

# Agroforestry Improvements to School Gardens in Rural Uganda

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## Introduction and Objectives

Agroforestry can have a significant impact on nutritional food security and resource independence at Nakanyonyi primary school. Agroforestry is defined as purposefully combining the practices of agriculture and forestry to promote the human, livestock, financial, and ecological welfare (USDA, 2012). In addition to a primary human benefit, agroforestry ensures a diversity of food, ecological, and construction resources. During the 2017 Summer Service Learning Course, the agroforestry team had several objectives at Nakanyonyi (NAK) primary school:

- Establish a fruit tree orchard at Nakanyonyi primary school.
- Protect the NAK orchard with a living and barbed-wire fence.
- Repair and maintain living fences at NAK.

Agroforestry seeks to meet a variety of needs through diversity of tree and understory species.

## Materials and Methods

### Planting a papaya and mango orchard:

- Dig holes 1.5 ft. deep and 3 feet wide, spaced 8-10 ft. apart.
- Amend soil with manure.
- Plant the seedlings, make sure to water ( $\frac{1}{2}$  -  $\frac{1}{3}$  watering can) once a day for two weeks. Afterwards, decrease watering to every other day. Continue "hardening off" until seedlings do not require watering.

### Constructing a barbed wire and Euphorbia living fence:

- Dig 2 ft. deep holes every 7 ft. in straight lines around the area.
- Obtain hardwood posts; tamp thoroughly until they do not wobble.
- Dig a 1/2ft trench (3-6 inches of loose soil) between each post. Cut 1-2ft long Euphorbia cuttings; place the Euphorbia cuttings in the trench about every half foot (if dry, water the cuttings).
- Obtain a roll of barbed wire and U-Shaped nails. Hammer 2-3 rows of wire to the posts, keeping it as taut as possible.
- Suggestion: While this program used fence posts from hardwood trees such as Cassia, it is advised to obtain fence posts from the local "Mutuba" (*Ficus natalensis*), due to the tree's natural ability to grow from cuttings and resist termite damage.



Figure 1: A diagram<sup>1</sup> of a complete agroforestry system. Note that agroforestry products at Nakanyonyi primary school do not currently involve domestic livestock, but there is potential for future objectives.

