

Maize-Cowpea Intercropping for smallholder farmers

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Introduction

From the perspective of the farmer, intercropping is a practice which increases the efficiency of the limited resources available. Most importantly, good intercropping systems make more efficient use of our more important resource: Land. This is only the case if a combination of two crops produces a higher relative yield when combined than when grown in monoculture.

The technical feasibility of intercropping is difficult to achieve in intensive, large scale agriculture, because of the reliance on selective herbicides and machinery, which doesn't often have the capacity to separate two crops. However, small-scale farming lends itself to intercropping. In fact, it is a common and ancient practice in many parts of the world, including Zimbabwe.

However, the yield benefits of intercropping systems are often not quantified under different fertilisation amounts, and there is little technical information on how to produce a successful intercrop.

Therefore, this technical bulletin shall

present results of a field trial at ART Farm in Harare which investigated Maize-Cowpea intercropping under three different fertilisation practices. The system used is strip-cropping, found in previous research to be the most suitable method of intercropping in this context. The principles of good intercropping in a smallholder context will also be explained.

Methods

The site is located at ART Farm, Harare, on red clay loam soils. The trial was rain-fed only. Only hand-weeding was employed. At harvest, yields were adjusted to 12.5% moisture for Maize and 11% for Cowpea. The trial design was a split-plot design with one main factor and one sub-factor. The main factor was cropping system, and the sub-factor was fertilisation. The experiment had 6 repeats. The treatments are found in table ???. Maize was planted at 53,333 plants per hectare in monoculture. Intercrop design and populations are shown in figure 2.1. Maize and cowpeas were planted at the same time, on the 8th December 2023. Maize variety was SC555, a medium-maturing cultivar, and the

Cowpea variety was CBC2.

Treatment	System	Basal.Fertiliser.per. Station	Urea.Top.Dressing.per. Station
1	Conventional	#5 cup	#5
2	Conventional	#2 cup	#5
3	Conventional	#2 cup	#2
4	Conventional	#2 cup	#2
5	Conventional	-	-
6	Intercropping	#5 cup	#5
7	Intercropping	#2 cup	#5
8	Intercropping	#2 cup	#2
9	Intercropping	#2 cup	#2
10	Intercropping	-	-

Figure 2.1: Table of treatments and their management.

