Biomass electricity and rural development in Africa: a weak link

L. Gazull, D. Gautier

Outlines

Introduction

Since the early 2000s, the electrification of Sub-Saharan Africa (SSA) has become an international priority. In 2015, SSA displays the lowest electrification rates in the world. In total only 16% of households have access to electricity, and less than 5% in rural areas

Electricity is seen as a key driver of economic development and fight against poverty. In 2007, the UE has initiated a strategic partnership with Africa to provide access to sustainable energy services to 500 million people by 2030 (AAEEP). In 2012, the UN launched an ambitious program (SE4ALL) to bring together the private sector, governments and civil society from around the world to work in partnership to increase the electrification rates in developing countries and in SSA in particular. In SSA the objective is to reach 50% in 2030. In 2013, with the same target as SE4ALL, president Obama has launched Power Africa Initiative. The same year, in France, JL Boorlo has launched another program « energies for Africa » which goal is to create an international Agency to electrify Africa.

All these programs also have the objective to double the share of renewable energy in developing countries in 2030. In SSA, solar, wind, and biomass projects are seen as solutions that could meet communities' needs by generating small amounts of electricity closer to the end consumer.

Compared to wind and solar, bioenergy systems are seen as systems that can drive local development through local ownership, creation of employment and supply of energy. Moreover, SSA is considered a part of the world that has a huge potential in biomass largely under-utilize, and biomass is pushed by many experts as an opportunity for rural development.

Purpose :

The objective of this study is to analyze the dynamics of biomass electrification projects in SSA since the last 10 years: what is the actual production, who are the players, what are the technologies used, what are the resources used, and finally who benefit from these systems?

Method and data :

The study analyzed power plants implemented between 2000 and 2014 or still planned in 2015. It focused on 3 sources of data :

1. The production capacity database from of IRENA / IEA
2. The database of projects funded by international donors : the WB, the Global Environmental Facility, the EU Energy Facility, and the French Development Bank (AFD).
3. Surveys, interviews and field observations in 8 African countries: Burkina Faso, Mali, Senegal, Cameroon, Congo, Gabon, Madagascar, Mozambique.

Results

In the IRENA database only large production units (> 500 kWe) appear. Power production is directly linked to sugar cane industry. Almost all the plants listed by Irena are sugar cane factories, located mostly in East Africa. Most of them are owned and operated by large private groups : Illovo, Tereos, Hippo Valley, Mehta Group, Madhvani group, etc.

The electricity is used primarily for the sugar cane factory itself and some are exporting on existing national grids. These facilities are in operating condition but most of them are old and inefficient.

In donors databases, biomass projects are the poor cousins of electrification projects in SSA : only 0% to 3% of fundings devoted to electrification in Africa are dedicated to projects using biomass.

EU Energy Facility (2004 – 2014): 12 € billions dedicated to energy in Africa, 1.3% dedicated to bioenergy systems

AFD : only 1% dedicated to decentralised bioenergy systems

The World Bank : 11 $US Billions dedicated to energy in Africa, 0 project using biomass technologies

GEF/UNEP Program : 1 US$ billions dedicated to energy in Africa, only 1 biomass project : Cogen Africa + 2 hybrid projects = 3.7% of fundings..

Except for one project in Madagascar (Bioenergelec), grants mainly concern electricity production in the agro-industry sector: sugar cane and tea.

By zooming within the 8 countries, it appears that two main types of bioenergy systems coexist in SSA:

Agroindustry-based bioenergy systems : i) Sugar cane, in Cameroun(Sosucam) and Senegal (CSS) ; ii) timber in Gabon(precious wood), Cameroon (Alpi, Mbang) and Congo (CIB) ; iii) Cotton in Burkina Faso (Dagris) ; or iv) Rice in Senegal (CNT). These plants have power capacities between 0.5 to 5 MWe and are managed by private groups.

The power plants associated with sawmills are relatively new or just planned and operate with forestry residues. They belong to large logging companies whose principal market is the export of timber. The plants provide electricity to mills, the workers and sometimes to neighboring villages. The power plants associated with sugar and cotton factories are generally old and produce electricity primarily for their own use.

