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Maize and Pigeonpea Intercropping Systems in Mpumalanga, South Africa

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Pigeonpea (*Cajanus cajan*) is one of the major pulse crops of the tropical and subtropical regions of Asia, Africa, and the Caribbean. In South Africa, it is usually grown singly or as a hedge plant in home gardens or around the sugarcane (*Saccharum officinarum*) fields. Being one of the most drought tolerant legumes, pigeonpea has a great potential to increase the sustainability of cropping systems in the arid and semi-arid regions. In India, pigeonpea is generally intercropped with cereals, other legumes, cotton (*Gossypium* sp), and castor (*Ricinus communis*) (Saxena 1999). As intercropping is an important aspect of smallholder-farmer crop production systems, a study was initiated to evaluate the performance of pigeonpea cultivars with varying maturity periods with maize (*Zea mays*) in two intercropping systems.

Maize is the major cereal grown by the smallholder farmers in Mpumalanga in South Africa. The short-duration (SD) CIMMYT maize composite EWF-2 was intercropped in two trials, one with the SD cultivars ICPL 87091 and ICPL 87105, and a second one with the long-duration (LD) cutivar ICEAP 00040 and medium-duration (MD) cultivar ICP 6927. Two intercropping systems, the alley planting and same row planting systems with maize, were evaluated in these trials using randomized complete block design with four replications during the 1998/99 season at Malekutu (25°12' S and 31°12' E at 350 m above sea level) in Nsikazi District of Mpumalanga Province. In the alley planting system, two pigeonpea rows were planted after every three maize rows. In the second intercropping system, maize and pigeonpea were planted on the same row maintaining the plant populations at sole cropping. In the SD trial, seeds were sown 10 cm apart in rows spaced at 70 cm. In the LD-MD trial, plant spacing was 70 cm in rows spaced at 90 cm with 2 plants at each station. The LD trial was planted in mid-December 1998, and the SD trial in the first week of January 1999. Insect pests mainly the pod-sucking bugs and pod borers were controlled by spraying the insecticide Karate® (cyhalothrin) once in the LD-MD trial and three times in the SD trial. The data were analyzed using the MSTAT-C program.

Yields of both maize and pigeonpea in intercropping systems were generally lower than in monocropping systems in both the trials (Table 1). The yield reduction in the intercropping systems for LD and MD pigeonpea cultivars ranged from 7.4% to 31.0%, while that of maize ranged from 8.7% to 38.6% (Table 2). In the SD trial, the reduction in yield ranged from 36.8% to 66.3% in pigeonpea and from 12.9% to 41.9% in maize (Table 2); also the yield reduction in both maize and pigeonpea was significant. For MD and LD cultivars, there was a significant yield reduction under alley planting system. The average land equivalent ratio (LER) was the same (1.24) in both the systems in the SD trial. In the LD-MD trial, the average LER was 1.37 in the alley system and 1.77 when intercropped on the same row with maize.

These findings are in conformity with the results obtained from similar alley cropping studies carried out in India and Sri Lanka in the past. Intercropping had little effect on sorghum (*Sorghum bicolor*) yields, but pigeonpea yields were reduced by 21% (Abeyaratne 1956). Saxena et al. (1998) found that a combination of 75% maize and 25% pigeonpea had an 8% advantage in land use. Intercropping yields reduced maize yields by 5–23% and pigeonpea yield by 11–78% in another study in Sri Lanka (Saxena 1999). In general, the LD and MD pigeonpea cultivars are best adapted to intercropping as they mature later than maize. Being deep-rooted they make use of the moisture reserve, which would otherwise be unutilized.

Table 1. Yields of maize and pigeonpea in intercropping systems at Malekutu, Mpumalanga, South Africa, 1998/99[1].

Cropping system[2]	SD pigeonpea cultivars	LD and MD pigeonpea cultivars	Yield in SD trial (kg ha^{-1})		Yield in LD-MD trial (kg ha^{-1})	
			Maize	Pigeonpea	Maize	Pigeonpea
Maize + pigeonpea in the same row	ICPL 87105	ICEAP 00040	1966	458	2594	1204
Maize + pigeonpea in the same row	ICPL 87091	ICP 6927	1856	606	2882	1207
3 rows of maize + 2 rows of pigeonpea (3:2 alley)	ICPL 87105	ICEAP 00040	1312	822	2011	891
3 rows of maize + 2 rows of pigeonpea (3:2 alley)	ICPL 87091	ICP 6927	1483	852	1935	959
Sole maize			3257	–	3154	–
Sole pigeonpea	ICPL 87105	ICEAP 00040	–	1360	–	1300
Sole pigeonpea	ICPL 87091	ICP 6927	–	1349	–	1379
Mean			1775	907	2515	1157
CV (%)			7.80	35.2	17.06	17.83
LSD (P = 0.05)			186	421	661	311

1. SD = Short-duration; MD = Medium-duration; and LD = Long-duration.
2. Maize cultivar EWF-2 was tested.

Table 2. Yields of maize and pigeonpea in two intercropping systems compared with sole crop yields at Malekutu, Mpumalanga, South Africa, 1998/99.

Cropping system[1]	SD trial[2]			LD-MD trial[3]		
	ICPL 87105	ICPL 87091	Mean	ICEAP 00040	ICP 6297	Mean
Pigeonpea yield reduction (%)						
1:1 same row (maize + pigeonpea)	66.3	55.1	60.7	7.4	12.0	9.5
3:2 alley (maize + pigeonpea)	39.6	36.8	38.2	31.0	20.0	25.5
Mean	52.9	45.9	49.5	19.0	16.0	17.5
Maize yield reduction (%)						
1:1 same row (maize + pigeonpea)	12.9	17.8	15.4	17.8	8.7	13.4
3:2 alley (maize + pigeonpea)	41.9	34.3	38.1	36.2	38.6	37.4
Mean	27.4	26.1	26.8	27.0	23.7	25.4

1. Maize cultivar EWF-2 was tested.
2. Short-duration (SD) pigeonpea cultivars were tested.
3. Long-duration (LD) and medium-duration (MD) pigeonpea cultivars were tested.

The results from the current study showed that intercropping of maize, especially with LD and MD pigeonpea cultivars, was a useful practice towards increasing profitability of the dryland cropping systems. However, there is a need to determine the most suitable crop combinations and the systems acceptable to the dryland farmers in Mpumalanga to maximize the advantage of land use.

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