)) and Luhihi (2.233°S, 28.2853°E, 1556 masl) and in the territory of Walungu, "groupements" of Burhale (2.692°S, 28.647°E, 1625 masl) and Lurhala (2.625°S, 28.758°E, 1964 masl).

Soils in Lurhala and Burhale are rather infertile Dystric or Humic Nitisols or Humic Ferralsols (FAO/UNESCO, 1988), developed on eruptive formations from the Pliocene or Pleistocene and characterized by a heavy clay texture, low soil pH, low base saturations and high organic C contents (Hecq, 1961). In Kabamba and Luhihi, more fertile Humic Nitisols and Ferralsols are found because of recent rejuvenation by volcanic ashes or mudflow deposits; these soils have high organic matter content, favourable pH and larger nutrient reserves than the soils of either Lurhala or Burhale (Lunze, 2000; Bashagaluke et al., 2011).

Experiment establishment, management

The on-farm experiments were conducted in four sites during four consecutive cropping seasons (2010B, 2011A, B and 2012A). The farms belonged to the members of the farmer group (18 farms per site) at Kabamba, Luhihi, Burhale and Lurhala and were dominated by the East African highland beer banana genotype 'Nshikazi' (*Musa* sp. AAA-EA group). Each farmer's banana plot was a replicate. The experiments were established within existing banana plantations (in various ratoon production stages) using a split-plot design (Figure 1).

The plot size was 14 × 10 m per farm. Each plot was subdivided into two main plots (14 × 5 m) and each main plot contained 21 banana mats. The main plot treatments consisted of two levels of banana leaf canopy pruning: leaving only seven youngest leaves from the top or leaving all leaves, as a control. Each main plot was subdivided into two subplots (7 × 5 m) containing nine banana mats, with three banana mats at the common border between the two subplots (Figure 1). The subplot treatments comprised improved (bush bean 'MLB49', climbing bean 'AND10' and soybean 'SB24') or local leguminous crop cultivars that were planted in the banana plot.

The local legume cultivars were selected by the farmers from a pool of currently cultivated genotypes and depended on location: at Burhale and Lurhala the local bush beans were 'M'Mafutala', 'Ciringiti', 'Kabumba', 'M'sole', 'Njwijwi', 'Ishikazi', 'Tangaza', 'Mugorobo' and 'Mubanda', while at Kabamba and Luhihi they

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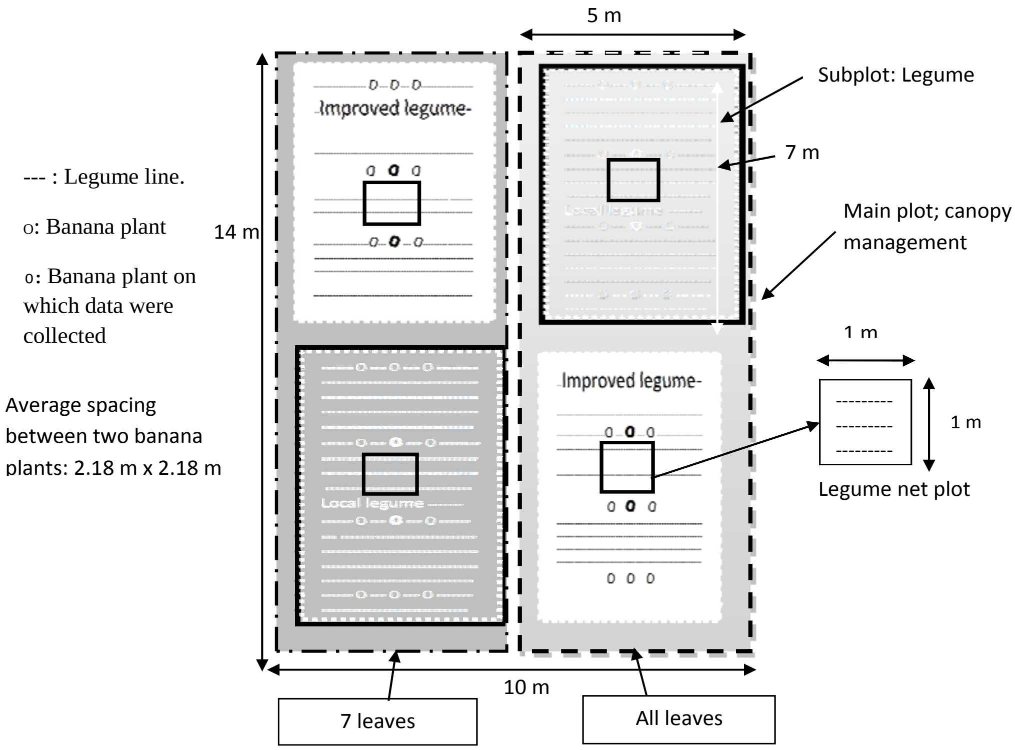

