Agro-environmental zoning for biofuel production in East Africa

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Biofuels must be produced in a sustainable and equitable manner in East Africa if they are to increase energy self-sufficiency whilst at the same time reducing deforestation and GHG emissions compared to fossil fuels. This is confirmed by a study carried out by the DFID-funded Policy Innovation Systems for Clean Energy Security (PISCES) research programme in collaboration with United Nations Environment Programme (UNEP). The study – environmental suitability and agro-environmental zoning of Kenya for biofuel production – was aimed at determining suitable areas of eleven biofuel feedstocks in Kenya, and at identifying high value biodiversity areas and areas of high socio-cultural values to be recommended for *exclusion* from biofuel production.

Among the areas identified as being suitable for *exclusion* were protected areas, wetlands, areas under cultivation, wildlife movement corridors, human conflict areas, slopes over 45% and important bird areas.

In terms of the size of suitable area, sweet sorghum has the highest coverage of 185,821 km^2 (32.6%) followed by castor at 171,557 km^2 (30.1%) and Jatropha at 15,047 km^2 (27.6%). The feedstock with the least area suitability is coconut with 1,860 km^2 (0.3%) followed by palm oil at 9,359 Km^2 (1.6%) and canola at 12,743 km^2 (2.2%). Feedstocks with wider suitability could be more appropriate when considering a national biofuel programme, but this is not to say that the smaller feedstocks in terms of area should be ignored, since different feedstock have their advantages and disadvantages.

It can also be expected that indigenous feedstocks such as *Croton megalocarpus* may emerge to have a more extended range than predicted and be less problematic than currently-better-known crops such as Jatropha.

The result of this comparison has shown that the coastal, central and western areas have the highest potential for feedstock production given the high number of feedstocks suitability per scene. Northern and Southwestern Kenya has the lowest potential.

Most feedstocks yield best in agriculturally high potential arable lands. Few feedstocks (castor and sweet sorghum) were classified as highly suitable in areas of marginal to medium agricultural potential. Others such as Jatropha are tolerant to drought and, once established, can survive in agriculturally marginal areas.

However, without sufficient rainfall and nutrients, general yield and productivity is very low, making these areas unprofitable for investing in non-irrigated feedstock production. Therefore, careful balancing is required between high suitability areas for feedstock production and the overarching need to safeguard food production and water resources.

Marginal and degraded areas where production of biofuels would pose the least competition with food crops may not yield commercial results with most feedstocks unless accompanied by heavy investment in soil fertility improvement, water harvesting and conservation. Research is needed to develop arid or semi-arid feedstock varieties that are productive in such areas. There is a need for clear policies, including appropriate policy incentives to attract investors to the agriculturally marginal (degraded) areas.

In view of increased demand for extensive land areas for investing in bio-fuels, there is need to improve the land administration systems to deal with conflicting claims between vested interests and the traditional land usages and ownership rights that are emerging under bio-fuels expansion. There is need to ensure that changes in land use and practices associated with bio-fuel production are sustainable. Responsible land allocation, land use change and policy enforcement are required to manage competition over land, reducing food insecurity and encroachment on protected and communal areas.

There needs to be careful consideration of whether to promote non-edible