EFFECT OF DIFFERENT CROPPING SYSTEMS ON THE GROWTH AND YIELD OF SWEET CORN AND SWEET POTATO

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ABSTRACT

Sweet corn and sweet potato were grown under 13 different cropping treatments. Double rows spaced at 0.3 m with interval row spacing of 1.0 m appeared to be the optimum treatment combination with a mean yield of 21.99 t/ha. Under this scheme, yield increases of 75% and 66% were noted in sweet corn and sweet potato, respectively. Land equivalent ratio (LER) was significantly affected by cropping systems. Both alternate cropping scheme and double row arrangement had LER greater than 1. The LER values obtained on yield as fraction of monoculture checks for sweet corn and sweet potato indicated a net positive effect between the two cropping patterns. LER notably decreased as the interval row spacing was increased from 1.0 m to 2.0 m for double rows spaced at 0.3 m and 0.5 m. Growth and yield parameters of sweet potato that were significantly affected by the different cropping treatments were: leaf area per plant, leaf area index (LAI), length of vines at harvest, yield of marketable tubers per hectare, yield of tubers per plant, total dry matter (TDM) per plot,and harvest index (HI). On sweet corn, leaf area per plant, LAI, date to green maturity, weight of ears per plant, TDM per plant and HI were the growth and yield parameters that were significantly affected by the cropping treatments. Parameters that were not significantly affected by the cropping treatments used for sweet potato were: length of vine 30 days after planting, number of marketable and non-marketable tubers per plant, and yield of non-marketable tubers per hectare. Cropping systems did not have a significant effect on plant height of sweet corn 30 and 60 days after planting.

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KEY WORDS: Sweet corn. sweet potato. Multiple cropping. Land equivalent ratio. Total dry matter. Leaf area index. Harvest index. Cropping patterns. Monoculture.

INTRODUCTION

Multiple cropping is fast gaining the attention of farmers in the Philippines because of small farm ownership and increasing demand for food. However, a number of farmers who practice multiple cropping, specifically intercropping, are not aware of the correct cropping practices and combinations that will ultimately produce high crop yield.

Improved cropping systems are designed for maximum utilization of environmental resources, especially when the species composition has different morphological characteristics. The most successful cropping combinations used in multiple cropping, especially in intercropping, are those in which plants have widely different leaf canopies (Herrera and Hardwood, 1973). Short crops grown under tall ones create different strata of leaf concentration which make for more efficient utilization of light. This intercropping practice builds up a rough canopy architecture, thus allowing good wind turbulence that gives a good distribution of CO_2 for the photosynthetic process thereby increasing dry matter production (Chang, 1974).

Sweet potato and sweet corn make good cropping combinations because of their distinct morphological characteristics. There is a great demand for optimizing their production through intensive cropping systems owing to their importance as alternate sources of staple food by people in the Eastern Visayas region.

This study presents the best cropping treatment to obtain maximum yield of sweet corn and sweet potato under the prevailing conditions in the region, and the profitability of cropping systems on these two crops compared to other crops normally grown by farmers under the existing cropping patterns.

MATERIALS AND METHODS

Experimental Design and Field Layout. — The experiment was laid out in an area of 2,340 sq m using the randomized complete block design (RCBD) with 3 replications. Plot dimension was 6 m wide and 10 m long. For relay cropping, the crops were arranged as follows: sweet corn first, followed by sweet potato. For intercropping, the alternate row method was used with variation in number of rows and cropping combinations. Thirteen cropping combinations were studied using the following codes to designate the different cropping patterns as treatments:

T_1 - Sweet corn alone
T_2 - Sweet potato alone
T_3 - Sweet corn - sweet potato (intercropping alternate row)
T_4 - Sweet corn with sweet potato (relayed 7 days before harvest of sweet corn)
T_5 - Sweet corn with sweet potato (relayed 14 days before harvest of sweet corn)
T_6 - Sweet corn with sweet

Table 1. Planting arrangement for sweet corn - sweet potato cropping experiment.

