

Impact of Biochar on Agricultural (Maize) Production in Bungoma County, Kenya

Experimental Plots during
April – August 2022

A project of Biochar Pamoja and
Woodgas International

Four-Page Summary Report

Released October 2022

For more details, see the full
twenty-six-page report at **Woodgas International**
<https://woodgas.com/resources>

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Introduction

“Biochar Pamoja” is a Kenyan enterprise focused on the production of biochar using the RoCC kilns to pyrolyze waste biomass into biochar, which is charcoal destined for long-term sequestration in soils. While focused on biochar production, we also work on storage, preparation, and eventual use of the biochar in soils.

Much information about RoCC kilns is at the cited website, but in particular see the slide set and/or the video delivery entitled: “RoCC Kilns and Biochar in Kenya” (Green Carbon Webinar) [2022-02-24] [Video](#) | [Slides](#).

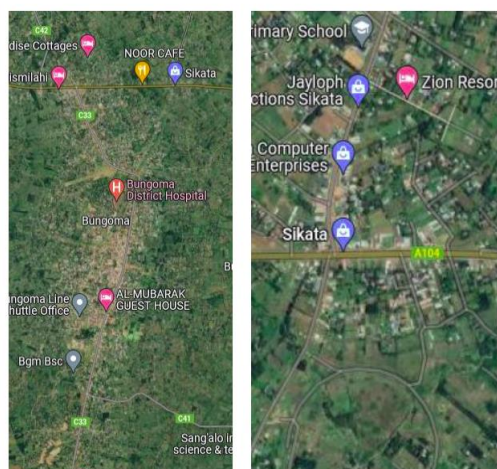


A 2-barrel RoCC kiln (see image) with one operator can produce up to 50 kg of good quality biochar in one 8-hour workday using field-dried corn (maize) stalks or sugarcane field trash (tops and leaves). The char is weighed hot (no moisture added), cooled, and stored awaiting future sale or preparation with manure, compost, urine, commercial fertilizer, etc. before being placed into soil, as presented in this report.

Demonstration plots

With cooperation of farmer Mr. Fred Namasakhe, the poorest patch of his land was selected for our demonstration plots. It was ploughed on 31 March but not planted until 26 April.

The Demonstration Plots are Measured from the SE Corner of Fred's Farm



We measured and marked out six equal plots with dimensions of 20 feet by 10 feet (Approx. 6m by 3m) and provided footpaths of 2 feet (50cm) all around each plot in the field.

Star marks the SE corner

Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6
Biochar mixed with animal manure	Biochar mixed with Synthetic fertilizer - YARA MICROP	Biochar only	Synthetic fertilizer - YARA MICROP	Biochar with urine	Nothing added (This plot was slightly smaller, see notes.)



Left: Looking toward the southeast corner of the field.



On 26th April 2022 we prepared 24 planting holes per row and 7 columns on Plots 1, 2, 3, 4, & 5. Each planting hole got 1 corn seed.

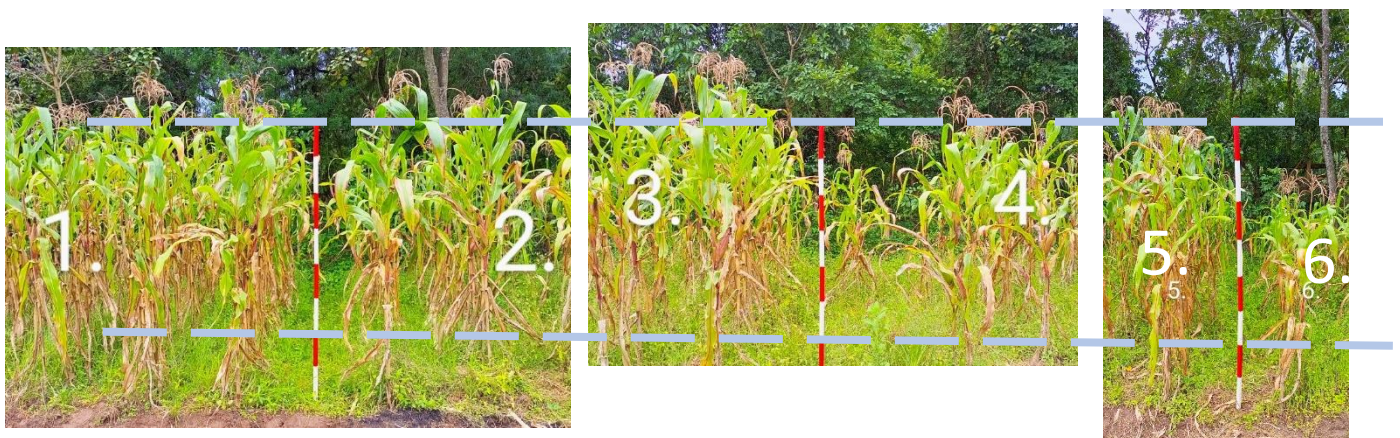
**** NOTE of exception of Plot 6:** Space utilization on Plot 6 was affected by trees on two of its sides on the bottom Southeast corner of the farm. It could only accommodate 130 corn seeds. $130/168 = 77.4\%$ or approximately 25% fewer seeds were planted in Plot 6. Later calculations take this into account. Details about planting procedures and plot treatments are in the full report.

	Biochar Manure	Biochar Fertilize	Biochar only	Fertilizer only	Biochar Urine	Control	Total
Plot Number	1	2	3	4	5	6	
Planted seeds	168	168	168	168	168	130	970
Germinated	122	68	102	47	101	90	530
Harvested cobs (ears)	84	52	51	38	67	23	315
Weight green no husks	7350	5600	3700	3650	5450	500	26250
Weight dry kernels (g)	2600	1950	1350	1300	1900	200	9300

Germinated/planted	73%	40%	61%	28%	60%	69%	55%
Cobs/germinated	69%	76%	50%	81%	66%	26%	59%
Cobs/planted	50%	31%	30%	23%	40%	18%	32%
Weight/cob (g)	88	108	73	96	81	22	83
Dry weight/cob (g)	31	38	26	34	28	9	30
Dry weight/planted (g)	15	12	8	8	11	2	10

[Note about Plot 6 applies to the raw numbers but not to the calculated proportionate values.]

Color code: Dark green = best of 6; light green = 2nd; Amber = 3rd & 4th; Orange = 5th; Red = worst of 6.



Interpretation:

The most important ratio is the bottom line: how much usable food is produced per planted seed in each plot.

Based on this single quantitative study, we must look for trends, not precise numeric results, especially because the control plot did very poorly. We must not dwell on the numerically true statement that “The biochar plus manure plot (#6) yielded 800% more grain compared to the control plot.” Such statements would be misleading and inappropriate because the results could be hugely impacted by unaccounted / unobserved factors.

However, without needing to do any fancy analysis, it is clear that the benefits of any kind of fertilizer or biochar alone are beneficial over the lack thereof.

Based on 8 g of dry kernels for every kernel planted, the benefits of biochar appear to be similar to the benefits of commercial fertilizer alone in this experiment.

The extra benefit of adding either fertilizer or urine to biochar is visually evident with an extra 40 to 45 percent increase in output.

We note that the best is plot 1. Manure with biochar nearly doubled the output vs using biochar alone. Unfortunately, we did not have a plot of manure only for comparison.

In conclusion, the results encourage us to continue our biochar efforts, seeking more experimental results and encouraging larger trials involving more farmers.

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The four-page summary report and the full twenty-six-page report are available as downloadable PDF files from the resources page of the **Woodgas International** website (<https://woodgas.com/resources>) .