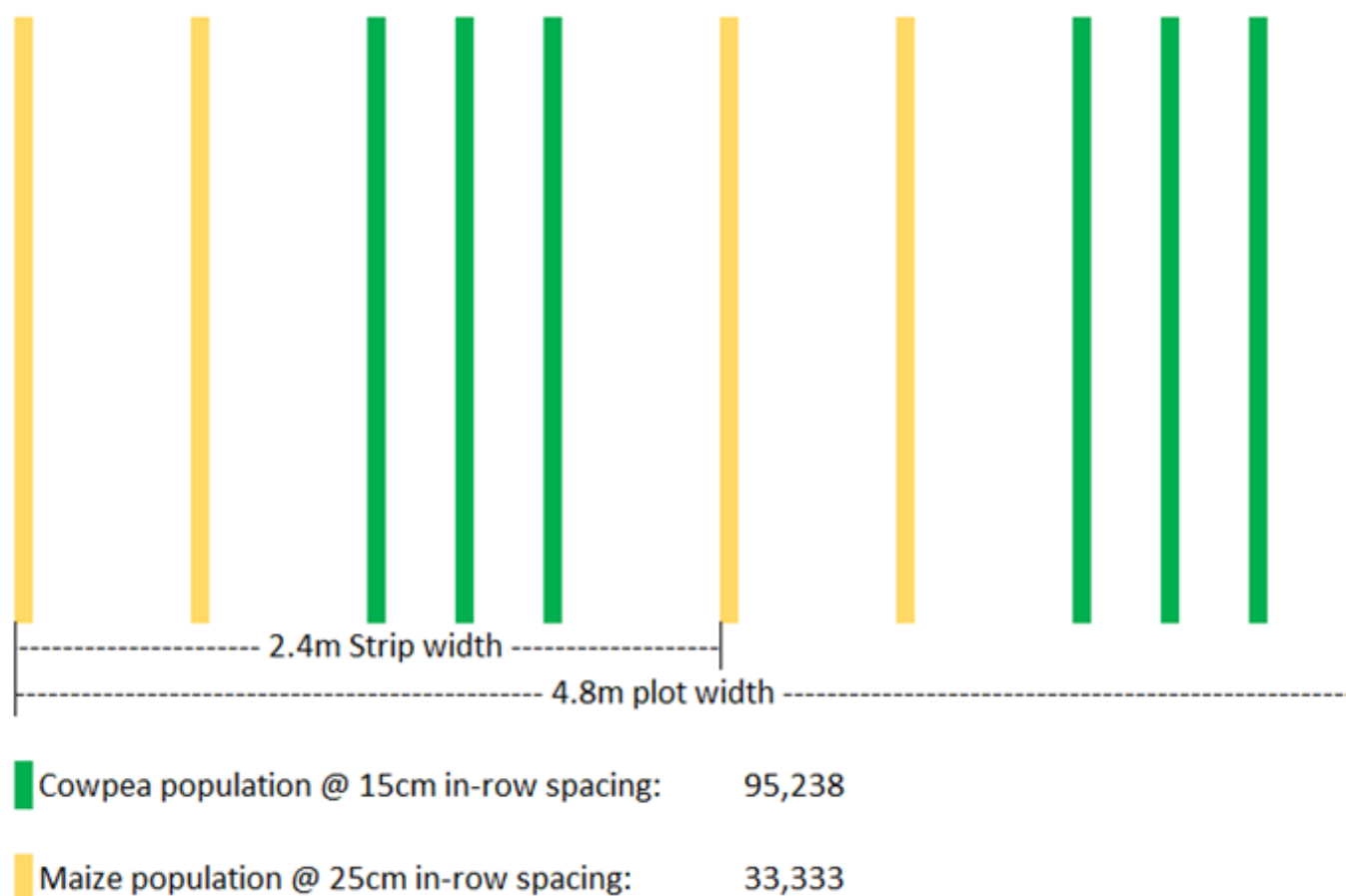


Figure 2.2: Diagram showing the pattern of Maize and Cowpea intercropping. Maize is spaced at 60cm and cowpeas are spaced at 30cm, with a 60cm gap between crops.

Results

Weather

Weather this season made crop growing conditions extremely tough. ART Recorded the highest rainfall for October on record (40 years), and the second lowest rainfall for February on record. Temperatures were generally 1.5 - 2 degrees higher than the long-term average from January to the end of the season. Therefore, the crop had to be planted very late this season.

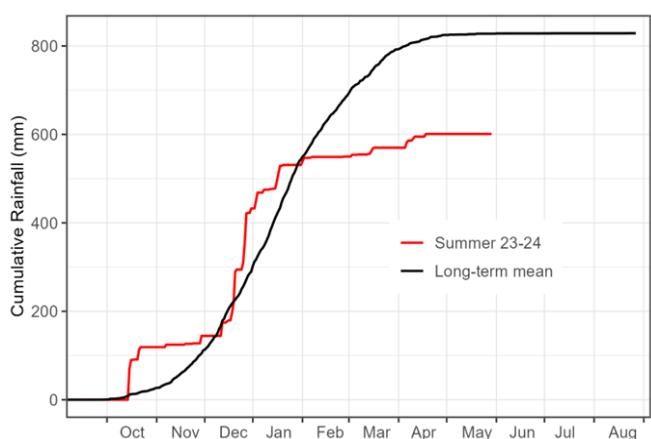


Figure 3.1: Cumulative rainfall at ART Farm by day.

Yields

Figure 3.2 shows that although intercropped maize was generally slightly lower yielding than monoculture maize, these differences were not significant. This is demonstrated using the letters above the columns, where different letters indicate statistically significant differences. On average, the yield reduction was 0.5t/ha. This is relevant for the 2023-4 summer growing season at ART Farm, Harare.

There were also no significant differences between fertilisation treatments, for both maize and cowpea.

