



Workers in Garalo, Mali, press jatropha seeds that contain an oil that can be burned to produce electricity.

in order to be able to support more farmers and add another 900 hectares of jatropha. Rijssenbeek says his long-term goal is to provide biofuel-generated electricity to 100 villages.

FACT FOUNDATION

### GROUP POWER

What makes the Garalo project so successful, says Rijssenbeek, is that locals took charge of and responsibility for the initiative themselves. Garalo's farmers organized themselves into a cooperative that collects and presses the jatropha seeds. The farmers make decisions and deal with problems together, collectively guaranteeing fair prices for their crop and the electricity they buy.

To kick-start the project, several organizations, including Stichting Het Groene Woudt (a Dutch private foundation) and a Malian government department funded by the World Bank, provided funding to build a facility to extract oil from jatropha seeds and a power station to convert the oil to electricity. The power station is run by a local non-governmental organization, the Mali Folkecenter ([www.malifolkecenter.org](http://www.malifolkecenter.org)). In addition, the FACT foundation helped local businesses gain access to financial credit to take advantage of the new electricity supply.

Could projects like Garalo's be expanded across Africa to make a significant impact on alleviating poverty and improving livelihoods? It is a tempting prospect (see 'A new hope for Africa,' page S20). Many land-locked African nations with poor infrastructure have little or no access to the fossil fuels on which the developed world depends. Biofuels, made from a choice of crops suitable for the region, could provide an affordable, locally grown source of fuel, and could also be traded internationally, says Tom Richard, a bioengineer at Pennsylvania State University. Large-scale production will generate an export market for biofuels from developing countries enabling farmers to "diversify their income generation," says Richard. In this way, the burgeoning biofuel industry could help poor nations to strengthen their economies, and create jobs and new streams of income for farmers.

Despite its many successes, the Garalo biofuels initiative falls well short of such a grand ambition. Its benefits are still limited to the homes and businesses now on the grid. In addition, the project is still dependent on outside funding. "It is very expensive to run small-scale distilleries," says Frank Rosillo-Calle, an honorary research fellow in energy policy at Imperial College London.

Charitable projects such as this are good first steps but are unlikely to help Africa achieve wider economic growth and energy independence. Rijssenbeek's aim that the project will run as a self-sustaining business is still a distant hope. The income generated from the sale of electricity covers operating expenses, but barely makes a dent in the costs incurred in establishing the project. "At this stage it is not

### LOCAL BENEFITS

# The seeds of an economy

*Biofuels could help poor nations modernize, but scaling up aid supported projects to commercial operations is far from easy.*

BY NATASHA GILBERT

After nightfall, the streets around Garalo, a small town in southern Mali, used to be pitch black. The town's 10,000 or so inhabitants had no electricity and so used paraffin (kerosene) to light their homes and places of work, and battery-powered torches to find their way around.

For years the locals had been requesting extension of the national grid to the area, but the job had proved to be too expensive. In 2006, Garalo's farmers took matters into their own hands. Realizing their cotton had ceased to earn them a decent wage, they planted those fields instead with jatropha (*Jatropha curcas*), whose seeds produce oil that can be burned to produce electricity. To achieve their ambition, Garalo's villagers teamed up with a non-governmental organization called Fuels from Agriculture in Communal Technology (FACT) Foundation ([www.fact-foundation.com](http://www.fact-foundation.com)). This Netherlands-based foundation assists developing countries to produce and use biofuels.

Today, local farmers cultivate 600 hectares of land with jatropha, which provides electricity to 350 homes — roughly half of Garalo's population — and businesses, and also powers streets lights. Another 200 households have expressed an interest in becoming connected, says Winfried Rijssenbeek, director of the FACT Foundation.

In addition to providing light, heat and fuel for transportation, biofuels have given Garalo's businesses and tradespeople the tools and confidence to modernize and expand. One tailor, for example, bought an electric sewing machine; a furniture maker bought powered tools. Both artisans can now do their jobs faster and better and thus earn more income, says Rijssenbeek. "Electricity has a big impact on the villagers. It creates a positive attitude in the people living there," he adds.

The Garalo project is a testament to how biofuel production can greatly improve the lives of poor people in developing countries, so much so that the FACT Foundation is rolling out the model to another 10 nearby villages

possible to run the enterprise as a commercial project,” Rijssenbeek concedes.

The road to large-scale biofuel production for developing countries is bumpy, and what works as a small-scale aid project rarely translates into commercial success. The lion's share of investment in biofuel production in developing countries comes from large foreign-owned companies looking to establish industrial-scale plantations, says Laura German, a specialist in the governance of forests at the Indonesia-based Centre for International Forestry Research (CIFOR). A study<sup>1</sup> by German and Jan Willem van Gelder, of economic research firm Profundo, found that between 2000 and 2009, US\$ 5.7–6.7 billion was invested by 10 large companies in Asia, Africa and Latin America (with Brazil accounting for just over half). However, the foreign-owned commercial biofuel projects established so far have largely failed to deliver the anticipated benefits for local populations.

