

Maize-Jackbean Intercrop as Influenced by Mixture Proportions and Planting Patterns

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1. Introduction

- Maize (*Zea mays L.*) is widely grown throughout the world and has the highest production of all the cereals, being 817 million tonnes in 2009 (FAOSTAT).
- Jackbean (*Canavalia ensiformis*; *Leguminosae*) is a food in marginal areas where other pulses fail. It serves as forage and as green manure to improve soil fertility and erosion control (Smartt, 1990).
- There is potential to integrate more legumes in existing cropping systems as intercrops, because growing sole legume crops in fallows has been rejected by smallholder farmers due to labour and land constraints (Kumwenda *et al.*, 1996).
- If legumes are intercropped in a timely manner, competition with the maize crop for light, water and nutrients can be minimized while legume herbage N can be accumulated and maize production increased (Jeranyama *et al.* 1998).

This study investigates different planting pattern and row arrangements for the Maize-Jackbean intercropping system to optimize food production.

3. Results

- Alternating Single Row (ASR) had taller maize and jackbean plants in both years at different stages of observation compared to Alternating Double Row (ADR).
- Fig. 1 shows that maize and jackbean grew taller in 2016 than in 2015.

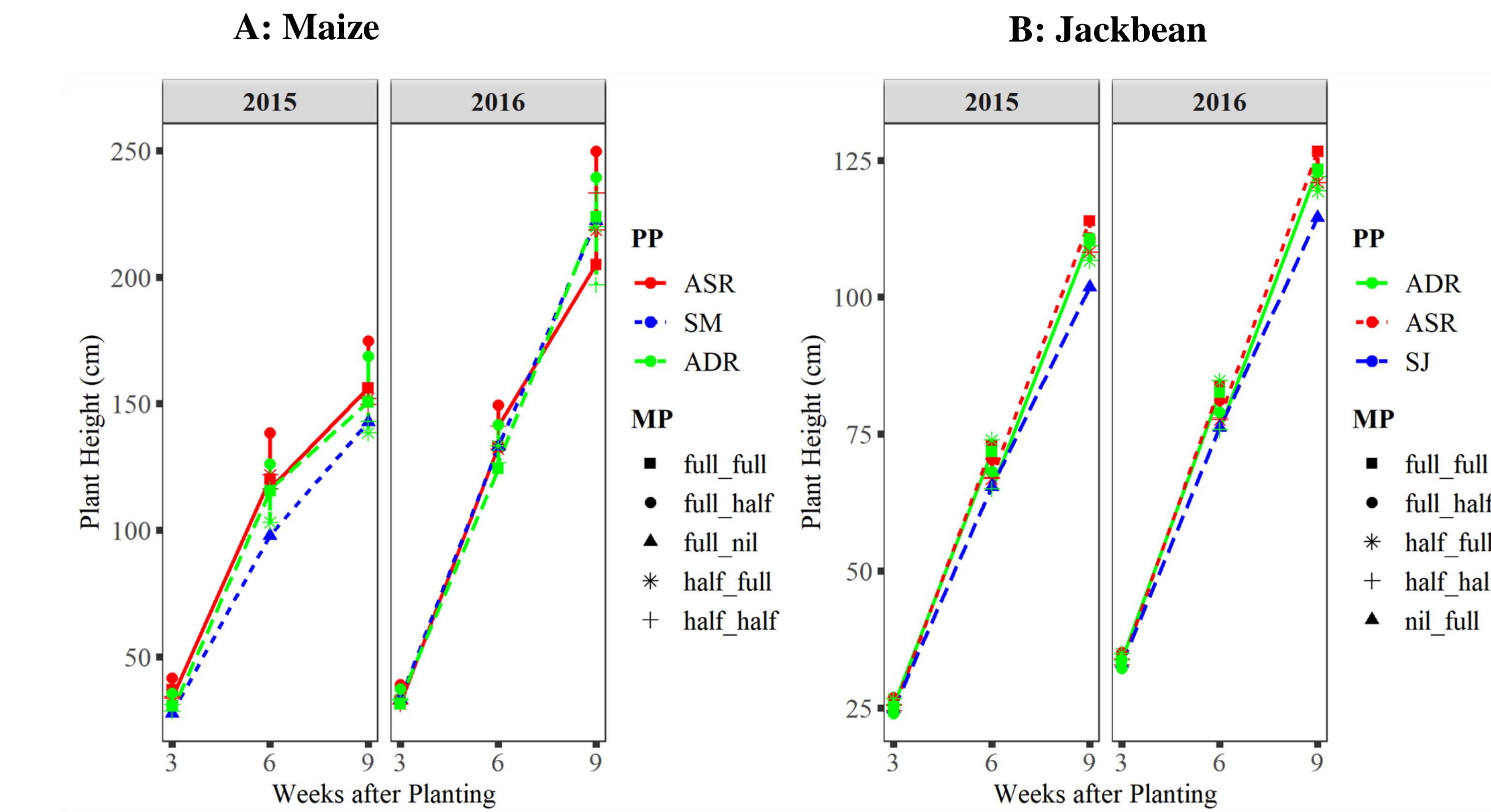


Fig. 1: Plant Height of (A) Maize and (B) Jackbean at 3, 6 and 9 Weeks after planting in 2015 and 2016

- Planting Pattern (ASR) and Mixture Proportion (full_half) had the tallest height and best canopy for maize in both year at different time of observations.
- ASR + full_full had the tallest jackbean plants while ASR + full_half had the best canopy spread for jackbean in both years.