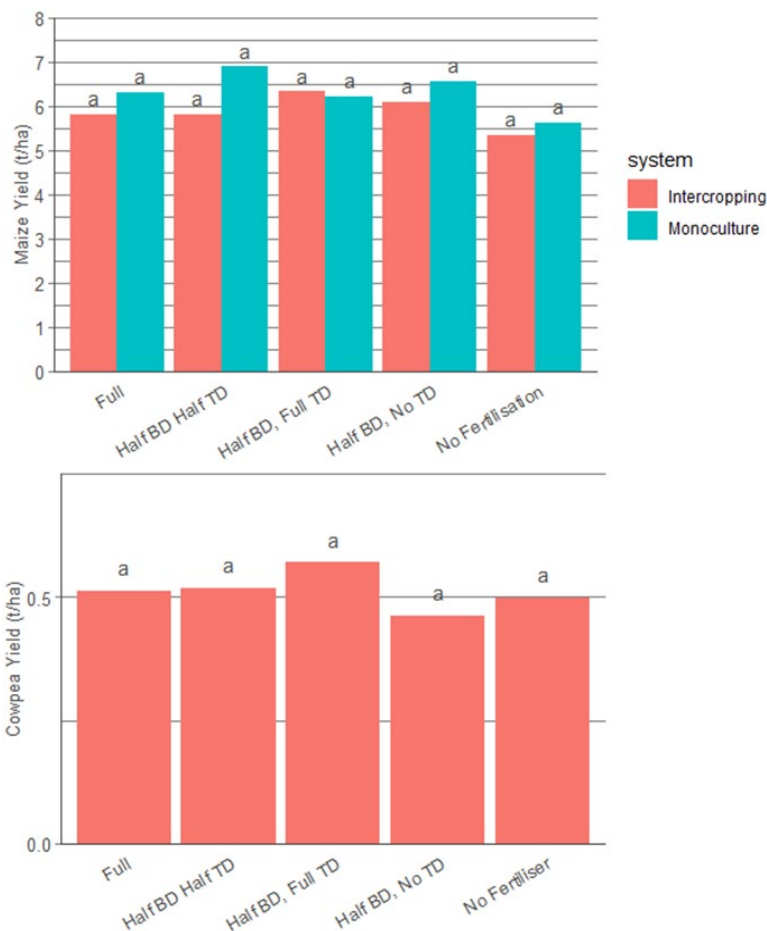


Figure 3.2: Maize and Cowpea Yields in intercropping and monoculture treatments. Columns with different letters indicate significant differences (p = 0.05). BD = Basal Dressing, TD = Top Dressing.

Discussion

The results show that there was no significant difference between intercropped and monoculture maize yields. The p-value we achieved was below 0.05, which means that we are less than 95% certain that the results did not happen by pure chance. This level of certainty is a standard threshold when evaluating data. This result means that despite having a slightly lower population, as well as having cowpea strips, the intercropped maize did not suffer in yield. As the cowpea also provided a small yield in the intercropped treatments, this represents a significant advantage in the intercropped system. The lack of a difference in fertilisation amounts is surprising, but considering the previous crop of barley was heavily fertilised (400Kg of Basal and Urea /ha), there may have

been significant residual nutrients in the soil.

The design allowed for additional sunlight to hit the Maize in the intercropped treatments, which may have caused helped boost the yield of the lower population maize. However, the cowpea Yield suffered considerably. Wider strips of both maize and cowpea may help to balance the yields to achieve greater cowpea yields, whilst likely not having a large effect on the maize yields.

5 Conclusions and Recommendations

Intercropping shows time and time again to produce greater returns from the land, while boosting diversity, food nutritive value, and even income. This trial demonstrates that this is the case at ART, in a well-managed context. Farmers are encouraged to try intercropping on their own lands, whether they are on degraded or highly fertile soils, and are intensively managed or not. Some principles

- Choose crop combinations wisely. Consider how well the crops complement each other, value in the diet, and value as a cash crop. A tall and a short crop often perform well because they utilise different spaces and maximise on harvesting sunlight. For example, cereals and legumes are both important in our diets and support each others growth through providing physical support and nitrogen fixation, respectively.
- Use strip-cropping method to optimise the sunlight that reaches the understory crop. Often, intercropping by alternating crop at every row can provide an advantage to the more competitive and vigorous crop. By growing in strips, you allow both crops to compete with one another more equally.
- Consider a staggered planting - if you value one crop over the other, give it an advantage by planting it first. Or if one crop emerges much sooner, consider planting it later than the other crop.
- Try out different intercropping methods - always grow the monoculture equivalents so you can have an idea of what the crops would yield if grown separately.
- Most importantly, adhere to principles of good agricultural practice as a first priority. Try to provide fertilisation, be it inorganic or organic, plant early in the season, use quality seed, and keep the weeds at bay.



for practicing intercropping in a smallholder context are:

Figure 5.1: Maize and cowpea demonstration plots. It is always necessary to compare monocultures of intercrop combinations when trialling intercropping.