Treatment	Area per Corn Plant (m^2)	Spacing Between Hills of Sweet Corn (m)	Spacing Between Single/ Double Rows of Sweet Corn (m)	Actual Plant Population of Sweet Corn/ ha.	Area Actually Occupied by Sweet Corn/ ha. (m^2)	Area/ Plant of Sweet Potato (m^2)	Spacing Between Hills of Sweet Potato (m)	Spacing Between Rows of Sweet Potato (m)	Actual Plant Population of Sweet Potato /ha.	Area Actually Occupied by Potato /ha. (m)	Ratio of Sweet Corn/ Sweet Potato (Occupied area/ha.)	Plant Ratio (Corn/ Sweet Potato)
T_1 - corn alone	0.50	0.50	1.0	20,000	10,000	—	—	—	—	—	1:0	1:0
T_2 - sweet potato alone	—	—	—	—	—	0.30	0.30	1.0	33,333	10,000	0:1	0:1
T_3 - sweet corn - sweet potato (intercropping alternate row)	0.25	0.50	.5	20,000	5,000	0.15	0.30	0.5	33,333	5,000	1:1	1:1.66
T_4 - sweet corn with sweet potato (relayed 7 days before harvest of sweet corn)	0.50	0.50	1.0	20,000	10,000	0.30	0.30	1.0	33,333	10,000	1:1	1:1.66
T_5 - sweet corn with sweet potato (relayed 14 days before harvest of sweet corn)	0.50	0.50	1.0	20,000	10,000	0.30	0.30	1.0	33,333	10,000	1:1	1:1.66
T_6 - sweet corn with sweet potato (planted immediately after harvest of sweet corn)	0.50	0.50	1.0	20,000	10,000	0.30	0.30	1.0	33,333	10,000	1:1	1.1.66
T_7 - sweet potato with sweet corn (planted immediately after harvest of sweet potato)	0.50	0.50	1.0	20,000	10,000	0.30	0.30	1.0	33,333	10,000	1:1	1:1.66
T_8 - sweet potato intercropped between 2 double rows of corn at intervals of 1.0 m with each row at 0.5 m	0.25	0.50	0.5	26,666	6,666	0.15	0.30	0.5	22,222	3,333	2:1	1.19:1
T_9 - sweet potato intercropped between 2 double rows of corn at intervals of 1.5 m with each row spaced at 0.5 m	0.25	0.50	0.5	20,000	5,000	0.15	0.30	0.5	33,333	5,000	1:1	1:1.66
T_{10} sweet potato intercropped between 2 double rows of corn at intervals of 2.0 m with each row spaced at 0.5 m	0.25	0.50	0.5	20,000	5,000	0.15	0.30	0.5	33,333	5,000	1:1	1:1.66
T_{11} sweet potato intercropped between 2 double rows of corn at intervals of 1.0 m with each row spaced at 0.3 m	0.20	0.50	0.3	32,760	6,552	0.15	0.30	0.5	22,987	3,448	1.9:1	1.4:1
T_{12} - sweet potato intercropped between 2 double rows of corn at intervals of 1.5 m with each row spaced at 0.3 m	0.20	0.50	0.3	25,000	5,000	0.15	0.30	0.5	33,333	5,000	1:1	1:1.3
T_{13} - sweet potato intercropped between 2 double rows of corn at intervals of 2.0 m with each row spaced at 0.3 m	0.20	0.50	0.3	21,698	4,339	0.15	0.30	0.5	37,735	5,660	1:1.3	1:1.73

potato (planted immediately after harvest of sweet corn)

T_7 - Sweet potato with sweet corn (planted immediately after harvest of sweet potato)

T_8 - Sweet potato intercropped between 2 double rows of corn at intervals of 1.0 m with each row at 0.5 m

T_9 - Sweet potato intercropped between 2 double rows of corn at intervals of 1.5 m with each row spaced at 0.5 m

Table 2. Mean values of the different growth and yield parameters for sweet corn under the different cropping systems.