Figure 1. Sketch of the experimental design.

were 'M'sole', 'Karahoti', 'Ishikazi', 'Ngwaku Ngwaku', 'Masugampene', 'D6' and 'Civuzo'; the local climbing beans were ('Madama', 'Lwirungu', 'Nyamwisisi', 'Kiangara' and 'Kiana') and the local Soybean cultivars were 'Imperial' and 'Peka-6'. The improved legume cultivars were selected based on their performance and adaptation to local agro-ecological conditions during legume germplasm evaluation experiments previously conducted by the Consortium for Improving Agriculture-based Livelihoods in Central Africa (CIALCA) project, while the local cultivars were selected by the farmers (CIALCA, 2007).

At each site, six farmers grew improved and local soybean, six grew improved and local bush bean, and six grew improved and local climbing bean, thus across all four sites there were, in total, 24 sub-plots each of improved and local soybean, climbing bean and bush bean, planted in established farmers' fields of banana with an average banana mat spacing of 2.18 x 2.18 m. Legume planting was done by members of the farmer groups at each of the study sites in the first week of September for the 'A' planting season (that is, at the start of the second rainy season) and the first week of March for the B planting season (that is ,at the start of the first rainy season). Four lines of legumes were established between 2 banana mats per subplot. The inter- and intra-line spacing for bush, climbing and soybeans were, respectively, 50 × 20 cm, 50 × 25 cm and 50 × 10 cm.

The farmer groups performed all field operations (that is, field preparation before planting and weeding) and installations (i.e., field demarcating and planting) and harvested the plots under the supervision of a team of project agronomists. Crop management was identical in both subplots (no tillage and legumes were planted in lines). Banana leaf pruning was only carried out during the months of bean cultivation and leaves were cut at weekly intervals. Banana de-suckering was carried out at the onset of the bean cropping season, leaving three stems per mat, while manual weeding was carried out at monthly intervals (that is, before legume planting, during legume flowering and at pod formation). All pruned banana leaves and harvested pseudostems were cut into small pieces and placed between the legume lines to improve the soil.

Data collection and analysis

Data collection was carried out by the agronomists, who visited the farmer groups regularly and ensured that farmers weeded all plots on time and concurrently. Before the experiment began, in the banana fields in each site, soil samples were collected from the 0 to 30 cm soil layer, air-dried, sieved to pass 2 mm and analyzed for standard chemical properties at the Kawanda soils lab in Uganda (Table 1).

Legume yields were assessed during four consecutive bean cropping seasons (2010B: that is, during the first wet season of 2010 which started in March and ended in June; with harvesting taking place in June, 2011A: during the second wet season of 2010 which started in September and ended in January 2011; with harvesting taking place in January, 2011B and 2012A) and one cycle of banana. In addition, the number of leaves in the 'all leaves' treatment (control) was recorded at harvest of the legumes.

The net plot in each banana subplot consisted of the two inner banana mats. Banana bunch weight data were collected on two plants from these two inner mats. A total of 576 banana plants were assessed across the various experimental sites, with 288 plants assessed in both main plots ('7 remaining leaves' and 'all leaves'). A total of 72 banana plants were assessed at each of the four sites (Kabamba, Luhihi, Burhale and Lurhala) for the '7 leaves' and 'all

Table 1. Soil characteristics at each of the four on-farm experimental sites.

