

Jatropha facts

Biofuels: possible impacts on food security in Kenya

Policy message

- Drivers of food insecurity in Kenya differ markedly between regions. Thus, policies to promote food security, including investment in biofuel production, must be flexible enough to take into consideration local and regional drivers of food insecurity.
- Growing crops for biofuel feedstock can present opportunities for smallholder farmers. However, potential risks and rewards must be carefully assessed, and technical feasibility assured before smallholders are encouraged to engage in this sector.
- Jatropha takes several years to achieve its full yield potential and hence farmers would have little or no income while it establishes. As such, smallholders should grow jatropha only in hedgerows, rather than on larger areas of land.



Figure 1: Food security is not only determined by availability of food, but also by other factors, such as access to food, security, livelihood strategies, farming systems, etc.

Table 1 (to the right): Drivers of food insecurity in Kenya. Grimm (2012)

Biofuels have been promoted as a solution to two crises: the climate crisis and the oil crisis. Governments around the world, including in Africa, are actively pursuing policies to develop the biofuels sector, in particular to help reduce their dependence on oil imports. For example, the Kenyan Energy Act of 2006 mandates the Government of Kenya to pursue and facilitate production of biofuels in the country. However, turning over land to production of feedstock for biofuel production is likely to have impacts on food security. This policy brief examines challenges to food security in Kenya and the likely impacts of biofuels, and provides concrete recommendations on how best to address them.

Biofuel and food security

Producing biofuel (whether traditional **biofuels** such as firewood and charcoal or new-generation **biofuels** such as bioethanol or biodiesel) requires large amounts of feedstock. This implies diverting agricultural land from food-crop production to growing biomass for biofuel. It is feared that this might lead to food shortages and to increased food prices at national, regional, and global scales.

According to the World Food Summit (FAO 1996), **food security** “exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.”

This seemingly simple definition conceals the fact that **food security** is a highly complex development issue (Misselhorn 2006). Many factors influence **food security**, either positively or negatively, including access to land and land tenure, post-harvest losses, prices for farm inputs, transport infrastructure, violent conflict, rainfall variability, and availability of water (Figure 1). However, **food security** is not just about the availability of food, but also depends on the ability of people to acquire enough

Drivers	Categories
Income	Economic
Employment	
Costs of living	
Food prices	
Prices of agricultural inputs	
Prices of agricultural products	
Access to markets	
Infrastructure	Socio-political
Government policies	
Extension services	
Education	
Health	Socio-cultural
Dependency syndrome	
Unrest and violent conflicts	
Attitudes and perceptions	
Tradition	
Overpopulation	
Agricultural practices	Land use management and production systems
Post-harvest management	
Overdependence on one crop	
Land degradation	
Management of water resources	
Human-wildlife conflicts	
Livestock pests and diseases	
Crop pests and diseases	Ecological
Rainfall variability & water shortage	
Soil and/or terrain	

Featured case studies

A study conducted between 2009 and 2011 (Grimm 2012) showed that the key drivers of food insecurity in Kenya differed markedly between regions. This highlights the need for careful analysis of local economic, environmental, societal, cultural, and political circumstances to identify adapted measures to mitigate food insecurity. Interventions can be implemented at various levels, from local to international, and can be addressed by various actors, such as households, community leaders, regional political institutions, the government, or international agencies. In many cases multi-level interventions involving several actors are required.

In Mpanda (Tanzania), farmers started planting jatropha in 2003 as outgrowers for a German investor. Most planted jatropha on agricultural land formerly used for the production of maize (Figure 2). Farmers received significantly less income from jatropha than would have been earned from selling maize, as the investor, who eventually stopped the project, was unable to pay the agreed price for jatropha seeds. As a result, food insecurity of local households increased (Lyimo 2010).

In Engaruka (Tanzania), farmers established around 110 kilometres of jatropha hedgerows around their plots (Figure 3); hence, they did not divert land from food production. The productivity of these hedges was estimated at 0.7 kg of seeds per meter. Selling these seeds at current market prices would earn each household an average additional income of USD60 per year, which would help improve food security (Lyimo 2010).