Treatment	Days to Green Maturity	Leaf Area/ Plant (m^2)	Leaf Area Index	Total Dry Matter/ Plant (g)	Harvest Index	Weight Green Corn Ear /Plant (g)	Yield of Green Husked Corn Ear/ ha (t)
T_1 - corn alone	64b	0.5083bc	1.02e	316.00a	0.38b	120b	2.40b
T_2 - sweet potato alone	—	—	—	—	—	—	—
T_3 - sweet corn - sweet potato (intercropping alternate row)	64b	0.4683c	1.87cd	90.17cd	—	—	—
T_4 - sweet corn with sweet potato (relayed 7 days before harvest of sweet corn)	64b	0.5067bc	1.01e	196.38abcd	1.87a	130a	2.60b
T_5 - sweet corn with sweet potato (relayed 14 days before harvest of sweet corn)	64b	0.6100a	1.22de	256.00abc	0.69b	130a	2.60b
T_6 - sweet corn with sweet potato (planted immediately after harvest of sweet corn)	63b	0.5150bc	1.03e	289.50ab	0.42b	120b	2.40b
T_7 - sweet potato with sweet corn (planted immediately after harvest of sweet potato)	63b	0.4883bc	0.98e	320.00a	0.40b	130a	2.60b
T_8 - sweet potato intercropped between 2 double rows of corn at intervals of 1.0 m with each row at 0.5 m	64b	0.5525ab	2.31bc	142.00abcd	0.85b	120b	3.20a
T_9 - sweet potato intercropped between 2 double rows of corn at intervals of 1.5 m with each row spaced at 0.5 m	64b	0.5017bc	2.00cd	106.58bcd	0.58b	60c	1.99b
T_{10} - sweet potato intercropped between 2 double rows of corn at intervals of 2.0 m with each row spaced at 0.5 m	66a	0.4500c	1.79cd	88.50cd	0.41b	50d	1.04b
T_{11} - sweet potato intercropped between 2 double rows of corn at intervals of 1.0 m with each row spaced at 0.3 m	64b	0.5190bc	3.45a	93.85cd	0.71b	60c	2.59b
T_{12} - sweet potato intercropped between 2 double rows of corn at intervals of 1.5 m with each row spaced at 0.3 m	67a	0.4625c	3.06a	56.20d	1.09ab	60c	1.99b
T_{13} - sweet potato intercropped between 2 double rows of corn at intervals of 2.0 m with each row spaced at 0.3 m	64b	0.4485c	2.98ab	66.50d	0.57b	40e	0.93c

Means with the same letters in the column are not significantly different at 5% level, DMRT.

- T_{10} - Sweet potato intercropped between 2 double rows of corn at intervals of 2.0 m with each row spaced at 0.5 m
- T_{11} - Sweet potato intercropped between 2 double rows of corn at intervals of 1.0 m with each row spaced at 0.3 m
- T_{12} - Sweet potato intercropped between 2 double rows of corn at intervals of 1.5 m with each row spaced at 0.3 m
- T_{13} - Sweet potato intercropped between 2 double rows of corn at intervals of 2.0 m with each row spaced at 0.3 m

Table 1 shows the planting arrangement for the sweet potato — sweet corn cropping experiment.

Planting. — Sweet potato (var. *Kaimay)* and sweet corn (Hawaiian Supersweet) were planted following the specified procedures for the different cropping treatments. Corn seeds were sown in furrows and thinned two weeks after germination to one plant per hill at a distance of 50 cm each to obtain the desired plant population per treatment. Sweet potato cuttings 30 cm long were also planted in furrows at an inclined position with the soil covering 2/3 portion of the cutting.

Fertilizer Application. — Urea (45-0-0), ammophos (16-20-0), and muriate of potash (0-0-60) were applied at the rates of 45-50-50 kg N, P_2O_5, and K_2O/ha for sweet potato and 55-55-90 kg N, P_2O_5, and K_2O/ha for sweet corn. These rates were based on the results of soil analysis done by the Bureau of Soils in Cebu City. The fertilizers were applied in split dosage, i.e. one-half of the total amount of N, P_2O_5 and K_2O rates for each crop was applied during planting and the remaining half was side-dressed 30 days after planting. No other elements were applied to the plants.