Territory	Site	Altitude (masl)	pH	OM* (%)	N (%)	P (mg/kg)	Ca (cmol/kg)	Mg (cmol/kg)	K (cmol/kg)
Walungu	Burhale	1647	5.5	6.3	0.28	4.4	0.32	0.02	0.19
	Lurhala	1981	5.0	9.4	0.41	2.8	0.25	0.00	0.22
Kabare	Luhihi	1556	6.1	6.8	0.24	21.2	4.24	1.91	0.64
	Kabamba	1595	5.6	2.1	0.19	18.7	5.85	2.19	0.83

*organic matter.

Table 2. Effect of banana leaf pruning on banana bunch weight and yield. (means of 18 replicates).

On-farm site	Number of leaves	Bunch weight (kg)	Yield (t/ha)	Banana planting density* (plants/ha)
Burhale	7 leaves	14.53 ^{abc}***	37.10^{bc}	3791 ±2498^{b}
	Control (8±1)	13.53^{bc}	33.96^{cd}	3611 ±2159^{bc}
Lurhala	7 leaves	11.11^{c}	31.20^{d}	4992 ±2547^{a}
	Control (7±1)	11.23^{c}	34.98^{cd}	3346 ±1986^{c}
Kabamba	7 leaves	16.46^{ab}	40.83^{ab}	2821 ±1908^{d}
	Control (8±2)	15.77^{abc}	40.78^{ab}	2912 ±2162^{dc}
Luhihi	7 leaves	18.02^{a}	41.53^{a}	1998 ±1645^{e}
	Control (11±1)	18.36^{a}	42.06^{a}	1572 ±991^{e}
	LSD (0.05)	4.29	4.29	426
	CV (%)	35.02	37.46	66

*Plant density was measured before treatments were applied.**: Means in a column followed by the same letter are not significantly different from each other according to Turkey's HSD test (p<0.05).

leaves' main plot treatments. Two banana plants were assessed for each of the six legume sub-plot treatments at each trial site and main plot treatment ('all leaves' and '7 leaves').

A 1 m^2 legume net plot was measured at the center of each 35 m^2 subplot to collect data on legume yield. Data were collected on 40 bush bean, 32 climbing bean and 80 soybean plants per legume net plot. The following characteristics were assessed for banana: bunch weight, yield and mat density. Banana bunch weight was calculated using a formula developed by Nyombi et al. (2009). The mat density was determined at each experimental site by measuring the distance between a mat (at the centre of the mat) and the four closest neighboring mats. This measurement was repeated five times in each subplot. The average distance was then used to calculate the mat density per hectare. In addition, legume dry grain yield was assessed for each legume type and treatment.

An analysis of variance was conducted to determine the effects of the different treatments using a general linear model procedure (SAS Institute Inc., 2000). Tukey's studentised multiple range test was used to determine significant differences at 5% probability level. Banana plant density data were included as a covariate in the analysis of banana bunch weight and yield using Statistix 8.software (2004). In addition, the correlation between yield and planting density was calculated using SPSS (2008).

RESULTS AND DISCUSSION

Banana yield

Banana leaf pruning from no leaves cut to leaving seven leaves generally did not affect bunch weight or yield (Table 2). The non-significant effect of leaf pruning on bunch weight and yield, when leaf pruning was moderate (five remaining leaves' and 'all leaves)', was reported also by Ntamwira et al. (2012). Although not significantly different, the average yield of banana with seven leaves at Burhale was higher than banana yield of plants with no cut leaves (control).

The apparent difference could be explained by the fact that there was a higher banana density in the seven-leaf plots (3,791 mats per hectare) than in the control plots (3,611 mats per hectare) (Table 2). In the experimental area, farmers do not use uniform spacing during planting. Banana bunch weight and yield varied between legume types in the southern sites of Burhale and

Table 3. Effect of legume types on banana bunch weight and yield of banana, along with measured plant density of banana. (means of 6 replicates).

