CARE INTERNATIONAL MOZAMBIQUE

Study: Effectiveness of intercropping in managing the dietary and food security needs of farmers in Inhambane and Nampula Provinces.

IN 2016, CARE MOZAMBIQUE COMMISSIONED A STUDY TO EVALUATE THE EFFECTIVENESS OF INTERCROPPING IN MANAGING THE DIETARY AND FOOD SECURITY NEEDS OF FARMERS IN INHAMBANE AND NAMPULA PROVINCES. DURING ONE OF THE WORST DROUGHTS THAT HAVE IMPACTED INHAMBANE, THE COMBINATION OF GROWING DISEASE-RESISTANT CASSAVA ALONGSIDE EARLY MATURING COWPEA SEED AND RATOONED PIGEON PEAS HAS PROVEN TO WITHSTAND ONE OF THE WORST DROUGHTS AND PROVIDE BOTH THE CALORIC AND PROTEIN CONTENT THAT FAMILIES NEED TO AVOID SUFFERING THROUGH A HUNGER SEASON. IN ADDITION TO THE OBVIOUS NUTRITIONAL AND FOOD SECURITY BENEFITS THAT THESE SYSTEMS OFFER, OVER TIME, INTERCROPPING IS ALSO PROVEN TO IMPROVE SOIL HEALTH, REDUCE THE RISK OF CROP FAILURE, AND IN SOME CASES, CROPS LIKE PIGEON PEAS OFFER SOME FARMER A NEW AND LUCRATIVE SOURCE OF INCOME. THE PURPOSE OF THIS STUDY WAS TO FIND SIMPLE TECHNOLOGIES THAT INCREASE PROTEIN CONTENT, IMPROVE SOIL FERTILITY AND ARE RESILIENT TO DROUGHT AND CLIMATE CHANGE

A Triple Win – the cassava, pigeon pea, cowpea cocktail

An earlier study commissioned by CARE Mozambique on the viability of **disease resistant cassava** found that the improved variety of the plant was effective in controlling prevalent viruses that decimated harvest in prior years. Farmers were not only enthusiastic about the results, but were eagerly planting the new cassava varieties in their fields as fast as the Farmer Field School (FFS) plots could produce the cuttings. The results of this study find that in addition to disease resistant cassava, the FFS trials using ratooned pigeon peas and 60-day cowpea hold incredible promise for smallholder farmers in Mozambique.

Despite having suffered an intense drought, the ratooned pigeon peas (left) are growing exponentially better than maize plants (right) planted on the same plot.

It is common practice in CARE's FFS to intercrop pigeon peas with maize, which is a lucrative cash crop that is coveted by farmers, but extremely difficult to grow in drought prone areas. A new innovation in pigeon pea farming was discovered in neighboring Zambia, where researcher Sebastian Scott found that by cutting off the stem of a pigeon pea plant just after planting the following season's maize (called ratooning), the pigeon pea will produce enough biomass to increase the crop yields of the maize itself. Using this technique, maize yields have increased by over three times in areas with **ratooned**

pigeon peas. Moreover, the pigeon pea is rapidly becoming one of the most lucrative crops across Mozambique. In eastern Kenya, throughout much of Zambia, and near several ports of Mozambique, Asian traders scour rural areas to buy pigeon peas that they will export to India. **This presents huge potential for an improved variety of pigeon peas to boost the incomes of small-holder farmers, as it becomes one of Mozambique's best cash crops as a result of the increasing unmet demand for this grain in India.**

THE MAGIC COWPEA

Perhaps the most potentially game changing innovation comes with the introduction of two varieties of **60-day cowpeas** to the FFS in Inhambane. The results again prove that the improved variety is effective in increasing dietary diversity, protein content and overall food security. The 60 day cowpeas produce dry beans about 20 to 30 days sooner than any of the traditional varieties within Mozambique. Since cowpeas are usually the first grains to be produced after the rains start, the ensuing hunger season is cut short by almost a full month. This is especially important for women, who have the strenuous job of weeding food crops like maize, usually at a time of year when they are least able to feed themselves well. Furthermore, since the leaves of the cowpea, which have 25% protein content, are also edible and widely consumed, cowpeas easily supply the first and most nutritious fresh food of any kind during the rainy season.[1]

But even traditional varieties of cowpeas, which produce significantly less than the 60-day varieties, are important for several reasons. In both Nampula and Inhambane, cowpeas are the second most important crop grown by smallholder farmers (after cassava) and very likely the most important single source of protein. In Africa as a whole, cowpeas are the most widely grown legume. Furthermore, the leaves of the cowpea can be dried and stored for up to 12 months, thereby providing protein-rich food to smallholder farm families year-round.

60-day cowpeas, thriving even after suffering serious drought in Funhalouro, Inhambane

Perhaps equally important is that when cowpeas and lablab beans are planted at the same time and very close to each other, the 60-day cowpeas grow so quickly that the lablab beans cannot climb over them before the cowpeas have matured. In any system where crops such as lablab beans, common beans, or groundnuts are intercropped with maize, sorghum, millet or cassava, it is highly likely that 60-day cowpeas could be added to the mix without reducing the growth of the other crops. The 60-day cowpea will be harvested and dead **before the other crops need either the above-ground space or the root space that the cowpeas occupy.**

