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Charcoal briquettes – affordable, clean energy for Uganda

By

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UIRI is a Center of Excellence in R+D

UIRI's Executive Director receives EAC Centre of Excellence award during the Heads of State Summit in 2013

Geo-politics of cotton

- Chavez(RIP) as President of Venezuela (2nd Feb 1999 to 5th Mar 2013) signed agreements on bauxite and gold in Mali and potential oil exploration in Benin, **but the cooperation deals over cotton hold a deeper geopolitical significance**. By championing cotton — a small-farm crop that is the most significant export from both Mali and Benin — amidst accusations of U.S. and WTO protectionism, Chavez was enhancing his geopolitical prominence in Africa.
- As renewable resources become widely distributed, **supply-side geopolitics are expected to be less influential than in the fossil-fuel era.** Instead of focusing on just two major resources, oil and natural gas, low-carbon energy geopolitics may depend on many additional factors, such as access to technology, power lines, rare earth materials, patents, storage, and dispatch, not to mention unpredictable government policies.
- The used clothes (second-hand clothing) debate continues to be a disincentive to develop the cotton sector in Africa.

Facts about Uganda

- Change in Forest Cover: Between 1990 and 2000, Uganda lost an average of 86,500 hectares of forest per year. The amounts to an average annual deforestation rate of 1.76%. Between 2000 and 2005, the rate of forest change increased by 21.2% to 2.13% per annum. In total, between 1990 and 2005, Uganda lost 26.3% of its forest cover, or around 1,297,000 hectares. Measuring the total rate of habitat conversion (defined as change in forest area plus change in woodland area minus net plantation expansion) for the 1990-2005 interval, Uganda lost 24.7% of its forest and woodland habitat.

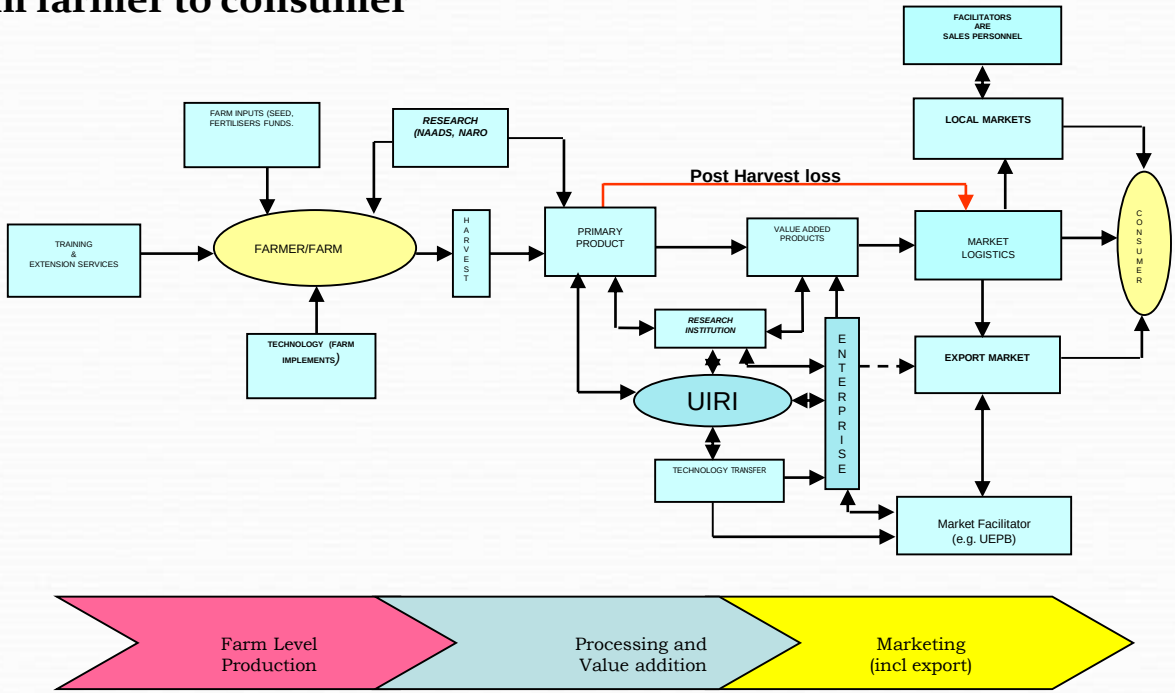


•**93% of Ugandans rely on charcoal/firewood as source of energy** source (GIZ)