Site	Legume type	Bunch weight (kg)	Yield (t/ha)	Banana planting density (plants/ha)
	Climbing bean	14.39^{abcd}*	36.74^{cd}	4132 ±2504^{b}
Burhale	Bush bean	13.19^{bcd}	32.74^{de}	3094 ±2096^{cd}
	Soybean	14.81^{abcd}	38.70^{abc}	3802 ±2104^{bc}
	Climbing bean	12.10^{cde}	36.32^{cde}	4957 ±2095^{a}
Lurhala	Bush bean	9.75^{e}	33.52^{de}	4001 ± 3020^{b}
	Soybean	11.57^{de}	31.64^{e}	3715 ±2130^{bc}
	Climbing bean	16.47^{abc}	42.77^{ab}	2768 ±1723^{d}
Kabamba	Bush bean	15.58^{abcd}	40.36^{abc}	2744 ±1877^{d}
	Soybean	16.43^{abc}	38.60^{bc}	3128 ±2496^{cd}
	Climbing bean	17.94^{a}	41.85^{ab}	1648 ±743^{e}
Luhihi	Bush bean	18.85^{a}	43.41^{a}	1967 ±1763^{e}
	Soybean	17.52^{ab}	38.20^{bc}	1756 ±1536^{e}
	LSD (0.05)	4.62	4.62	711
	CV (%)	35.04	37.35	66

*: Means in a column followed by the same letter are not significantly different from each other according to Tukey's HSD test (p<0.05).

Lurhala, which had poorer soils compared with the northern sites (Table 3). At Burhale, the yield of banana intercropped with climbing bean (36.7 t ha^{-1}) or soybean (38.7 t ha^{-1}) was higher than with bush bean (32.7 t ha^{-1}); in both cases banana plant density was higher. At Kabamba and Luhihi, banana yield with climbing bean was not significantly higher than with bush bean and soybean However, at Luhihi, there was a significantly higher yield of banana intercropped with bush bean compared to banana intercropped with soybean when incorporating banana plant density as a covariate in the analysis.

Pypers et al. (2010) suggested that increased plant densities could enhance crop production in intercropping; lower banana yield in low density plantings compared with the yield at high density was also reported by Athani et al. (2009). Small bunches (11.1 kg) were recorded in plots with a high plant density (4,992 mats per hectare), while larger bunches (18.0 kg) were recorded in plots with a low planting density (1,998 mats per hectare) (Table 2).

Legume yield

Banana leaf pruning to seven leaves enhanced the four-season average soybean yields at the four sites for both local and improved varieties, although not significantly, except at the Burhale and Kabamba sites for 'SB24' (Table 4). Yields of soybean in the north (Luhihi and Kabamba) were greater than in the south (Lurhala and Burhale), where soil fertility was very low (Table 1). Under the seven-leaf pruning treatment, the 'SB24' improved cultivar gave the highest yield at Kabamba (449 kg/ha) and the lowest at Lurhala (198 kg/ha). The evaluation of some other new soybean cultivars (e.g., 'SB4', 'SB6') by the CIALCA project in South Kivu also gave good yields in the north but not in the south, although the new cultivars 'Peka, SB19 and 'SB24' have been more successful than local cultivars in all sites (CIALCA, 2007). Banana leaf pruning to seven leaves increased climbing bean yield of both the improved and local cultivars, although by more for local varieties (Table 5).

The average yields of the improved and local climbing beans were higher in the south at Lurhala on poor soils but high altitude (1,981 masl) and lowest at Luhihi (1,556 masl) in the north. Although the banana planting density was low at Luhihi, favorable soil fertility levels gave rise to large plants with large leaves, hence reducing the amount of light for the intercropped legumes. In contrast, small banana plants with small leaves and bunches in a high density setting were mainly observed on the poor soils of Burhale and Lurhala which resulted in an overall reduced shading level for the intercropped legumes. In addition, climbing beans performed better at higher elevations in eastern DR Congo and Rwanda (White et al., 2010; CIAT, 2013) and are thus mainly observed in farmers' fields at altitudes above 1,800 masl with high rainfall. Koc (2011) also reported that at high elevation

Table 4. Effect of banana leaf pruning on grain yield of soybean cultivars during four seasons. (means of 6 replicates).

