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Gasifier and Biochar Applications in Kenya - How to Expand Further

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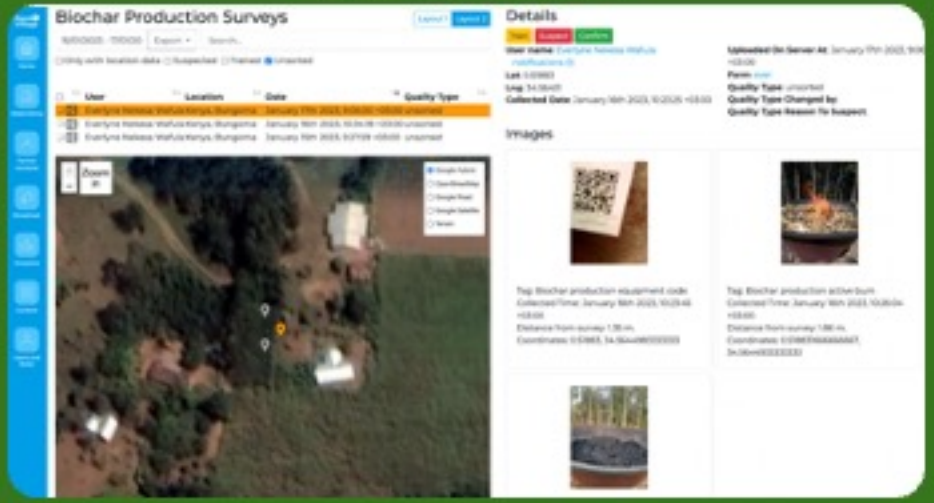
CO2REGEN



- CIRCULAR
- INCLUSIVE
- EMPOWERING

01 Sourcing & processing feedstock

02 Pyrolytic conversion (captive heat & power)

03 Cascaded recycling on & off the farm

04 Crop & soil specific recommendations

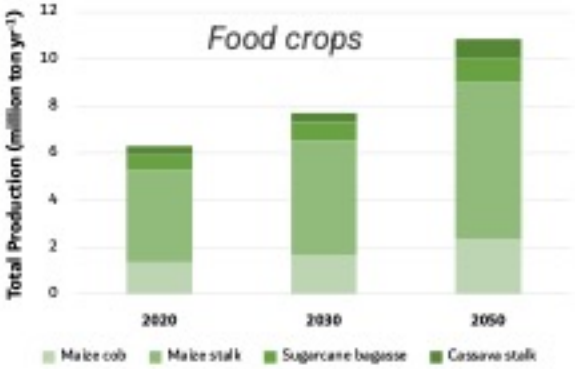
05 Full accounting of soil C balance change

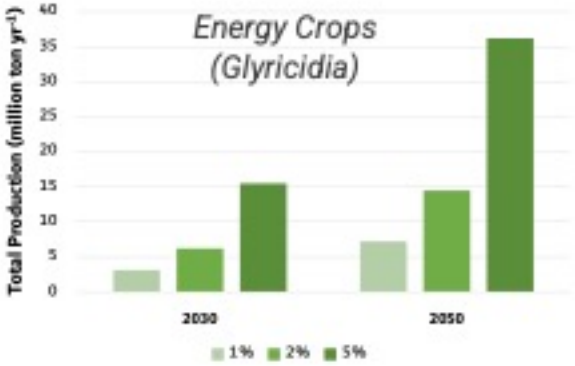
Sourcing & Processing of Feedstock

- Quantifying total and removable biomass residues

Kenya biomass potential

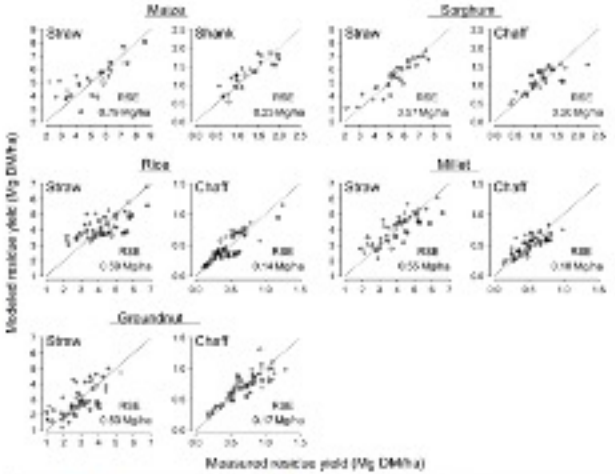
From: Welfle et al. 2020, https://doi.org/10.1016/j.biombioe.2020.105767