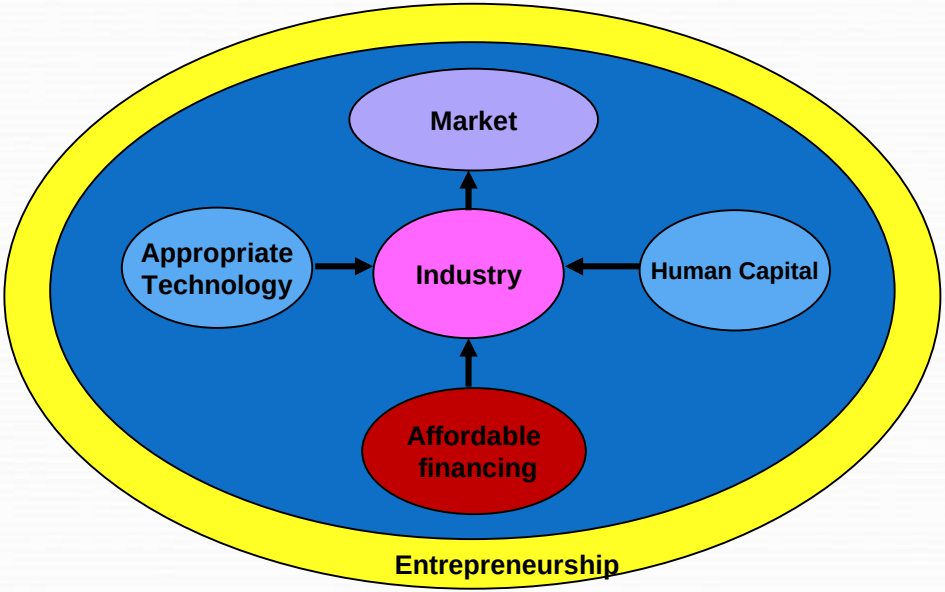
•**Over 90% of agricultural** residues, **cotton stalks** inclusive, **are treated as waste** source (UNDP, 2005)

Schematic of an agrarian product value chain

From farmer to consumer



Pillars for industrialization



Uganda's approach to industrial development: what must be done

- Take stock of the challenges at hand and seek solutions, learn from past mistakes.
- Take corrective actions and address the required fundamentals (e.g. security; rule of law)
- Strengthen, build, and, in some cases, rehabilitate institutions relevant to the industrialization process (e.g. grant to build UIRI was negotiated in 1987, now it is a center of excellence)
- Query, review, and rectify some of the bureaucratic practices that are antithetical to development (e.g. procurement procedures, licensing of all types, intrusive audits).
- Develop policies that will guide the development process
- Improve and enhance enabling infrastructure (i.e. road network, connectivity, communications, etc.). Ditto the financial infrastructure.
- Revamp curricular, especially for technical skills training.
- Revisit and rationalize regulation – stop suffocating private sector with overbearing regulation.
- Implement plans - and learn to celebrate achievements rather than plans.

Realistically starting small is inevitable, staying small is inexcusable!

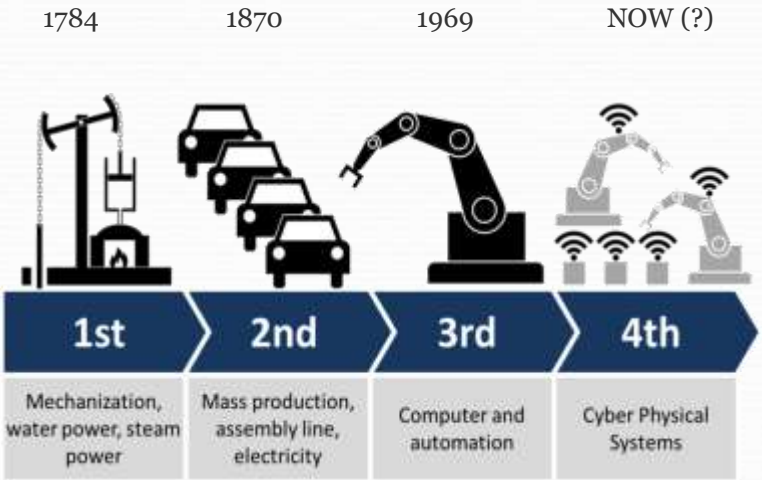
STAGES OF TECHNOLOGY DEVELOPMENT

- Subsistence farming (preceded by hunting and gathering)
- Mechanized agriculture
- Industrialization
- Technology-driven knowledge economy

Question: Where is Uganda/Sub-Saharan Africa in this continuum?