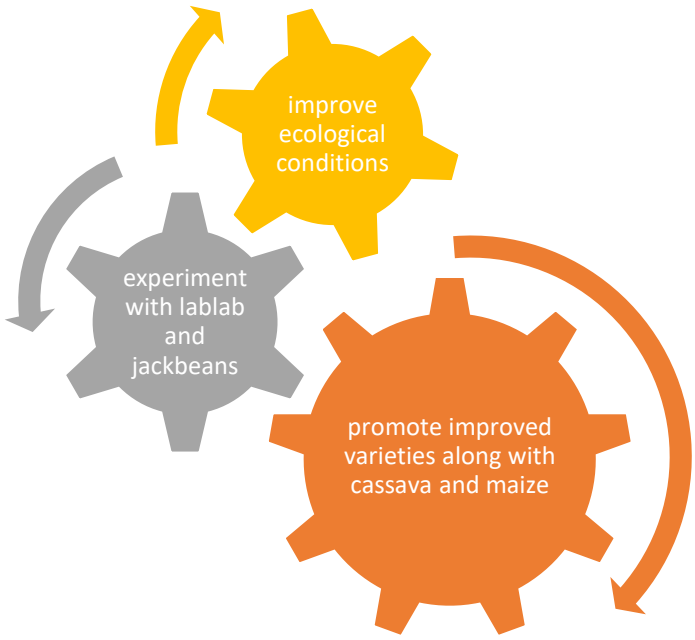
[1] A further reduction of the hunger season will be achieved through CARE's work with lablab beans, which produce mature beans throughout six months of each year, and will increase cassava or maize production by well over 100% within three to four years.

Thus, the intercropping of cowpeas in other systems could easily increase total food productivity by 30%, and protein availability by around 50%, at very little added cost, with virtually no complications and with a higher over-all food security because of its drought-resistance. This alone can have significant impacts on household food and nutrition security.

Perhaps most impressive of all is that the 60-day cowpea can help other crops grow better, even during severe drought. The study found that because the 60-day cowpea is harvested earlier than other crops, and the attendant biomass applied to the soil early (within 40 days of a maize crop being planted for example), it serves as a nitrogen side-dressing to the cassava, pigeon pea and whatever maize is present in the field. That is, the nitrogen and other nutrients are absorbed almost immediately by the maize and other crops, and once absorbed are largely protected from dry-season losses. In this way, **the 60-day cowpea can provide a significant boost in production the very first season it is planted.**[2]

MAKING THE HUNGER SEASON DISAPPEAR

The next effort of CARE Mozambique will be to test the viability of lablab beans as part of the intercropping system, along with jackbeans, cowpeas and maize. Farmers could use this system on part of their land, and continue using the traditional cassava/cowpea system on the rest of their land, very likely rotating one with the other. Lablab is very nutritious, and is a good source of fresh beans through and after the dry season. With plentiful fresh grains available year round, this system could very well eliminate the hunger season, while improving the fertility of the farmers' soil for future planting. **CARE Mozambique can take the findings from this study and implement them in a year round program to target hunger reduction, even during drought.** The FFS can promote resilience to drought by incorporating improved varieties of 60-day cowpea, disease resistant cassava, ratooned pigeon peas and jackbeans, simultaneously experimenting with other varieties of improved crops such as lablab, and also working to improve the ecological conditions under which these crops are grown so that they will be more resilient to future droughts.



[2] Farmers will inevitably want to plant some sweet potatoes in among the three main crops, and an occasional maize plant, as they do traditionally. This is, in fact, a good idea, because over time, as the soil improves, planting distances can be reduced, and more and more maize and other crops that are less drought-resistant can be added to the system. Because with the improving soil and the increased cover, the whole system will be more resilient to drought, and crops that would die under present conditions will actually thrive.

RESILIENCE TO CLIMATE CHANGE. **Looking at climate change resilience specifically, this system of intercropping presents four simple, inexpensive ways that smallholder farmers can increase the resilience in the face of extreme drought and climate change**:

1. **Maintain cover**. This is one of the three principles of Conservation Agriculture, and has proven its effectiveness across drought-prone Africa. However, in this case, we will use *in situ*-grown mulches, rather than mulches laboriously transported onto farmers' fields.

2. **Increase the soil's organic matter (OM) content**. An increased OM content can increase water retention by two or three times. Needless to say, these changes would go a long way toward allowing crops to thrive even during droughts.

3. **Provide a light shade to crops and soils**. Under a light shade, both the transpiration rate of crops and the evaporation rate from soils can be cut in half. Both of these factors mean, once again, that soil moisture will last longer and crops will grow better with the moisture that is there.

4. **Increase the size and penetration of crops' root structures**. Certain crops, such as lablab beans and pigeon peas, will re-sprout if cut off late in their growth cycle. This means that instead of struggling to grow new root systems every year, crops can dedicate all their resources to new above-ground biomass, and have an adequate quantity of water to do so. The FFS trial of cutting off pigeon pea plants has shown that regrowth is much more vigorous when the plant maintains its previous root structure, and there is no reason to think that lablab regrowth will not be equally vigorous if it is treated the same way.

CONCLUSION

The system described above succeeds in meeting every single objective that is desired of an agricultural system for Inhambane. **It is hard to imagine a more beneficial, sustainable system that can provide highly nutritious food and almost ensure food security in such a degraded, drought-prone environment. The system meets all of the criteria of soil and environmental improvement, productivity, sustainability, profitability, and ease of adoption.** Cassava yields could double what they are today, providing sufficient calories throughout the year, with the cowpea and pigeon pea meetings a household's protein needs. The cowpea /pigeon pea mix will dramatically improve soil fertility and water retention. Moreover, its profitability, lack of increased labor or expense, primary dependency on the traditional crops of the area and structural similarity to their traditional systems make this intercropping system a highly acceptable new system to implement in Mozambique.

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