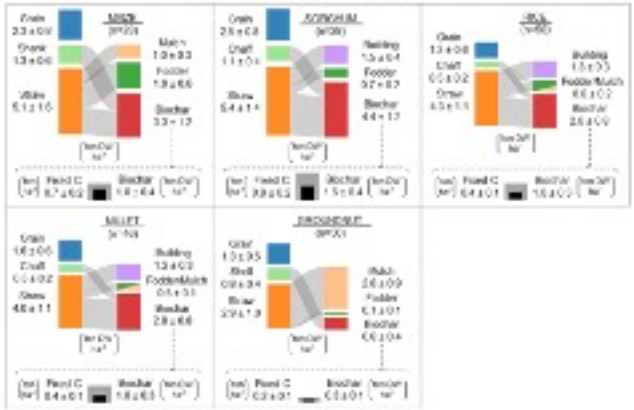




Allometric prediction & Scenario analysis

From: Roobroeck et al. 2019, https://doi.org/10.1002/eap.1984





Sourcing & Processing of Feedstock

- Identify suitable biomass residues for feedstock supply and gasifier system

1-month-old pruning

1-year-old pruning

Grade 1 & 2 tea pruning

Grade 3 & 4 tea pruning

Murubai invasive tree

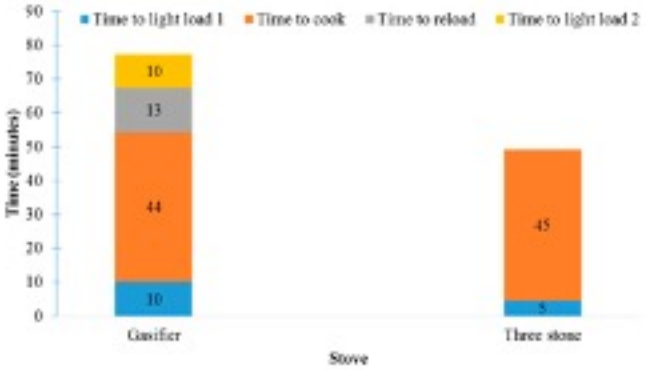
Miscanthus stalk

Maize shank

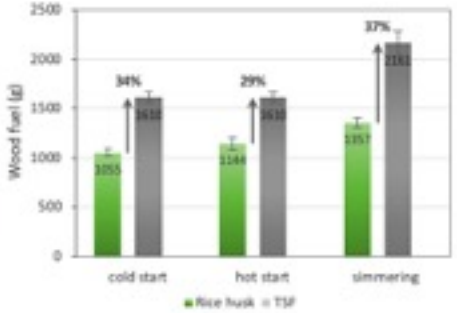
Pyrolytic Conversion System (domestic)

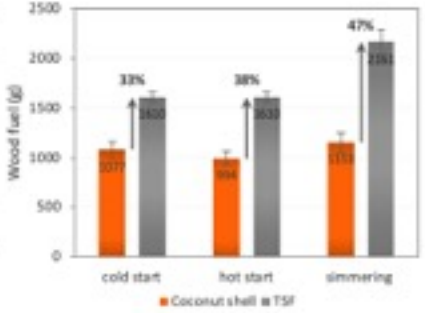
- Match technology with cooking and agricultural practice
- Operational costs and feedstock supply

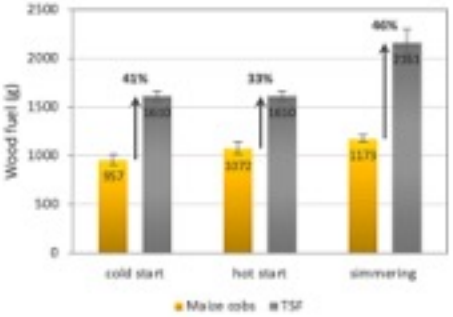
From: Gitau et al. 2019, https://doi.org/10.3390/en12224285