Figure 2: A farmer in her jatropha field in Mpanda (Tanzania). It was estimated that she could have earned around six times more income from the same field by growing and selling maize. (©Lyimo)

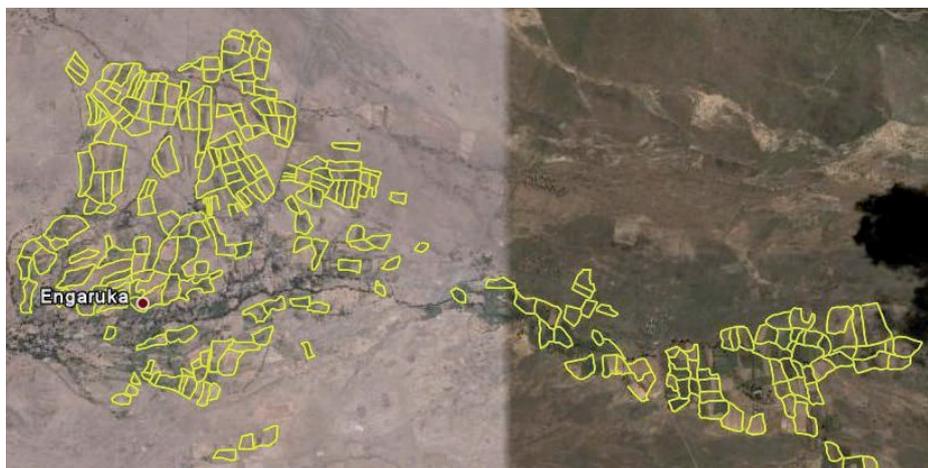


Figure 3: Jatropha hedges (yellow lines) around farm plots in Engaruka (Tanzania). Jatropha can provide opportunities for additional income and therefore improve food security. (Lyimo 2010)

food for a nutritious diet. Thus, poverty and lack of income-generating opportunities are also strong drivers of food insecurity. **Biofuels** can have both positive and negative impacts on **food security**, increasing opportunities for income and rural growth but reducing local food production.

What are the causes of food insecurity in Kenya?

A review of the literature and interviews of local **food security** experts reveal that there are at least 27 drivers of food insecurity in Kenya (Table 1; Grimm 2012). These drivers can be grouped into five categories: economic, socio-political, socio-cultural, land-use management and production systems, and ecological. Participatory mapping of these **food insecurity drivers** (Figure 4), conducted with local **food security** experts, indicated prevalence of economic drivers (low income, poor access to markets, and high prices of farm inputs) in high-potential areas in western Kenya; prevalence of socio-political drivers (lack of infrastructure and of rural advisory systems) in remote areas in the north-east; and an important role for socio-cultural drivers, including traditions that hinder development, shortage of land because of population pressure, and violent conflicts among pastoralists in the western highlands and the Rift Valley. Poor water management, inadequate agricultural practices, land degradation, and overreliance on one crop (drivers related to production systems), and unreliable rainfall (ecological driver) affect **food security** throughout the country.

The participatory mapping also revealed that each region has its own combination of drivers of food insecurity. This means that there are no simple remedies for **food security** and solutions must be context-specific. Furthermore, the fact that drivers of

food insecurity belong to a wide range of economic, environmental, socio-political, socio-economic, and agricultural issues implies that a multi-scale approach to **food security** is needed. For example, food insecurity caused by inappropriate post-harvest management has to be tackled at farmer level through improved rural advisory systems, whereas food insecurity caused by high food prices has to be addressed at national level through price-control measures. Hence, different decision-making levels need to collaborate and complement each other to achieve food-security goals.

Risks and benefits of biofuel production

The findings on drivers of food insecurity in Kenya indicate that the potential impacts of **biofuels** on **food security** are likely to be very different from one area to the other. For example, where the principal drivers of food insecurity are economic, biofuel production could provide additional income and create jobs, reducing food insecurity. But where shortage of land is a primary constraint, turning land over to biofuel crops will increase food insecurity. Thus, policies to promote **food security**, including investment in biofuel production, must be flexible enough to take into consideration local and regional drivers of food insecurity (Diaz-Chavez et al 2010).

There are a number of ways to avoid competition between biofuel and food crops for land and labour. For example, if smallholders are planning to plant extensive areas of land with crops destined for biofuel

production, they should be encouraged to grow only annual crops, especially multi-purpose crops that can be used for energy or food, such as sorghum and maize. These allow smallholders to adjust to short-term market developments. Alternatively, they can plant biofuel crops such as jatropha (*Jatropha curcas*) as hedges between food-crop plots, minimising competition for land.

