Intercropping maize and sweet potato in western Kenya: A technology to increase crop production for food security

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Abstract

In the production of sweet potato most farmers in western Kenya practice relay cropping with maize where sweet potato is planted when maize is approaching physiological maturity. Rarely do they practice intercropping to maximize on time and space. The present study evaluated land use efficiency of maize and sweet potato under different cropping patterns. Three maize and three sweet potato cultivars with differing maturity periods (early, medium and late) were intercropped in two different cropping patterns. The sole crops of maize and sweet potato served as the control plots. The trial was arranged in a Randomized Complete Block Design (RCBD) with 3 replicates for two consecutive cropping seasons. Data was collected on maize and sweet potato yield, grain weight per cob, mean tuber weight, number of tubers per plant and harvest index. Data was analyzed using ANOVA and treatment means separated using LSD. Land Equivalent Ratio (LER) was calculated to determine land use efficiency in the intercrop systems. The LER index identified 90% of the intercrop combinations as biologically more efficient; there was 10 - 67% higher land use efficiency due to intercropping. Overall sweet potato yields were higher in intercrops since harvests were from two cropping seasons instead of one. The results also suggest that the medium maturing maize and sweet potato cultivars are best suited for intercropping and also allow for successful growing of crops in two growing seasons in a year.

Media summary

Intercropping maize and sweet potato increases the land use efficiency leading to more yields from same piece of land.

Key words

Maize, sweet potato, intercropping, land use efficiency, yield

Introduction

Arable land in western Kenya is continuously being sub-divided into smallholdings in the face of increasing population pressure. Per capita food availability in these farms has declined from 150 to 60kg for cereals in the past 35 years (Jaetzold et al., 2007). The food situation is made worse by the low purchasing power of the populace due to limited employment opportunities. Surveys have shown that approximately 58% of rural families in western Kenya live below the poverty line and lack money to buy food requirements from the market (MoPND, 2006). The low poverty levels partially limit sustainable investment of high capital inputs to intensify crop productivity.

There is therefore need to encourage farmers to adopt innovative integrated crop intensification approaches to increase productivity of their lands. Intercropping is one of the cropping strategies that have been recognized to improve the food security situation and incomes for the farmers (Sullivan, 2003). Intercropping is a form of intensification in time and space where two or more crops are grown simultaneously. It is a way of reducing the risk of complete crop failure and increasing crop productivity.

The objective of the present study was to evaluate performance of a maize/sweet potato intercrop and calculate the land use of such an intercrop under different cropping patterns with an aim of developing the most efficient system for increased crop production and diversifying the food base in western Kenya

Methods

Three maize (DH04, H513 and H614D) and three sweet potato (SPK 004, Kemb10 and Bungoma) varieties were selected based on their maturation periods (early, medium and late maturing). The sweet potatoes were also selected based on their inherent levels of carotene. The trial was arranged in a Randomized Complete Block Design with three replicates. The treatments consisted of the sole crops of the maize and sweet potato varieties serving as the control plots, and combinations of maize and sweet potato in two intercropping patterns. The first intercrop patterns had sweet potato ridges spaced at 120 cm and a single maize row in between the sweet potato ridges. The second intercrop pattern consisted of sweet potato ridges spaced at 240 cm with paired maize rows spaced at 30 cm between the sweet potato ridges. The trials were tested in two seasons, the short rains of 2005 and long rains of 2006. Data were collected on yield of maize and sweet potato in t/ha. Data were subjected to ANOVA and means separated by LSD. Land Equivalent Ratios (LER) of the intercrops were calculated to get the Land Use Efficiency (LUE) values of all the tested cropping patterns.

Results

There were higher maize yields in the maize sole crop as compared to the maize yield in the intercrops during the short rains season of 2005. However, there were no differences in maize yields between the sole and intercrop arrangements in the long rains seasons of 2006. This observation could be attributed to more moisture experienced in the long rains season. Higher sweet potato yields were obtained in the sole crops than in the intercrops during both seasons. Sweet potato being s low storey crop did not compete enough in the intercrop.

Table 1: Yield and Land Use Efficiency of maize/sweet potato cropping systems: Short rains 2005

Cropping system	Maize var.	Sweet potato var.	Maize yield t/ha	Sweet potato yield t/ha	Relative yield		LER
					Maize	SP	
Sole crop	DH04	-	2.10	-	-	-	1.0
	H513	-	1.66	-	-	-	1.0
	H614D	-	2.81	-	-	-	1.0
	-	SPK004	-	11.34	-	-	1.0
	-	Kemb10	-	16.28	-	-	1.0
	-	Bungoma	-	6.82	-	-	1.0
Intercrop	DH04	SPK004	1.89	6.07	0.90	0.54	1.44
		Kemb10	1.49	7.25	0.71	0.43	1.14
		Bungoma	1.62	4.39	0.77	0.64	1.41
Intercrop	H513	SPK004	1.75	6.20	1.05	0.55	1.60
		Kemb10	1.46	8.41	0.88	0.50	1.38
		Bungoma	1.42	4.67	0.86	0.68	1.54
Intercrop	H614D	SPK004	2.15	4.12	0.77	0.36	1.13
		Kemb10	2.00	6.38	0.71	0.38	1.09
		Bungoma	1.78	3.55	0.63	0.52	1.15

The maize variety H614D yielded the best both in sole and intercrops compared to the other maize variety but H513 was better in terms of Land Use Efficiency. The sweet potato variety SPK 004 generally performed better than the other two sweet potato varieties.

Table 2: **Yield and Land Use Efficiency of maize/sweet potato cropping systems: Long rains 2006**

Cropping system	Maize var.	Sweet potato var.	Maize yield t/ha	Sweet potato yield t/ha	Relative yield		LER
					Maize	SP	
Sole crop	DH04	-	4.78	-	-	-	1.0
	H513	-	1.63	-	-	-	1.0
	H614D	-	5.20	-	-	-	1.0
	-	SPK004	-	30.17	-	-	1.0
	-	Kemb10	-	28.01	-	-	1.0
	-	Bungoma	-	13.04	-	-	1.0
Intercrop	DH04	SPK004	4.51	10.49	0.94	0.35	1.30
		Kemb10	3.71	10.42	0.78	0.35	1.13
		Bungoma	4.12	3.90	0.86	0.30	1.16
Intercrop	H513	SPK004	2.04	12.69	1.25	0.42	1.67
		Kemb10	1.64	10.34	1.01	0.37	1.38
		Bungoma	2.13	4.01	1.31	0.31	1.62
Intercrop	H614D	SPK004	5.52	8.18	1.06	0.27	1.33
		Kemb10	5.57	7.76	1.07	0.28	1.35
		Bungoma	5.93	2.32	1.14	0.18	1.32

The intercrop patterns were biologically more efficient than the sole crops. This was evidenced by the high Land Equivalent Ratios of 9-60% during the short rains season and 13-67% during the long rains season (Table 1 and 2).

Conclusion

The maize variety H513 is best suited for intercropping with sweet potato since there is less competition in this arrangement. SPK 004 was a better sweet potato yielder both in sole and intercrop patterns. Land was used more efficiently in intercrop situations (LER > 1.0) though varied with maize & sweet potato variety used. Sweet potato yields were low in intercrops but the advantage is one gets two harvests in a year instead of one using a smaller area.

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