How can the production and use of bioenergy contribute to nutrition security?

Micro-gasification value chains to increase access to sufficient, safe, and nutritious food

Tiziana Pirelli

GBEP Webinar: Exploring the bioenergy-nutrition nexus
30 May 2022 - 14.00 – 15.00 CEST
The ‘biochar systems’: concept and innovative approach

Use of residues for cooking

Clean and renewable energy production

Biochar as by-product

Biochar as soil amendment

Increased soil fertility

Elsa stove © University of Udine
Biochar as soil amendment

- Carbon capture & Storage (CCS);
- Increase soil fertility and productivity through various mechanisms:
  - Direct nutrients supply and recycle: P, K, Ca, Mg, Mn, Fe...
  - Indirect nutrient availability increases: increase CEC, reduce nutrients leaching;
  - Liming effect: increases pH of acidic soil
  - Enhance Water Holding Capacity of sandy soils

Biochar can be further enriched with organic/mineral nutrients

Jeffery et al., 2011. Agriculture, Ecosystems and Environment 144, 175–187. A quantitative review of the effects of biochar application to soils on crop productivity using meta-analysis
Cooked food allows for better nutrition

• cooked foods tend to be softer than raw ones;
• Reduces the risk of food-borne illness and kills harmful microbes that can cause food/water poisoning;
• increases digestibility of some types of food (e.g., legumes and starchy food: cereal, potatoes and other tubers) and nutrients (e.g. carotenoids in carrots and lutein in tomatoes), then increasing the energy that people can get from the food

• allows for conservation of food, overcoming seasonal availability.

Feedstock suitable for gasification purposes

Organic, solid and dry waste and residues

- **Agricultural**
  - Crop residues: e.g., corn cobs, sugarcane
  - Poultry litter
  - Slaughterhouse/bones
  - Orchard pruning
- **Agro-forestry**
  - Tree prunings
- **Agro-industrial**
  - bones
- **Forestry**
  - sawdust

Improved feedstock

- Chips
- Pellet;
- Briquettes; easy to transport and store

Benefits from using waste/residues as fuel

- Fuel affordability
- Local availability: less time spent collecting fuelwood
- Reduced dependance on fuel import
- Add value to waste material
- Efficient waste/residues disposal
- Create job opportunities
- Recycle of Organic C and nutrients

International dialogues on forest landscape restoration and wood energy

Preliminary outcomes from multi-stakeholder consultations in sub-Saharan Africa

Pirelli T., Morese M.M., Miller C., 2020
Stoves can be built in loco to create job opportunities, increase income, enhance human livelihood and wellbeing.

DRAWINGS available on-line: BIOCHARPLUS project
A system that can be scaled and adapted to local traditions and needs

*Householder*

**Hospital and School canteens**

Medium scale H&P production plant – 25 kW
Recognized by FAO as best IFES in Ghana

Lessons learned on the Sustainability and Replicability of Integrated Food-Energy Systems in Ghana and Mozambique

PART 1: Main Findings

Year of publication: 2018
Place of publication: Rome, Italy
Pages: #50
ISBN: 978-92-5-130350-4
Author: Anne Bogdanski, Manas Puri, Christa Roth and Olivier Dubois
By Country/Territory: Ghana; Mozambique
Publisher: FAO
Agrovoc: Mozambique; energy; Ghana; systems; indicators

Available at: https://www.fao.org/documents/card/en/c/I8627EN/

Pigeon pea in Mozambique

Corn cobs pellet in Ghana
Other examples of modern bioenergy systems for the benefit of nutrition

**Biogas systems** to improve the sustainability of
- livestock farms
- agricultural farms

- Bioenergy crops on MUC;
- 2nd harvest crops
- Cover crops
- Crop residues

- 450,000 installed biogas household plants in Viet Nam - 10 m³
- Feedstock: pig manure
- Clean energy for lighting and cooking
Sustainable and modern bioenergy is key to achieve the 4 Betters at the heart of the FAO Strategic Framework 2022-2030
THANK YOU!

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