Smallholders venturing into biofuel production can face increased food insecurity when returns are less than costs. The resultant debt or loss of the farmer's capital (for example livestock) reduces the farmer's ability to weather future shocks. This, in return, may threaten natural capital, compromise ecosystem stability, threaten the whole economic productivity of the rural community, and undermine ecosystem and societal resilience.

Conclusions

The study found that each region in Kenya has its own combination of drivers of food insecurity, highlighting the need for context-specific approaches to **food security**. Within this complex landscape, production of feedstock for **biofuels** may have positive or negative impacts on **food security** (Diaz-Chavez et al 2010). For example, turning land over to biofuel production when pressure on land resources is already high, or during times of rapidly rising food prices, may increase food insecurity, especially for urban poor people or landless people in rural areas. Elsewhere, biofuel production can offer an alternative source of income to farmers and create jobs in the agricultural sector, reducing poverty and contributing to **sustainable development**.

Definitions

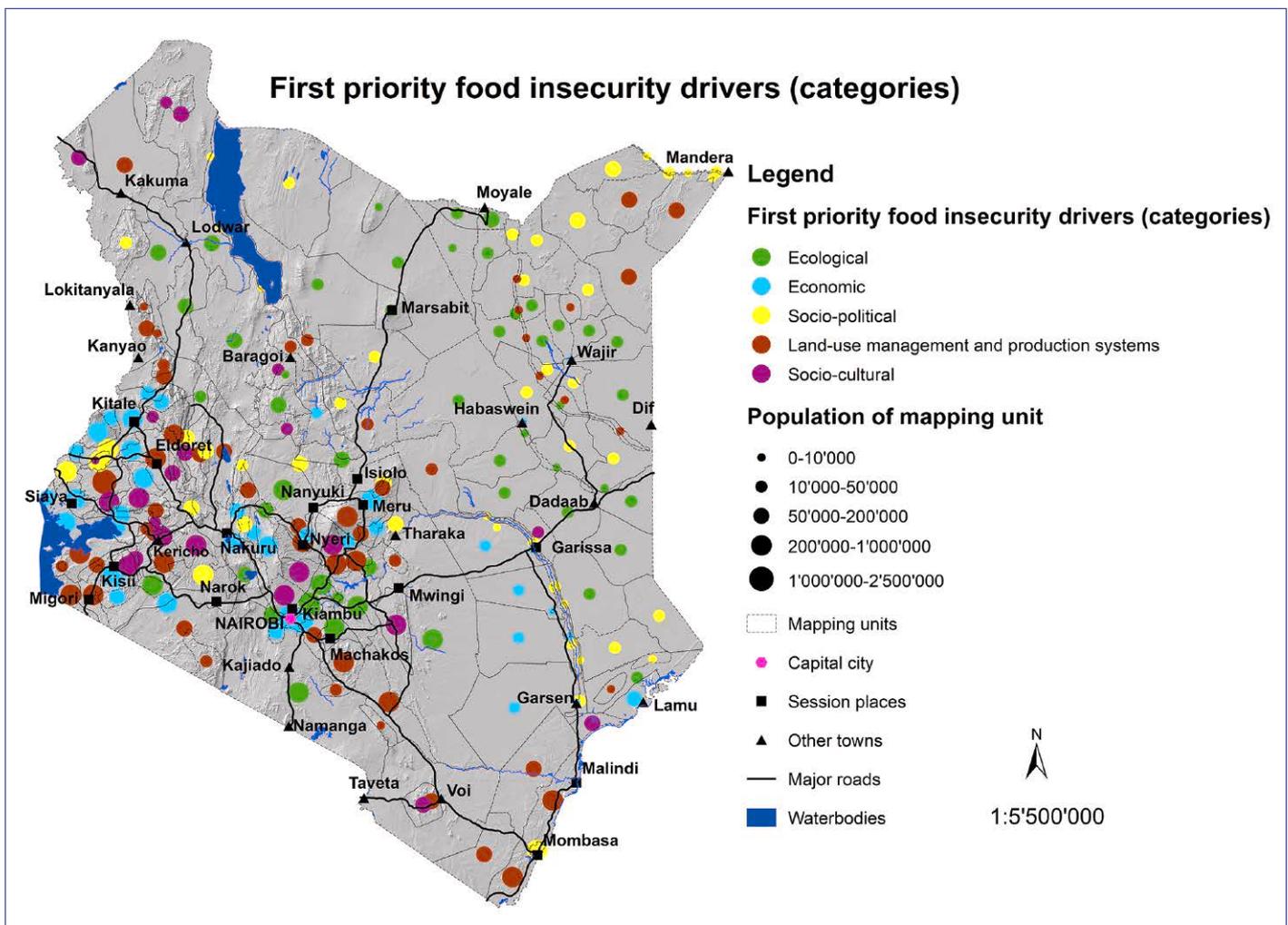
Biofuels include all fuels gained from biomass. Solid biofuels include firewood and charcoal. Liquid biofuels include straight vegetable oil and biodiesel gained from oleaginous plants, as well as bioethanol gained from crops that are rich in sugar or starch.