Site	Soybean type	Banana leaf treatment	2010B	2011A	2011B	2012A	Mean
			Legume grain yield (kg/ha)				
Burhale	Soybean (SB24)	7 leaves	398^{cd}*	313^{abcd}	150^{bc}	168^{d}	257^{def}
		Control (8±1)	166^{hi}	250^{cd}	120^{cd}	163^{d}	175^{gh}
	Local	7 leaves	351de	232^{d}	177^{b}	503^{a}	316^{cd}
		Control (8±1)	324^{e}	232^{d}	150^{bc}	345^{c}	263de
Lurhala	Soybean (SB24)	7 leaves	247^{fg}	NA	149^{bc}	NA	198^{fgh}
		Control (7±2)	185^{gh}	NA	158^{bc}	NA	171^{h}
	Local	7 leaves	218^{gh}	NA	187^{b}	NA	202^{fgh}
		Control (7±2)	170^{hi}	NA	160^{bc}	NA	165^{h}
Kabamba	Soybean (SB24)	7 leaves	750^{a}	313^{abcd}	320^{a}	415^{abc}	449^{a}
		Control (9±2)	450^{bc}	330^{abc}	296^{a}	450^{ab}	382^{b}
	Local	7 leaves	500^{b}	310^{abcd}	331^{a}	430^{abc}	393^{ab}
		Control (10±2)	300^{ef}	331^{abc}	303^{a}	430^{abc}	341^{bc}
Luhihi	Soybean (SB24)	7 leaves	208^{gh}	373^{a}	78^{d}	393^{bc}	263de
		Control (11±2)	192^{gh}	386^{a}	118^{cd}	240^{d}	234^{efg}
	Local	7 leaves	181^{ghi}	359^{ab}	90^{d}	227^{d}	214^{efgh}
		Control (11±1)	110^{i}	272^{bcd}	91^{d}	153^{d}	156^{h}
		LSD (0.05)	72	88	42	95	60
		CV (%)	49	57	38	55	41

*: Means in a column followed by the same letter are not significantly different from each other according to Turkey's HSD test (P<0.05).
NA: not applicable.

precipitation had a great effect on plant production but depended on increases in ambient temperatures. Legumes are more sensitive to drought stress than grasses (Koc, 2011).The improved cultivar 'AND10' gave lower average yields than those of the local cultivar for the control and seven leaf treatments in three sites (Kabamba, Burhale and Luhihi). This might be caused by poor adaptability (e.g., to soil, diseases and other ecological factors) of the improved cultivar and contrasts with results obtained in monoculture for other new cultivars introduced by the CIALCA project (CIALCA, 2007). Many of these cultivars, especially 'VCB81012', produced higher amounts of biomass compared with local cultivars in different sites in South Kivu (CIALCA, 2007). Banana leaf pruning to seven leaves increased the four-season bush bean yield (Table 6).

However, the grain yields in the seven-leaf treatments were not significantly higher than the control, except for the local cultivar at Kabamba. The improved cultivar 'MLB49' gave a four-season grain yield significantly higher than the local cultivar only at Luhihi (654 kg/ha for 'MLB49' and 445 kg/ha for the local cultivar in the seven-leaf treatment). These results were similar to the evaluation of bean grain yield by the CIALCA project, which showed that overall grain yields of different legume species evaluated in monoculture were significantly dependent on the site and were higher than local cultivars (CIALCA, 2007). This study revealed that banana-legume intercropping was more productive when banana leaf pruning was moderate (seven leaves). High banana leaf canopy shade levels could affect nodulation of legumes with a corresponding reduction of nitrogen fixation and yield, It was reported in a study on maize-legumes intercropping that maize shading the legumes under intercropping reduces nodule number through shading compared to mono-cropping (Lemlem, 2013).

In addition, retaining a reduced number of banana leaves (seven, in this study) during the months of bean intercropping does not significantly affect banana crop bunch weight and yield. As legume yield depended on

Table 5. Effect of banana leaf pruning on grain yield of climbing bean cultivars during four seasons (means of 6 replicates).