RESULTS AND DISCUSSION

Yield Response of Sweet Corn to Different Cropping Systems.

The green yield of sweet corn was significantly affected by the different cropping treatments (Table 2). The highest average yield was obtained in T_8 (3.20 t/ha) while the lowest was obtained in T_{13} (0.93 t/ha). The high yield of corn plants in T_8 was attributed to the optimum planting density, since the scheme provided for higher corn population (Table 1). T_8 appeared to be the optimum cropping combination to obtain maximum green yield of sweet corn. This treatment had higher yield than the monoculture, alternate cropping combination, relay (sweet potato relayed at 7 and 14 days before harvest of sweet corn), and sequential patterns (corn planted immediately after harvest of sweet potato and vice versa). Some of the double row schemes (T_9, T_{10}, T_{12} and T_{13}) had lower green corn yield due to the smaller area occupied by corn plants per hectare, which gave lesser corn population per unit area compared to the monoculture, relay (T_4 and T_5) and sequential patterns (T_6 and T_7).

The individual weight of corn ears per plant varied significantly (Table 2). The weight of individual corn ears per plant decreased by 36% when the pattern of planting was changed from monoculture to double row spacing. T_4, T_5, and T_7, had the highest weight of 130 g/plant while T_{10} and T_{13} had the lowest weights of 50 g and 40 g, respectively.

Growth Response of Sweet Corn to Different Cropping System.

The cropping systems significantly affected the period from planting to green maturity of sweet corn (Table 2). Plants in T_{12} attained green maturity longer than those in other treatments. Increasing the distance of interval row spacing from 1.0 m to 2.0 m between double rows spaced at 0.5 m and 0.3 m delayed the maturity of corn plants due to increased plant density per unit area (Table 1). Despite the increase in distance between double rows, plants in T_8, T_9, T_{11}, and T_{13} had similar dates of maturity as those under pure stand, alternate cropping scheme, and relay cropping.

Plants grown under the different cropping treatments differed markedly in their leaf area and leaf area index (LAI) measurements (Table 2). The double row scheme had higher LAI (3.45) but ranked third in leaf area per plant (0.519 m^2). The highest leaf area was obtained in T_5 (0.610 m^2 plant) followed by T_8 (0.553 m^2/plant). Although the value of the leaf area per plant decreased under the double row scheme, the LAI tended to increase. This was due to more plants per unit area compared to monoculture, relay cropping, and sequential patterns. Lowest LAI (0.98) was noted in T_7.

The higher LAI value of sweet corn in T_{11} appeared to be due to increased plant density because of narrow row spacing and more plants per unit area (Table 1). Sooksathan (1976) found that LAI for corn increased with increasing corn population up to a certain extent, since further increase in corn population tended to decrease LAI. In addition, the increase in LAI of corn may be brought about by the production of more leaf surface areas resulting in higher photosynthetic activity and yield.

On the other hand, corn plants having narrow canopy had low LAI. This was due to fewer and smaller leaves, which had lower surface areas thus reducing their photosynthetic activity resulting in lower yield.

The total dry matter (TDM) yield and harvest index (HI) of sweet corn are shown in Table 2. Highest TDM was noted in T_7, while the lowest was in T_{12}. This could be due to the decreasing trend in leaf area per plant under the double row scheme. On the other hand, HI was found to be higher in T_4 followed by T_{12}, T_8, and T_{11}. Lowest HI were obtained in T_1, T_5, T_6, T_7, T_9, T_{10} and T_{13}.

The decrease and increase in TDM per plant could be due to the sizes of the leaves and the whole canopy architecture of the plant. A plant which has smaller leaves is expected to display a narrow canopy, while one which has bigger leaves is expected to have a wide canopy. Since large leaves have wide leaf surface areas, these will have more photosynthetic activity to produce high TDM yield. On the other hand, small leaves develop narrow leaf surface areas resulting in low photosynthetic activity and low TDM yield. Results showed that the canopy architecture of the plant had the same effect on LAI and TDM. Cropping systems had no significant effect on plant height of corn at 30 and 60 days after planting.