The 4 Industrial Revolutions

Stages of industrial development and sequential industrial revolutions



UIRI's other cotton related activities

Proposed Model for Turning Cotton stalks into charcoal Briquettes

Beneficiaries include: Farmers; Farmer groups; SMEs; Consumers

Biomass Sources/Dry Cotton Stalks

UIRI

Stakeholders (Private Sector, Researchers, NGOs & Donors)

Government; Agencies like **CDO** NEMA , etc.

Basic Technology currently at UIRI







Potential for briquettes

Beyond domestic cooking in the third world, Biomass **briquettes** are a biofuel substitute to coal and charcoal. ... There has been a move to the **use of briquettes** in the developed world, where they are used to heat industrial boilers in order to **produce** electricity from steam. The **briquettes** are cofired with coal in order to create the heat supplied to the boiler.

Objectives and planned activities at UIRI

- Pilot a well equipped demonstration centre for conversion of waste to energy, with specific focus on cotton waste and cotton stalks.
- Create a **regional** Centre of Excellence for 'Briquetting' Technology
- Engage farmers in a technology for conversion of Waste to Char/Carbon for making carbonized briquettes
- Fabrication of basic equipment for briquette making
- Formulate guidelines for production and quality assurance of briquettes (From farmers to production center)
- Engage in research to improve technologies and processes that will lead to efficient production methods of effective products

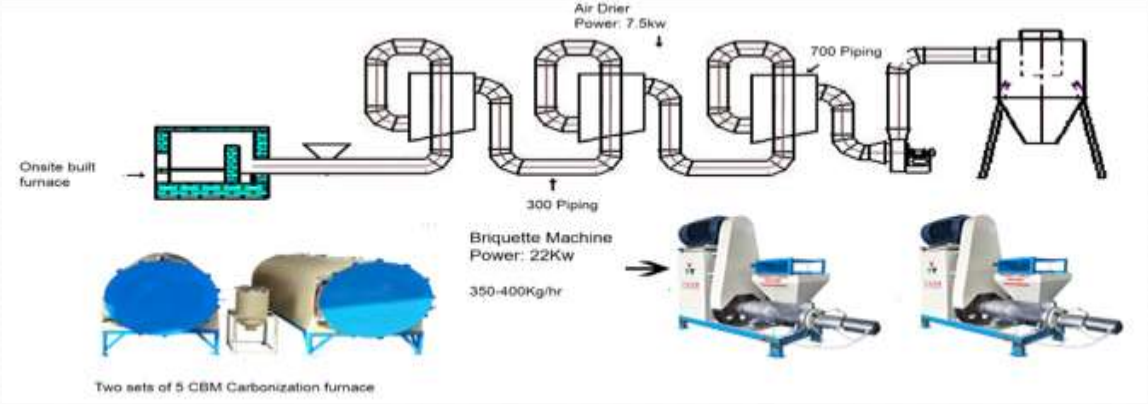
Production process

- Dry agricultural wastes like cotton stalks will be Carbonized using Carbonizing Units
- The char is then crushed, sieved, mixed with locally sourced additives, molded and dried into a final product
- The briquettes will then be packaged according to the desires and demands of the market.

UIRI's business development model follows this path: bench research and prototyping, followed by pilot processing and market testing, then commercial production. With briquetting we are ready for the latter, albeit at medium scale funds allowing.

Equipment and process schematic

- Built Carbonizers of 1-2 tons per day
- Mechanized systems; Motorized Press/Extruder, Crusher & Mixer



Machines and their capacities

Type of machine	Capacity
Built Carbonisers	1-2 tons perday
Extruder/Press	2-4 tons perday
Crushing system	2-5 tons perday
Mixing system	2-5 tons perday
Drying system	Capacity of 10 tons

Indicative costs

- The envisaged production facility (model) will cost approximately **$175,000**
- This cost is for both machinery and working capital

Estimated Production Capacity:

- Initial production capacity is estimated at 720 tons per year
- Production during the second year is planned to increase by 15%, and the model is to be replicated across the region.

Final remarks

- Briquetting is the easiest and most economical technology to solve some of **Uganda's** energy problems without abusing the environment;
- Briquetting is not harmful to the users in comparison with wood charcoal which emits smoke, and harmful gases;
- Briquetting is the best way to utilize the indigenous biomass

Other benefits and opportunities include:

- Saving energy and increase in calorific value;
- Minimizing deforestation; Reduction in air pollution;
- Increase in incomes from waste; and reducing the "garbage burden".
- Scholarly research, for example: Patent number **US3966427A** was issued and published on 29th June 1976 for an ***invention related to the manufacture of briquettes from wet mineral ore, including coal particles.***

Thank you!!

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