Food insecurity drivers are all causes that contribute to increasing food insecurity, either at individual and household level, or at society level in a certain region or an entire country. Drivers can appear alone, but it is mostly the combination of several drivers that leads to food insecurity.

Food security "exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO 1996).

Sustainable development is the management and conservation of the natural resources base and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations.

Figure 4: Participatory mapping of drivers of food insecurity in Kenya highlights differences in drivers in different parts of the country. Grimm (2012)





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Jatropha Facts *Jatropha Facts* is a series of five policy briefs providing research insights on important issues of jatropha and bioenergy. Each policy brief addresses a specific, policy-relevant aspect: (1) jatropha growth and oilseed production in Africa; (2) the potential of jatropha for climate change mitigation; (3) the potential of jatropha for rural energy supply in Africa; (4) the economic feasibility of biofuels in Africa; and (5) the food security implications of jatropha and other biofuels.

Policy implications

A careful analysis of the context-specific food-security situation must be undertaken before promoting large-scale biofuel production. Areas in which food insecurity is mainly triggered by lack of access to land or by increasing food prices should be avoided.

Adequate, coherent, and supportive policies must be put in place to guide development of the biofuel sector (Schut et al 2013). This implies an active role for national governments, based on a realistic biofuel production and consumption strategy.

Biofuel production should not be promoted among smallholders without adequate support from rural extension services. Active involvement from the government is therefore needed.

Biofuel production should not be promoted among smallholders in volatile market situations, when neither price nor outlets for the selected feedstock are predictable.

Investment in feedstock that needs several years to reach full production potential, such as jatropha, should only be proposed to smallholders if market prospects for these feedstock are secured on a long-term basis.

References

- Diaz-Chavez R.A., Mutimba S., Watson H., Rodriguez-Sanchez S. and Nguer M. (2010): *Mapping Food and Bioenergy in Africa. A report prepared for FARA*. Accra: Forum for Agricultural Research in Africa. Available at: http://www.globalbioenergy.org/uploads/media/1005_Imperial_College_-_Mapping_food_and_bioenergy_in_Africa.pdf; accessed 27 May 2013.
- FAO [Food and Agricultural Organization of the United Nations] (1996): *Rome Declaration on World Food Security*. World Food Summit, 13–17 November 1996. <http://www.fao.org/docrep/003/w3613e/w3613e00.htm>; accessed 27 May 2013.
- Grimm O. (2012): *Understanding Spatial Patterns of Food Insecurity in Kenya as a Contribution to Sustainable Rural Development Policies* [MSc thesis]. Bern, Switzerland: University of Bern.
- Lyimo R. (2010): *Jatropha curcas cultivation and its impact on land use and land cover change in Monduli and Mpanda Districts, Tanzania* [MSc thesis]. Morogoro, Tanzania: Sokoine University.
- Misselhorn A.A. (2006): *Food Insecurity in Southern Africa: Causes and emerging response options from evidence at regional, provincial and local scales*. Johannesburg, South Africa: University of the Witwatersrand. Available at: <http://ebookbrowse.com/misselhorn-phd-pdfjsessionid-694d983f06b74aed-8737668f5534030d-sequence-1-d278045030;accessed 27 May 2013>.
- Schut M., Cunha Soares N., Slingerland M. and van de Ven G. (2013): *Mozambique's policy framework for sustainable biofuels: A reflection on the development of the first African policy framework for sustainable biofuels*. Paper presented in the International workshop on Tracing Biofuel Transitions: Policies, Practices and Phase-outs. Eindhoven, The Netherlands: Eindhoven University of Technology (TU/e).

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