Table 3. Mean values of the different growth and yield parameters for sweet potato under the different cropping systems.

Treatment	Length of Vines at Harvest (m)	Leaf Area/Plant (m^2)	Leaf Area Index	Total Dry Matter/ Plant (g)	Harvest Index	Yield of Sweet Potato Tubers/ Plant (g)	Yield of Marketable Tuber/ha. (t)	Total Yield of Sweet Potato Tubers/ha (t)
T_1 - corn alone	—	—	—	—	—	—	—	—
T_2 - sweet potato alone	3.00b	0.5110g	1.70e	98.30a	4.02d	377.00ab	8.78bcd	12.58bcd
T_3 - sweet corn - sweet potato (intercropping alternate row)	4.20e	0.9280ab	6.18ab	48.90bc	8.01abcd	395.00ab	9.73bc	13.16bc
T_4 - sweet corn with sweet potato (relayed 7 days before harvest of sweet corn	3.00g	0.8770ab	2.92d	59.40abc	4.84d	240.00ab	5.66de	8.00de
T_5 - sweet corn with sweet potato (relayed 14 days before harvest of sweet corn)	3.70f	0.6290efg	2.09e	56.70abc	4.19d	229.20ab	4.25e	7.64de
T_6 - sweet corn with sweet potato (planted immediately after harvest of sweet corn)	3.30g	0.5370fg	1.79e	78.30ab	4.89cd	316.90ab	6.83cde	10.56cde
T_7 - sweet potato with sweet corn (planted immediately after harvest of sweet potato)	3.26g	0.6640g	2.21e	76.50ab	4.06d	310.20ab	7.54cde	10.34cde
T_8 - sweet potato intercropped between 2 double rows of corn at intervals of 1.0 m with each row at 0.5 m	7.70a	0.8825bc	5.89bc	60.30ab	13.12a	730.80ab	11.72ab	16.24ab
T_9 - sweet potato intercropped between 2 double rows of corn at intervals of 1.5 m with each row spaced at 0.5 m	5.62c	0.8826bc	5.88bc	45.40bc	9.25abcd	288.00ab	2.68de	9.60cde
T_{10} - sweet potato intercropped between 2 double rows of corn at intervals of 2.0 m with each row spaced at 0.5 m	5.40d	0.8455cd	5.63c	40.05bc	11.26ab	324.00ab	6.56de	10.80cde
T_{11} - sweet potato intercropped between 2 double rows of corn at intervals of 1.0 m with each row spaced at 0.3 m	6.90d	0.9745a	6.50a	72.00ab	10.59abc	758.67a	14.84a	17.43a
T_{12} - sweet potato intercropped between 2 double rows of corn at intervals of 1.5 m with each row spaced at 0.3 m	7.00b	0.8175de	5.45c	83.70bc	6.27bcd	435.60ab	9.47bcd	14.52abc
T_{13} - sweet potato intercropped between 2 double rows of corn at intervals of 2.0 m with each row spaced at 0.3 m	6.98b	0.8155def	5.43c	30.90c	7.64abcd	167.56b	5.80de	7.28e

Means with the same letters in the column are not significantly different at 5% level, DMRT.

Growth Response of Sweet Potato to Different Cropping Systems.

Cropping system had no significant effect on vine length 30 days after planting although it exerted a marked influence on the length of vines at harvest (Table 3). The longest vines were noted in T_8 (7.70 m) while the shortest vines were noted in T_2 and T_4 (3 m).

In terms of vine length development, T_8 appeared as the optimum spatial cropping arrangement for sweet corn and sweet potato. This was attributed to the ability of sweet potato vines to creep along the wide space formerly planted to corn under the double row scheme. After harvesting the corn plants under double rows, a wide space was left which was observed to be densely covered with sweet potato. The early dense growth of sweet potato plants produced longer vines as found in T_{12}, T_{13}, and T_{11}.