Site	Climbing bean type	Banana leaf treatment	2010B	2011A	2011B	2012A	Mean
			Legume grain yield (kg/ha)				
Burhale	Climbing bean (AND10)	7 leaves	447^{c*}	446^{bcd}	333^{cde}	385de	403^{cd}
		Control (8±1)	450^{c}	410^{cde}	286^{def}	266^{e}	353de
	Local	7 leaves	827^{a}	958^{a}	378^{bc}	413^{cd}	644^{a}
		Control (8±1)	725^{ab}	854^{a}	183^{gh}	372de	534^{ab}
Lurhala	Climbing bean (AND10)	7 leaves	665^{ab}	NA	542^{a}	NA	604^{a}
		Control (7±1)	628^{b}	NA	452^{b}	NA	540^{ab}
	Local	7 leaves	678^{ab}	NA	545^{a}	NA	612^{a}
		Control (7±1)	733^{ab}	NA	377^{bc}	NA	555^{ab}
Kabamba	Climbing bean (AND10)	7 leaves	NA	566^{b}	370^{bcd}	330de	489^{bc}
		Control (8±2)	NA	291^{e}	288^{def}	343de	488^{bc}
	Local	7 leaves	NA	576^{b}	369^{bcd}	660^{b}	592^{ab}
		Control (8±2)	NA	511^{bc}	328^{cde}	440^{cd}	402^{cd}
Luhihi	Climbing bean (AND10)	7 leaves	106^{d}	479^{bc}	217^{fgh}	530^{bc}	283^{e}
		Control (10±1)	81^{d}	426^{cde}	182^{gh}	885^{a}	258^{e}
	Local	7 leaves	228^{d}	533^{bc}	249^{efg}	830^{a}	417^{cd}
		Control (10±1)	140^{d}	336de	151^{h}	368de	267^{e}
		LSD (0.05)	162	139	87	143	111
		CV (%)	63	47	57	63	44

*: Means in a column followed by the same letter are not significantly different from each other according to Tukey's HSD test ($p<0.05$).
NA: not applicable.

Table 6. Effect of banana leaf pruning on grain yield bush bean cultivars during four seasons (means of 6 replicates).

Sites	Bush bean type	Banana leaf treatment	2010B	2011A	2011B	2012A	Mean
			Legume grain yield (kg/ha)				
Burhale	Bush bean (MLB49)	7 leaves	909 ^{b*}	750 ^{a}	208 ^{hi}	263 ^{ghi}	534 ^{abc}
		Control (8±1)	808 ^{b}	656 ^{ab}	156 ^{i}	193 ^{k}	453 ^{bcd}
	Local	7 leaves	1111 ^{a}	583 ^{bc}	183 ^{hi}	247 ^{hik}	531 ^{abc}
		Control (8±1)	844 ^{b}	518 ^{bcde}	101 ^{ig}	201 ^{i}	416 ^{cd}
Lurhala	Bush bean (MLB49)	7 leaves	425 ^{ef}	NA	838 ^{a}	NA	631 ^{a}
		Control (7±1)	469 ^{ef}	NA	725 ^{abc}	NA	597 ^{ab}
	Local	7 leaves	532 ^{de}	NA	746 ^{abc}	NA	639 ^{a}
		Control (7±1)	443 ^{ef}	NA	675 ^{bcd}	NA	559 ^{abc}
Kabamba	Bush bean (MLB49)	7 leaves	850 ^{b}	345 ^{f}	476 ^{efg}	412 ^{bcd}	521 ^{abc}
		Control (9±2)	800 ^{bc}	338 ^{f}	433 ^{fg}	365 ^{def}	484 ^{bcd}
	Local	7 leaves	1150 ^{a}	376 ^{ef}	341 ^{gh}	318 ^{efg}	546 ^{abc}
		Control (9±3)	373 ^{f}	345 ^{f}	378 ^{fg}	310 ^{fgh}	351 ^{d}

Table 6. Contd.

Luhihi	Bush bean (MLB49)	7 leaves	652 [cd]	661 [ab]	850 [a]	452 [b]	654 [a]
		Control (11±2)	325 [fg]	452 [cdef]	771 [ab]	535 [a]	521 [abc]
	Local	7 leaves	203 [gh]	536 [bcd]	606 [cde]	434 [bc]	445 [cd]
		Control (11±1)	127 [h]	396 [def]	525 [def]	380 [cde]	357 [d]
		LSD (0.05)	154	153	162	66	145
		CV (%)	44	53	60	41	54

*: Means in a column followed by the same letter are not significantly different from each other according to Tukey's HSD test (p<0.05).

site and crop production season, it is difficult to make general recommendations as to the type and cultivar of legume that is best suited to a specific locality. Banana landraces or hybrids with more erect leaves could also be envisaged for intercropping purposes as they will create less shade for the legume crop. However, rigorous de-suckering will need to be practiced. Alternatively, the use of cultivars with controlled/regulated suckering (that is, only allowing two to three suckers develop) and optimal banana plant density could be envisaged.

Conflict of Interest

The authors have not declared any conflict of interest.

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