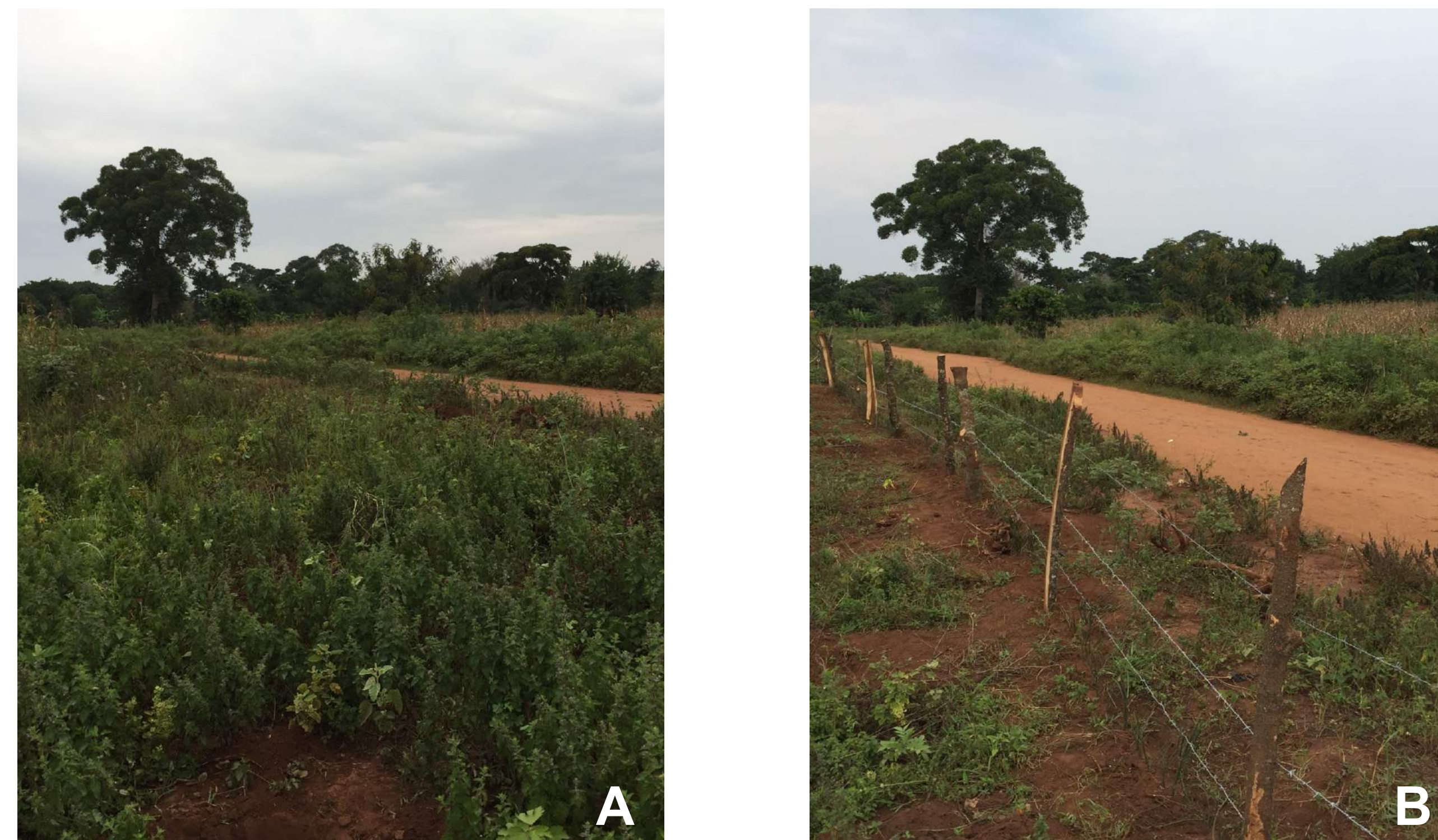


Figure 2: Before (A) and after (B) pictures of the fence surrounding the fruit orchard at Nakanyonyi. Notice the euphorbia cuttings planted below the first row of barbed wire. It is estimated that the euphorbia will be strong and tall enough to support the fence in 2-3 years.