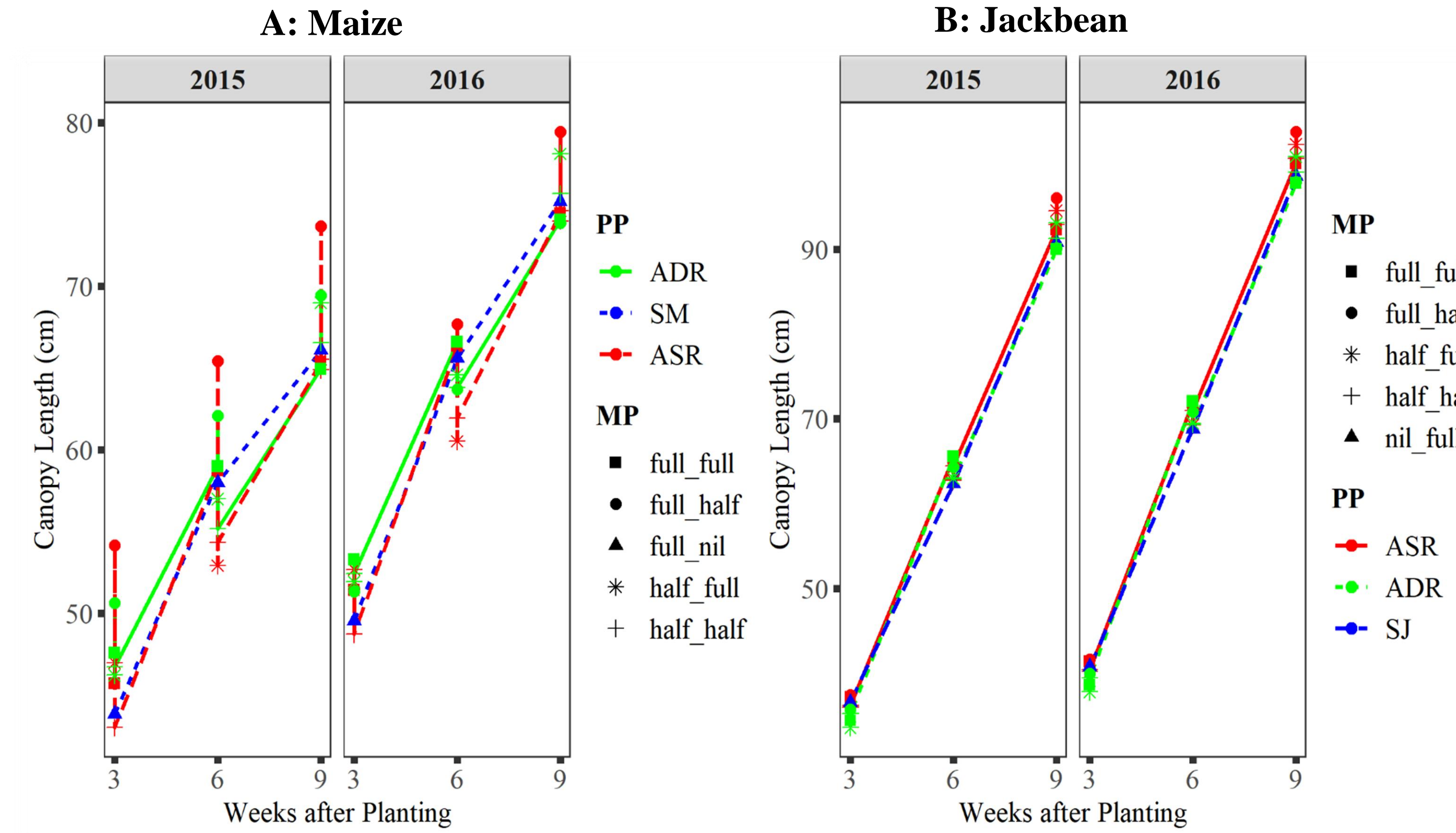


Fig. 2: Canopy Length of Maize and Jackbean at 3, 6 and 9 Weeks after planting in 2015 and 2016

4. Conclusions

- Intercropping had significant influence on the vegetative growth of both maize and jackbean compared to the sole crops.
- Alternate Single Row (ASR) was a better planting pattern for intercropping compared to Alternate Double Row (ADR).
- Intercropping is a suitable alternative to securing food stability in sub-Saharan Africa for subsistence farming.

5. References

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2. Methods

The trials were conducted at the Directorate of University Farm (DUFARMS) FUNAAB at Latitude 7° 15'N, Longitude 3° 25'E, in 2015 and 2016. The trial was a 2×4 factorial + 2 sole crops, replicated 3 times. Plots were regularly hand weeded and received 120 kg/ha N, 60 kg/ha P and 60 kg/ha K.

Planting patterns were alternating single row (ASR) versus alternating double rows (ADR), combined with four mixture proportions of the crops (Table 1) plus sole maize and jackbean crops.

Data were subjected to Analysis of Variance (ANOVA) using R version 4.1.1. Means were separated using Tukey' HSD test (p < 0.001).

Table 1: Spacing and plant population of maize and jackbean Mixture Proportions (MP)

	Spacing of Maize (cm)	Spacing of Jackbean (cm)	Maize plants/ha	Jackbean plants/ha
half_full	200 x 18.75	200 x 16.65	26,666	30,030
full_full	200 x 9.375	200 x 16.65	53,333	30,030