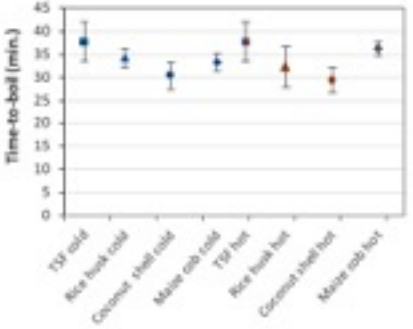


From: Zabrian et al. 2023, Submitted









Sourcing & Processing of Feedstock

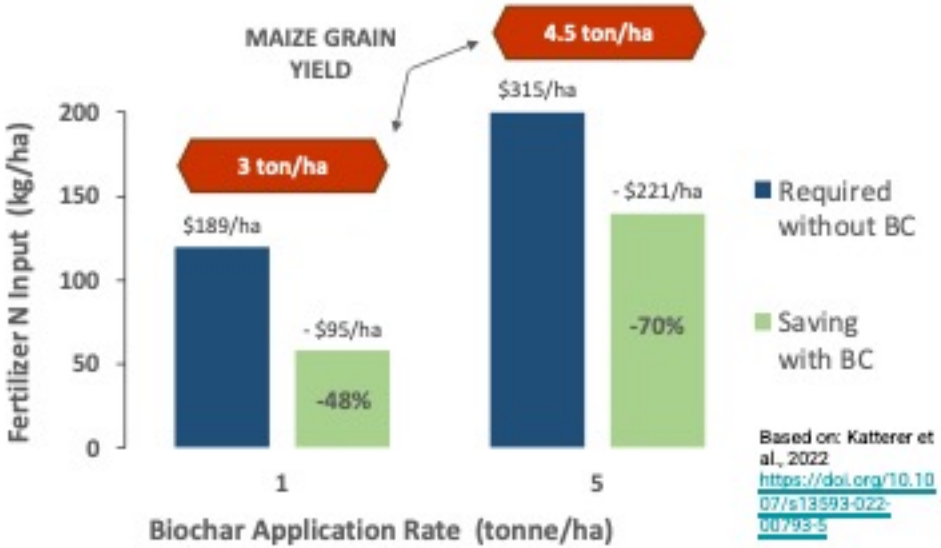
- Establish operating procedures and labour intensity/costs for collection
- List risks and optimization needs for collection and processing chain

Collection, sorting and transfer

Chipping and storage

Crop & Soil Specific Recommendations

- Formulate agronomic advisory for different food/cash production systems in line with accompanying inputs



Based on: Katterer et al., 2022 https://doi.org/10.1007/s13593-022-00793-5

Linear yield equivalence models show that applying biochar at 1 and 5 ton ha^{-1} the farmer would reduce N input by 48% and 70% while maintaining the same production level.

Cascading Utilization of Biochar Products

- Life-cycle augmentation through loops for improved nutrient management and material substitution

ON-FARM

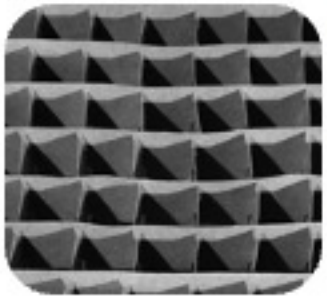
Manure + Biochar

Compost + Biochar

REDUCES

- Greenhouse gas emissions
- Nutrient leaching to groundwater
- Pest and disease proliferation

COMMERCIAL



- Coating of urea fertilizer for storage
- Slow-release agent for chemicals
- Chardboard industrial packaging
- Durable soil cover to replace plastic
- Media for vegetable, banana and tree nurseries

Pyrolytic Conversion System (industrial)

- Match technology with municipal and factory needs
- Equipment cost and business investment plan

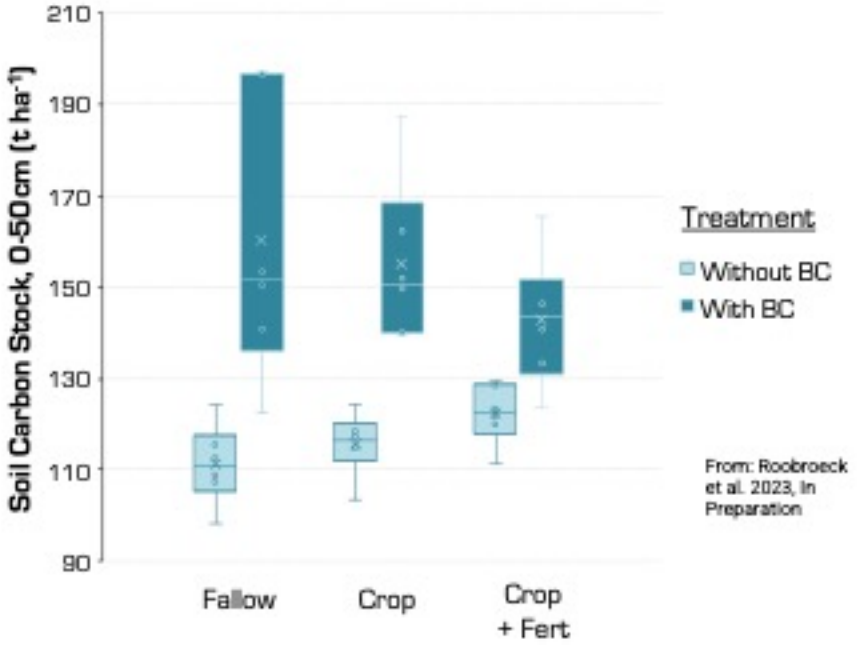
20-30 kWe

0.5 MWe

Dryer

Full Accounting of Soil C Balance Change

- Biochar amendment persistently increases soil C stock under intensive cropping
- Fertilizer addition enhances plant C input but reduces soil C gain of biochar
- Standards for C sequestration must consider gains from biochar and plant inputs linked to farming practices



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Questions

&

Answers