The leaf area and LAI values of sweet potato are presented in Table 3. T_{11} had the highest average leaf area per plant, followed by T_3 and T_9. The lowest leaf area was obtained in T_2 and T_6. Leaf area index was also found to be significantly affected by the cropping systems (Table 3). T_{11} had the highest LAI followed by T_3, while T_2 had the lowest LAI followed by T_6. It appeared that T_{11}, T_3, and T_8 gave the optimum spatial cropping arrangement for sweet corn and sweet potato plants in terms of leaf area and LAI measurements. The higher LAI of plants under double row spaced at 0.5 m and 0.3 m with interval row spacing of 1.0 m conforms to the findings of Hardwood and Herrera (1973) that intercropping combinations generally produce a high LAI and cover the ground much faster than in monoculture, thus preventing weed growth as well as run-off water.

Another significant effect of cropping systems was noted on the TDM per plant and HI of sweet potato (Table 3). The highest TDM per plant was noted in T_2 followed by T_6, T_7, T_{11}, T_8, T_4 and T_5, in that order. Although T_2, T_6, and T_7 produced higher TDM per plant, they developed the lowest HI. Highest HI were obtained in T_8, T_{10}, T_{11}, T_9, and T_3. The high HI of plants under these treatments were due to the higher weight proportion of sweet potato tubers per plant than their TDM compared to monoculture, relay and sequential cropping patterns. No significant effect was noted on the number of marketable and non-marketable tubers per plant.

Yield Response of Sweet Potato to Different Cropping Systems.

The total yield of both marketable and non-marketable tubers of sweet potato was significantly affected by the different cropping systems (Table 3). The highest yield was found in T_{11} (17.43 t/ha), followed by T_8 and T_{12}. The lowest average yield of tubers was obtained in T_{13} (7.28 t/ha) followed by T_5, T_4, T_9, T_7, and T_{10}, in that order.

The high tuber yield in T_{11} could be attributed to better use of solar energy by plants under the optimal double row arrangement scheme. This was because 64 days after planting both crops, sweet corn plants were harvested ahead leaving sweet potato totally exposed under sunlight. This eliminated competition for light and other environmental resources like water and nutrients which were fully utilized by sweet potato plants.

Significant effects were also noted on the yield per hectare of marketable tubers (Table 3). Changing the arrangement of double row spaced from 0.5 m with interval row distance of 1.0 m to a spacing of 0.3 m with the same interval row distance affected significantly the marketable tubers of sweet potato. T_{11} seemed to be the optimum cropping combination to obtain maximum marketable tuber yield, as indicated by higher leaf area and LAI of sweet potato plants.

In contrast to the marketable tuber yield of sweet potato, the non-marketable tuber yield was not significantly affected by the different cropping systems. Similarly, no significant difference in the number of both marketable and non-marketable tubers per sweet potato plant was observed.

Total Mean Yield of Sweet Corn and Sweet Potato Under Different Cropping System.

The combined mean yield of sweet corn and sweet potato is presented in Table 4. T_{11} had the highest total mean yield of green corn (2.59 t/ha) and sweet potato tubers (17.43 t/ha), followed by T_8 and T_{12}, with 3.20 t/ha and 1.99 t/ha of green corn and 16.24 t/ha and 14.52 t/ha of sweet potato tubers, respectively.

Increasing the distance of interval row spacing between double rows from 1.0 m to 2.0 correspondingly reduced the yield of both crops. Double row arrangements were optimal for growing sweet corn and sweet potato crops. A 75% increase in green corn yield (3.20 t/ha) was noted when sweet corn was grown in association with sweet potato (T_8) compared to T_1 (2.40 t/ha). By growing the crop in association with sweet corn (T_{11}), a 66% increase in sweet potato tuber yield (17.43 t/ha) was noted as compared to T_2 (12.58 t/ha). In a similar study, Andrew (1972) produced 70% more grain yield by intercropping sorghum with peas millet and cowpeas as compared to sorghum alone. Krants (1974) also noted a substantial yield increase from various combinations of alternate row cropping schemes over those of separate cultures.

