

# **How farms' structures and sustainability standards shape land availability for energy crops.**

## **Study cases in West Africa**

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### **Abstract**

Sustainability is crucial for biofuels and bioenergy production in general. However, historically speaking, the biofuels industry has largely ignored sustainability criteria and consequently has been the source of considerable controversy. Despite a real expansion worldwide, biofuels development has still to face many barriers in the three pillars of sustainability. In the environmental domain, biofuels have to face accusations of deforestation, loss of biodiversity, carbon emission, water usage, etc. In the economic domain, they are accused to compete with other land uses for basic needs such as food and material, and they must prove that they are more viable than oil and other renewable energies. In the social domain, they also have to answer to complaints about land grabbing, rural poverty, social acceptance.

Over the past twenty years, a large number of studies aimed to estimate the amount of bioenergy that can be produced in a sustainable manner. Results are very contrasted for many reasons mainly due to the heterogeneity of methodologies, definitions, assumptions and datasets employed.

However, most studies agree that among all possible sources of biomass energy, energy crops are considered as the most important. Other crops and forest residues can also be good sources but do not reach the potential of energy crops. These studies lead to consider that the main potential contribution of biomass for energy production will depend on one hand of the energy crops yields and on the other hand on the quantity, the quality and the location of available land to cultivate. Considering that grassland, savannah or shrubland are idle or non-used land, most of the studies locate the majority of potentially available land in developing countries, in Sub-Saharan Africa and South America. But there is considerable debates about the availability of land in these regions and many authors point out the need for a clearer picture of what it means.

Thus, land availability is maybe the most crucial parameters in sustainable potential assessment. But this concept of availability encompasses many interlinked factors and is lacking a clear definition. Depending on methodologies, availability may include technical or economic or social or legal or environmental factors, or multiple combinations of these different factors.

However, since the 1990s, in order to guarantee the sustainability of the global bioenergy potential, several governments, NGOs and private companies have proposed ecological and social sustainability criteria which bioenergy has to fulfill. Since the early 2000s a set of voluntary standards have emerged in the Agro-food sector. They are produced through multi-stakeholder initiatives (MSI), which are presented as their main source of legitimacy. Many of these initiatives also called "Roundtables" are recognized and used in the sector of biofuel feedstock production : Roundtable for sustainable Palm Oil (RSPO 2004), Roundtable for Responsible Soy (RTRS 2006), Better Sugar Cane Initiative (BSI), Better Cotton Initiative (BCI), and Round Table Sustainable Biofuels (RSB).

All these standards have in common to define principles and criteria that restrain the availability of land dedicated to energy crops. They place restrictions on i) the types of land that may be used to grow energy crops and on ii) the social and technical models of production. According to these

schemes availability of land is defined by criteria including technical factors (slope, soil, ...), legal factors (land rights, respect of legal conservation areas), logistics factors (accessibility, distance to plants), environmental factors (high conservation values, carbon stocks), conversion factors (loss of biodiversity, zero deforestation), or food security factors (no competition with food crops), etc.

These standards are still controversial and without doubt need to be improved, but in many countries including developing ones they currently drive feedstock production and therefore land availability for energy crops.

The main objective of this paper is to propose a spatially explicit methodology to assess and analyze land availability for energy crops at national scale. The originality of this methodology is to start from existing sustainability standards of production and to translate principles and criteria into spatial constraints of availability. The methodological framework is applied in two West African countries : Mali and Burkina Faso.

The application shows that taking into account farms structures and sustainable production rules reduces the land considered to be available by a factor of at least 4. The other key lesson is that family agriculture and contract farming may present viable alternatives to agro-industrial models. The advantage of this approach is that the scenarios built do not represent starting points of the assessment, but are rather one of the results. The scenarios and the production models are clearly formalized and thus represent topics of discussion which can be understood by producers and decision makers, allowing rules for the sustainable use of areas to be negotiated and refined.