Community-based electrification projects. These power plants have small power capacities from 50 to 150 Kwe and use various technologies and resources : wood boilers and steam, generators operating with jatropha oil, rice husk gasifiers. These technologies come from India, China, Brazil and Germany. The projects are mainly funded by NGOs and plants are managed either directly by the communities (cooperatives, associations) or by small private operators. In both cases this model involves the participation of the community along the bioenergy production chain. But most of these units are no longer working or are facing many problems that limit their actual functioning: supply, technical maintenance, non-competitive prices compared to diesel, collective management difficulties. In Mali and Burkina Faso, all electrification projects initially based on Jatropha oil supply were abandoned. None of the 700 multifunctional platforms installed in Burkina Faso and Mali are working with vegetable oil, and very little provides electricity (less than 10%) ; In Madagascar, among

5 installed biomass power plants, 3 are off and 2 are facing many material damage problems. In Benin, Songhai centers are still in the production testing stage. In Senegal the power plant of Kalom operating with peanut shells since 2012 has already suffered supply shortages.

Discussion

In SSA, success stories of power generation from biomass are currently on the side of sugar cane and timber industries. But compared to Latin America and South Asia, only a very small portion of the potential for cogeneration has been tapped (around 5 % of the national capacities in East Africa according to GEF analysis). Despite a large investment aid program (Cogen Africa) launched by GEF/UNEP in 2007 (Cogen for Africa), achievements are few. Only companies in Mauritius, Uganda and Reunion have invested in new power plants with the aim of selling on national grids

Sugar factories in Congo, Cameroon, Mozambique and Madagascar produce no or very little electricity. Most of installations are old, inefficient and generate electricity mainly for captive use. When it's the case, electricity is exported to national grids and does not benefit directly to neighboring villages. Indeed, smallholders are involved in power generation as raw materials' suppliers, but they are left over from any better access to energy. In the timber industry, it is less true because sawmills are often located in very remote areas far from existing grids. They then produce to the neighboring villages, but with lower powers than sugar factories.

In contrast, on the side of small decentralized rural electrification, aborted projects are numerous for many reasons: resource is not available all year long and many times missing, small scale technologies are unreliable and inefficient, energy prices at the end are higher than grid prices, skills to manage systems are missing. Most of those projects have been driven by the demand side considering that this demand will mobilize the biomass and pull the supply side. But experiences showed that even with agriculture residues, biomass is often already used, bioenergy supply chains are complex and need time to be created, and that impacts of such systems on job and business opportunities are very limited.

In both models, investments go mainly to technology improvement and capacity building but nothing has been done to support and encourage sustainability on the supply side. Electricity from biomass has neither led to the development of new energy crops, nor created new upstream rural activities, nor really brought more energy to rural people. In the timber sector, the production capacity could be increased if the studies were developed to analyze the possibility of planting trees, or intensifying the collection of fuel wood in the forest or better organizing wood supply chains. In the sugar cane sector electricity production encourages farmers to harvest the tops and leaves which have the consequence of leaving less organic matter to the soil.

Conclusion

In all the analyzed and surveyed projects the link between biomass electricity and rural development seems to be disconnected at four levels:

At the donors level: disconnection between a global discourse promoting bioenergy systems for energy security, environmental issues and rural development and a very small portfolio of supported projects in Sub Saharian Africa.

At the recipients' level: disconnection between rural development objectives and a concentration of investments in the agroindustry sector that does not directly benefit to rural people.

At the national level: disconnection between the existing capacity and the untapped potential in the agro-industries and the little electricity produced and distributed for the rural population.

At the local level: disconnection between the need to involve local communities and little consideration to existing biomass value chains, local rural economy and social life organization.

Behind the virtuous rural-development-based discourse at the political level, investments in bioelectricity sector in Sub Saharian Africa are mainly concentrated in the agroindustry sector. Biomass electricity, as it is currently funded and deployed, benefits marginally the rural development but it reinforces capitalistic positions of sugar and timber industrials.