T_{11} produced the highest yield due to higher population of corn plants per hectare (Table 1) and high yield of sweet potato tubers per plant (Table 3). When grown together, sweet corn and sweet potato more efficiently utilized the surrounding environmental resources such as temperature, space between plants, CO_2, and soil nutrients.

Table 4. Individual and combined mean yield of sweet corn and sweet potato and their Land Equivalent Ratio (LER) as affected by different cropping systems.

Treatment	Individual Mean Yield (t/ha)		Combined Mean Yield (t/ha)	LER for Sweet Corn and Sweet Potato
	Sweet Corn (Green)	Sweet Potato		
T_1 - corn alone	2.40b	—	2.40	—
T_2 - sweet potato	—	12.58bcd	12.58	—
T_3 - sweet corn - sweet potato (intercropping alternate row)	2.60b	13.16bc	15.76	2.14b
T_4 - sweet corn with sweet potato (relayed 7 days before harvest of sweet corn)	2.60b	8.00de	10.60	1.72b
T_5 - sweet corn with sweet potato (relayed 14 days before harvest of sweet corn)	2.60b	7.64de	12.96	1.69b
T_6 - sweet corn with sweet potato (planted immediately after havest of sweet corn)	2.40b	10.56cde	12.96	—
T_7 - sweet potato with sweet corn (planted immediately after harvest of sweet potato)	2.60b	10.34cde	12.94	—
T_8 - sweet potato intercropped between 2 double rows of corn at intervals of 1.0 m with each row at 0.5 m	3.20a	16.24ab	19.44	2.84a
T_9 - sweet potato intercropped between 2 double rows of corn at intervals of 1.5 m with each row spaced at 0.5 m	1.99b	9.60cde	11.59	1.74b
T_{10} - sweet potato intercropped between 2 double rows of corn at intervals of 2.0 m with each row spaced at 0.5 m	1.04b	10.80cde	11.84	1.79b
T_{11} - sweet potato intercropped between 2 double rows of corn at intervals of 1.0 m with each row spaced at 0.3 m.	2.59b	17.43a	20.02	3.33a
T_{12} - sweet potato intercropped between 2 double rows of corn at intervals of 1.5 m with each row spaced at 0.3 m.	1.99b	14.52abc	16.51	2.81ab
T_{13} - sweet potato intercropped between 2 double rows of corn at intervals of 2.0 m with each row spaced at 0.3 m.	0.93c	7.28e	8.21	1.72b

Means with the same letters in the column are not significantly different at 5% level, DMRT.

Total Land Productivity Index or Land Equivalent Ratio (LER).

Total land productivity is a basic consideration in evaluating crop combinations. These cropping combinations can increase land productivity from 30 - 60% over monoculture depending on crop arrangement (Krantz, 1974). Mendoza (1979) also pointed out that land productivity can be measured in terms of monetary returns or in equivalent land area basis. In this study, LER was calculated by determining the ratio of the yield of a crop in a mixture to its yield in monoculture under the same level of management.

Mixed cropping significantly increased the total productivity of the land (Table 4). The conventional and the double row schemes had LER values greater than 1. This suggests that intercropping sweet corn with sweet potato has a relative advantage over the monoculture. The values obtained on yield as fraction of pure culture checks for sweet corn and sweet potato indicated a net positive effect between the crop combination. LER values for relay cropping ($T_{4\ell}$ and T_5) slightly decreased as the duration of relay planting was lengthened (from 7 - 14 days before harvesting corn). Similarly, LER notably decreased as the interval row spacing was widened from 1.0 m to 1.5 m and then slightly increased as interval row distance progressed to 2.0 m for double row spaced at 0.5 m. However, the decrease in LER did not reach below 1. Apparently, T_{11} which has optimal double row and interval row distance provides greater chances for obtaining maximum yield.

Results point to the possibility of increasing the amount of solar energy distribution in a mixed crop culture. Improving the monoculture pattern of planting by using conventional alternate cropping and double rows appeared to minimize risks and provide for equal labor distribution. Furthermore, yield of both crops increased by more than 50% compared to their pure culture.

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