German has studied commercial biofuel production initiatives in Ghana and Zambia, where foreign companies have purchased more than 1.1 million hectares and 600,000 hectares, respectively, mostly to grow jatropha<sup>2</sup>. Local communities and farmers will often sell their land to foreign companies in the hope of gaining employment, or they might sign binding contracts to grow jatropha for a company. But companies often renege on contracts, German says, and the promised jobs never materialized. In one case in Zambia, farmers were contracted to grow jatropha for a fixed price only for a particular company. But as the crops began to bear fruit, “the company was nowhere to be seen,” she says.

The foreign companies hold most of the cards in these situations. Locals often lack the experience and legal knowledge to negotiate favourable terms, and have little power to hold the companies to account. Consequently, many communities end up tied to long-term lease agreements of up to 50 years in which

companies dictate the prices paid to farmers.

“People are desperate for investment but they are starry eyed about the benefits they could get,” German warns. “Expectations are high, but there is little understanding of what is required to get those benefits.”

It isn't all bad news: German and her colleagues came across a handful of companies in Ghana that were operating by the book. The companies had registered with appropriate government agencies, obtained environmental permits, and offered good pay and fair deals to locals. However, all biofuels ventures are “tarnished” in the eyes of civil society groups

**“People are desperate for investment but they are starry eyed about the benefits they could get.”**

and human rights campaigners, who protect the rights of local people. Ironically, it is the responsible ones, who talk to local groups and keep authorities informed, that are the most heavily investigated, says George Schoneveld, a researcher in forest governance also at CIFOR. “The more visible and engaging a company is, the more they tend to come under scrutiny,” he says. “The more secretive and shady ones have received almost zero exposure.”

#### ETHICAL EXPANSION

The efficiencies and economies of scale that come from commercializing and centralizing biofuels production have limited benefits for locals. In a report published in April, the Nuffield Council on Bioethics, a London-based think-tank, said that European policies to source 10% of Europe's transport energy needs from renewable fuels by 2020 are driving an “unsustainable” and “unethical” expansion of global biofuel production<sup>3</sup>.

Nevertheless, given the potential to help tackle climate change and reduce poverty, the Nuffield report concludes that governments have a “duty” to develop biofuels. If countries

can ensure that strict ethical and environmental standards are met — that is, the fuels do not infringe people's health and work rights nor contribute to net emission of greenhouse gas — then they should encourage foreign investment in biofuel schemes, says Richard Templer, director of the Porter Institute for Sustainable Bioenergy Research at Imperial College London. “If they can do biofuels properly, they should,” he says.

The Nuffield authors suggest that the European Commission should establish a monitoring system to check that any biofuel consumed in Europe meets human-rights standards and to enable swift sanctions against those found to be abusing these rights by, for example, not paying a fair wage, or employing children in the production process. They also call on the United Nations Environment Programme to develop an international standard to promote “a market for environmentally sustainable and human-rights friendly biofuels,” says Joyce Tait, a science-policy researcher and lead author of the Nuffield study.

Governments can also play a greater role in regulating the expansion of the biofuels industry to ensure its benefits are realized for local communities, says German. This could include requesting concrete commitments from companies and holding them accountable when these promises are broken, to ensure that people get legal compensation. Also, says German, governments could provide more financial support and incentives for the establishment of smallholder biofuel schemes and processing, such as those set up by the FACT Foundation, helping to bridge the gap between small aid projects and large-scale commercial ventures. Such international standards and regulations would help communities to realize the benefits of biofuels, encourage better practice among investing companies — and improve the reputation of biofuels.

There is time to learn lessons and make changes for the better. More projects demonstrating the positive impacts of biofuels, such as that in Garalo, will help to overcome the scepticism of those groups concerned about the negative impact of biofuels on social justice and food security, says Tom Richard.

“It's easy to think that we would do large-scale biofuels badly in the future because we do it badly now,” Richard says, adding, “We must get out of this mindset.” Biofuels, developed on both industrial and local scales, he says, need to be part of the options to help put the world on a more sustainable and equitable footing. ■

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1. van Gelder, J. W. & German, L. [www.cifor.cgiar.org](http://www.cifor.cgiar.org) (2011).
2. Schoneveld, G. et al. [www.cifor.cgiar.org](http://www.cifor.cgiar.org) (2010).
3. Nuffield Council on Bioethics. [www.nuffieldbioethics.org/biofuels-0](http://www.nuffieldbioethics.org/biofuels-0) (2011).



Farmers in Garalo, Mali, grow 600 hectares of jatropha to supply half the town with electricity.