Improving soil quality at primary school gardens in Uganda

Emily Hugen[1], Akitwine Dwayne Frank[2], Mbieza Moureen[3], 3Richard Schultz[3]
Iowa State University Student[1], Makerere University Student[2], Uganda Program Staff[3] , Iowa State University Staff[3]

Introduction

African soils, some of the oldest in existence, are known to be highly eroded and weathered. This causes soils, like in the Kamuli District in Uganda, to be nutrient deficient. The soils in Kamuli are acidic and low in macronutrients important to crop development. To counter this, a research experiment was conducted.

- Our objective was to assess soil nutrient availability and pH to determine if wood ash and intercropping were viable strategies to improve soil health.

Methods

Below are components of the experiment that were implemented in trial plots:

- **Wood Ash:**
  - 500 grams of dry wood ash was collected from the kitchen at Nakanyonyi Primary school. Ash was then spread evenly and incorporated into the soil by stirring followed by watering.
- **Intercrop**:
  - A nitrogen fixing legume, cowpea, was chosen as an intercrop. It was planted three seeds/hole six inches apart at a depth of 1 ½ inches.
- **Primary Crop: Collards**
  - One to two week old collard seedlings, with an established root system 2-3 inches long were selected for the primary crop within this trial. They were transplanted from a nursery bed to the trial plots.
- **Experimental Design**
  - Three trials (control, wood ash, and intercrop) were duplicated for a total of six plots. Eight collards were transplanted into each plot. Collards were each watered daily with 500 mL of water. Plant growth was charted between June 23rd and July 10th. . Representative sampling was taken among the three trials to analyze macronutrients and pH of the soil.

Materials and Variables

Materials:

- 500 grams of Wood Ash
- Cowpea seeds
- Collard seedling
- African hoe
- 500 mL cup
- Metric ruler & notepad for recording data

Controlled variables	Independent variable	Dependent variable

• A 9x5 ft. raised bed plot
• Row Spacing
  • 2ft x 2 ft
• Water
  • 500 mL
• Day planted
  • June 23rd
	• Two ash bed with 500 g of wood ash applied
	• Two cowpea intercrop bed with four rows of intercrop
		• Soil Analysis
		  • Macronutrients
		  • Potassium
		  • Magnesium
		  • Calcium
		  • pH

Photo 1. Measuring collard growth with Nakanyonyi students' help.

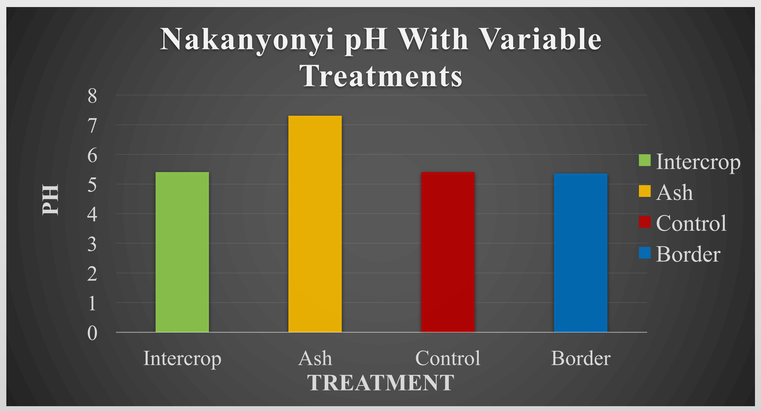

Figure 1: Graph of average pH within variable treatments.

Results

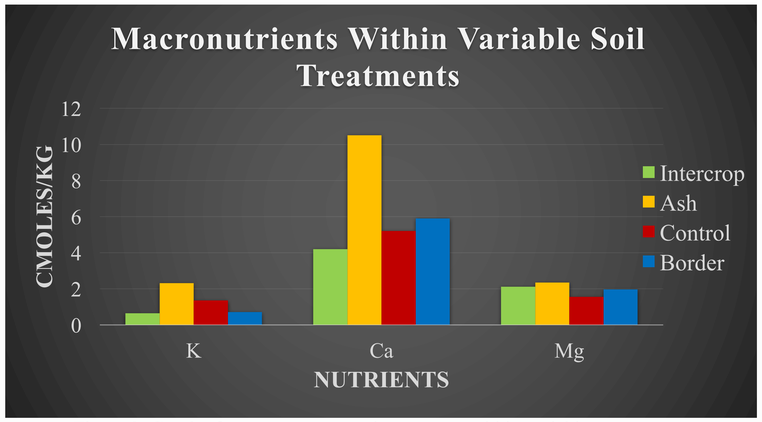

Figure 2: Graph of average macronutrient content within variable treatments.

- Wood ash increased the macronutrient availability of potassium, calcium and magnesium (Figure 2).
- The average pH for the wood ash plots was 7.3 compared to the control pH of 5.4. (Fig. 1).
- The nitrogen fixing intercrop had minor effects on macronutrients.

Conclusion/Recommendations

Conclusion:

- Wood ash successfully neutralized the soil and increased availability of calcium, potassium, and. Wood ash proved to be a viable strategy in improving soil health in the Kamuli District.
- Soil health greatly influences crop health. These strategies are just one of many options to contribute to global food security.

Recommendations:

- Apply less ash (300-400g), to decrease raise in pH.
- Pests such as termites and aphids caused irreparable damage to yield and should be looked into further.

Literature Cited

[1] Sanders, D. (01, January 1). Collards Horticulture Information Leaflets. Retrieved from https://content.ces.ncsu.edu/collards

[2] Wahle, E. (08, December 4). Using wood Ash in the Garden. Retrieved from http://web.extension.illinois.edu/state/newsdetail.cfm?NewsID=12505

IOWA STATE UNIVERSITY

Acknowledgements: College of Agriculture and Life Sciences, Center for Sustainable Rural Livelihoods and Iowa State University – Uganda Program
Jerry and Karen Kolschowsky and the Kolschowsky Family and Foundation, Rose Boughton, Tom and Terri Miller