half_half	200 x 18.75	200 x 33.3	26,666	15,015
full_half	200 x 9.375	200 x 33.3	53,333	15,015
full_nil	100 x 18.75	nil	53,333	0
nil_full	nil	100 x 33.3	0	30,030

The proportions of the intercrop mixtures were based on Adetiloye, (1985).

- Maize produced significantly higher grain yields in 2016 than in 2015
- Sole Maize (SM) and ASR+full_half planted in 2016 had significantly more grain weights than other treatment combinations.

Table 2: Maize Grain Yield [tons/ha]

Planting pattern	Mixture Proportion Maize - Jackbean	Yield (tonnes/ha)	
		2015	2016
ADR	full_full	2.56 ^{cd}	5.04 ^{abc}
ADR	full_half	3.94 ^{a-d}	5.03 ^{abc}
ADR	half_full	1.63 ^d	3.09 ^{bcd}
ADR	half_half	1.34 ^d	2.83 ^{bcd}
ASR	full_full	3.10 ^{bcd}	5.67 ^{ab}
ASR	full_half	3.87 ^{a-d}	5.97 ^a
ASR	half_full	1.41 ^d	2.47 ^{cd}
ASR	half_half	1.51 ^d	2.14 ^d
Sole maize	full_nil	2.77 ^{cd}	5.99 ^a

- Sole Jackbean (SJ) planted in 2016 had significantly more jackbean seed weight compared to other treatments combinations

- Year 2016 had significantly more jackbean seed weight compared to 2015

Table 3: Jackbean Seed Weight [tons/ha]

Planting pattern	Mixture Proportion Maize - Jackbean	Yield (tonnes/ha)	
		2015	2016
ADR	full_full	0.47 ^d	0.66 ^b
ADR	full_half	0.26 ⁱ	0.35 ^{gh}
ADR	half_full	0.45 ^{de}	0.64 ^b
ADR	half_half	0.32 ^{gh}	0.41 ^{ef}
ASR	full_full	0.45 ^{de}	0.64 ^b
ASR	full_half	0.24 ⁱ	0.33 ^g
ASR	half_full	0.44 ^{de}	0.63 ^b
ASR	half_half	0.27 ^{hi}	0.37 ^{fg}
Sole Jackbean	nil_full	0.54 ^c	0.72 ^a