## Orchard Species composition before and after Summer 2017

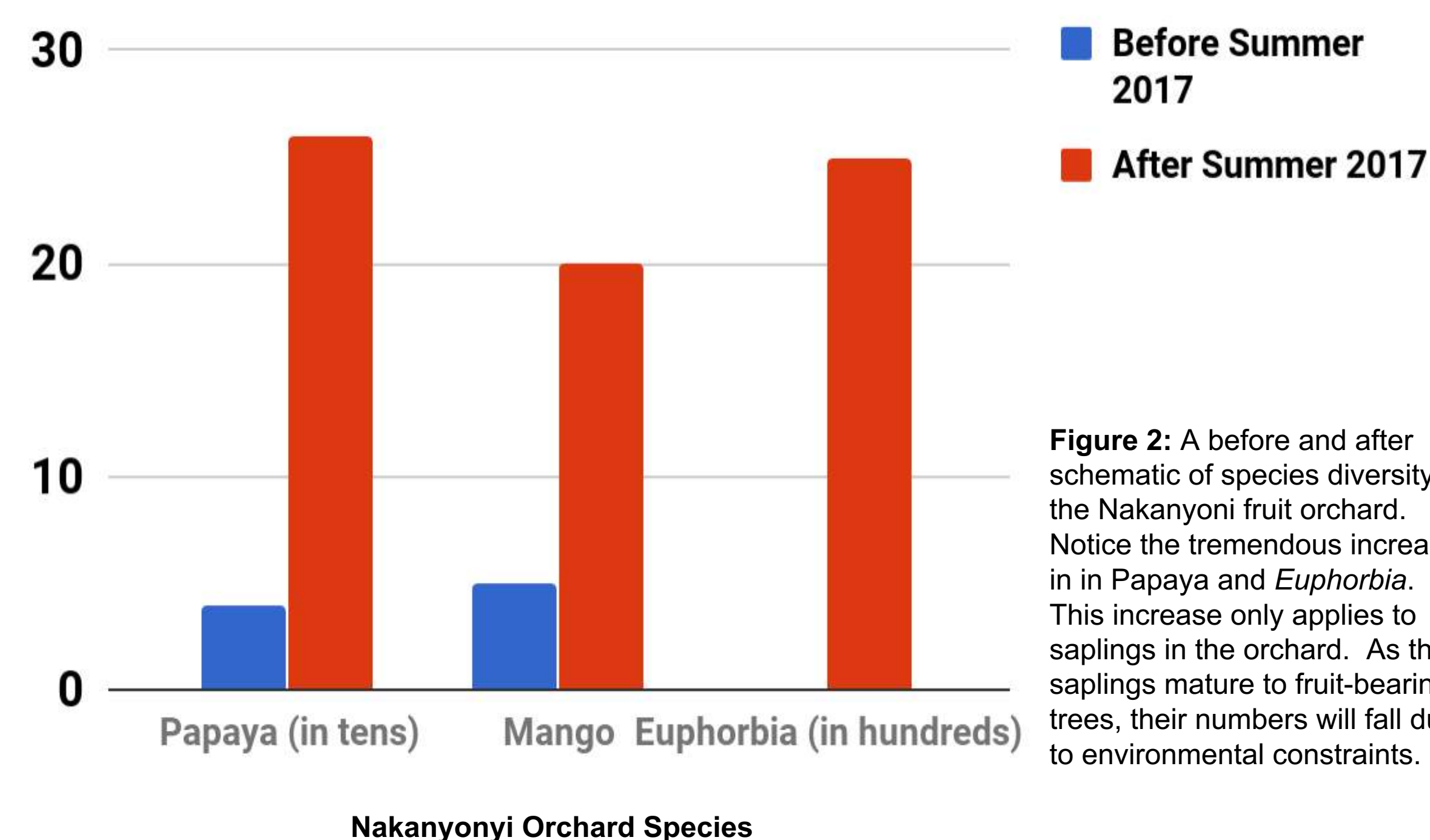


Figure 2: A before and after schematic of species diversity at the Nakanyonyi fruit orchard. Notice the tremendous increase in Papaya and Euphorbia. This increase only applies to saplings in the orchard. As the saplings mature to fruit-bearing trees, their numbers will fall due to environmental constraints.

## Results

- 1000 feet of fence built, using 75 wooden posts and 3 rows of barbed wire to protect the fruit tree orchard from livestock.
- Planted 250 papaya seedlings and transplanted approximately 15 mango seedlings to help provide school lunch at Nakanyonyi primary school.
- Planted approximately 2000 Euphorbia cuttings to support a living fruit orchard fence and maintain other Nakanyonyi fences.
- Developed a herbarium to help future service-learners identify common trees in the Kamuli district.
- Cleared away 2 termite mounds.

## Conclusion

By establishing a protected tree orchard, the Iowa State University and Makerere service learning team met their agroforestry goals and promoted environmental education at Nakanyonyi primary school. The orchard should provide the foundation for an exemplary agroforestry center that meets the educational and nutritional needs of pupils.

Many of the seedlings planted during summer of 2017 may experience die offs, and tree seedlings will need to be planted to accommodate for losses.



Figure 3: Geoffrey Sekyanzi, a past service learner, teaches Nakanyonyi students on the proper planting and care of a papaya seedling. In addition to improving food security and resource availability, agroforestry can offer educational value for future farmers.

## Future Recommendations

- Maintain the fence around the orchard at Nakanyonyi. Prune and plant more Euphorbia cuttings as needed.
- Intercrop papaya seedlings at Namasagali with a nitrogen fixer.
- Increase diversity of the fruit orchard by planting new species such as Jackfruit and avocado.
- Consider adding bio-fortified papaya to the NAK orchard.
- Plant a teak orchard to serve as a long-term financial investment.
- Replace rotted fence posts with *F. natalensis* cuttings, that could eventually provide fuel, construction wood, and bark cloth to the school system.

## Literature Cited

- 1: LinkedIn (2016): article on agroforestry by professor T. Nooralvandi <https://www.linkedin.com/pulse/what-agroforestry-dr-tohid-nooralvandi>
2. USDA (2017): Outline of agroforestry management practices <https://www.usda.gov/topics/forestry/agroforestry>

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