

Biomass energy: Another driver of land acquisitions?

As governments in the global North look to diversify their economies away from fossil fuel and mitigate climate change, plans for biomass energy are growing fast. These are fuelling a sharp rise in the demand for wood, which, for some countries, could outstrip domestic supply capacity by as much as 600 per cent. It is becoming clear that although these countries will initially look to tap the temperate woodlands of developed countries, there are significant growth rate advantages that may lead them to turn to the tropics and sub-tropics to fill their biomass gap in the near future. Already there is evidence of foreign investors acquiring land in Africa, South America and Southeast Asia to establish tree plantations for biomass energy. If left unchecked, these trends could increase pressures on land access and food security in some of the world's poorest countries and communities.

Policy pointers

- **Rapid expansion of biomass** energy in the global North is fuelling demand for wood and increasing interest in tree plantations in the global South.
- **There is growing evidence** of planned and operational plantations in Africa, South America and Southeast Asia.
- **If biomass is sourced from** food-insecure countries where local land rights are weak, there is a real risk that people could lose the land they depend on for their livelihoods.
- **There is a need for greater** public scrutiny and debate about the potential social impacts of biomass plantations in developing countries.

Growing interest in wood

Biomass energy makes up 77 per cent of world renewable energy, and trees and woody plants account for 87 per cent¹ of that biomass. This includes planted or managed trees such as conifers or broadleaved trees, some bamboo and woody grasses such as miscanthus grass or switchgrass, and forest and wood industry residues. Such woody biomass is often burnt directly for domestic heat and cooking, especially in the global South, but new technologies now allow it to be converted competitively into electricity.

In the search for renewable energy sources — to diversify economies away from fossil fuel and mitigate climate change — governments in Europe, North America and East Asia are turning their eyes to woody biomass, in some cases setting concrete targets for increasing the share of biomass energy (see *Big plans for biomass*, overleaf).

These plans by countries in the Organisation for Economic Co-operation and Development (OECD) to rapidly expand power plants fuelled by woody biomass are fast increasing the demand for materials such as wood chips and pellets, the latter being compacted and dried to reduce transport costs.³

Meeting national 2020 targets in Europe will require

an additional 40 million oven dry metric tonnes (odmt) of solid biomass to generate electricity and another 50 million odmt for heating.⁴ In the United Kingdom, plans to expand biomass energy will push demand for biomass up to as much as 60 million tonnes a year, compared with the one million tonnes burnt or co-fired in the country's biomass power stations today. And in Asia, the South Korea Forest Service forecasts that pellet demand could rise from 20,000 tonnes in 2010 to five million tonnes in 2020.

Securing sources

In the face of such rapidly escalating demand, securing reliable sources of woody biomass will be key. Local sourcing — tapping into forests near power plants — is often viewed as important from an energy security perspective and also reduces the (relatively small) greenhouse gas emissions linked to transport. Countries such as France, Germany and the United States are pursuing a model that mainly relies on domestic supplies.

But for many OECD countries, demand for biomass will outstrip national supply capacity and local sourcing will not be an option. In the United Kingdom, for example, projected demand for wood chips and pellets will exceed — by five or six times — the locally available supply of ten million tonnes a year.⁵ Business consultants John

There is a real risk that people will lose the land they depend on to survive

Clegg Consulting estimate that the rising UK demand alone could lead to an almost doubling of world trade in wood chips and pellets.

Some OECD countries, including Italy, Japan, the Netherlands, Sweden and the United Kingdom already import increasing volumes of wood pellets. And

others may quickly have to follow suit. According to the Confederation of European Paper Industries (CEPI), Europe will face a biomass deficit of up to 210 million tonnes of wood across

all sectors by 2020.⁶ More recent analyses suggest additional requirements of some 80 million tonnes.⁷

Where will Europe get its woody biomass? In part, it will rely on the world's existing leading exporters of wood chips and pellets. The anticipation of growing demand from western Europe is already driving major investment in new biomass pellet production units — in 2011 alone at least five major pellet facilities in Canada, Norway, Russia and the United States went into production, with a total combined capacity of around three million tonnes.⁴ Sourcing from other exporters, including Australia, Chile, South Africa and Vietnam, is hindered by high transport costs.⁸

The extent to which supplies from these sources can keep expanding is uncertain. For example, plans to reduce the use of fossil fuels in both Canada and the United States are expected to divert supplies of wood pellets away from export markets⁹ (data on planned increases in local supply capacity are unavailable).

It is likely that countries in Europe and elsewhere will have to look to non-traditional suppliers in the global South to plug their biomass gap. Operators in Brazil, for example, are increasingly interested in exporting to

Europe⁹ and some analysts see the country as one of Europe's most promising future sources of wood pellets because of its good infrastructure and relative proximity.

Africa is also likely to play a big role in feeding European demand for biomass. Already, some companies are moving to service or replant existing tree plantations for this purpose. For example, deals have been signed to produce woodchips for export markets in Europe and elsewhere by replanting old rubber plantations in Ghana and Liberia.¹⁰

But the sheer scale of projected global demand means that new plantations will also have to be developed to fuel biomass power stations. Africa is attractive in this regard because it is perceived to be abundant in land. And there is another reason for biomass suppliers to acquire land and develop plantations in the global South: tree growth rates (and consequent financial returns) are much higher. In natural temperate forests, growth rates range from 1 to 4m³ per hectare, each year. In temperate and sub-tropical plantations of conifers such as pines, this range rises to 10–30m³ per hectare, each year. Tropical pine plantations are faster still at 15–45m³ per hectare, each year. Fastest of all are tropical eucalypt plantations that can reach growth rates of up to 60m³ per hectare, each year.¹¹

The rise of biomass plantations

Energy companies are already developing plantations on available land in Canada, Europe, Russia and the United States using fast-growing material supported by stable policy environments and sustainability standards.¹² While such sources can meet demand, land acquisitions for biomass plantations in the global South are likely to remain limited.

But evidence suggests that private operators increasingly consider this a viable business option. The Figure, although not an exhaustive list, highlights some examples of land being acquired in the global South to establish tree plantations wholly or partly for biomass energy for export or domestic markets.

Several feasibility studies are understood to be underway in Southeast Asia, Africa and South America. And some land deals for biomass plantations have recently been announced. For example, in 2010, a US company announced the acquisition of a 49-year lease on 5,000 hectares of land in Ghana for a plantation to produce feedstock for biomass power plants.¹³ The company also operates in Guyana, where it leases some 2,000 hectares (with the option to lease an additional 58,000 hectares), hoping to export wood chips to the United States and the United Kingdom. The same company intends to establish energy crop plantations in Madagascar, Mozambique and Tanzania to export wood chips for biomass power to Southern Africa and India.¹⁴ And it is also understood to have concluded a deal with an Indian company to conduct trials of bamboo and

Big plans for biomass

Across the world, countries are setting themselves ambitious targets for using renewable energy sources, including biomass.

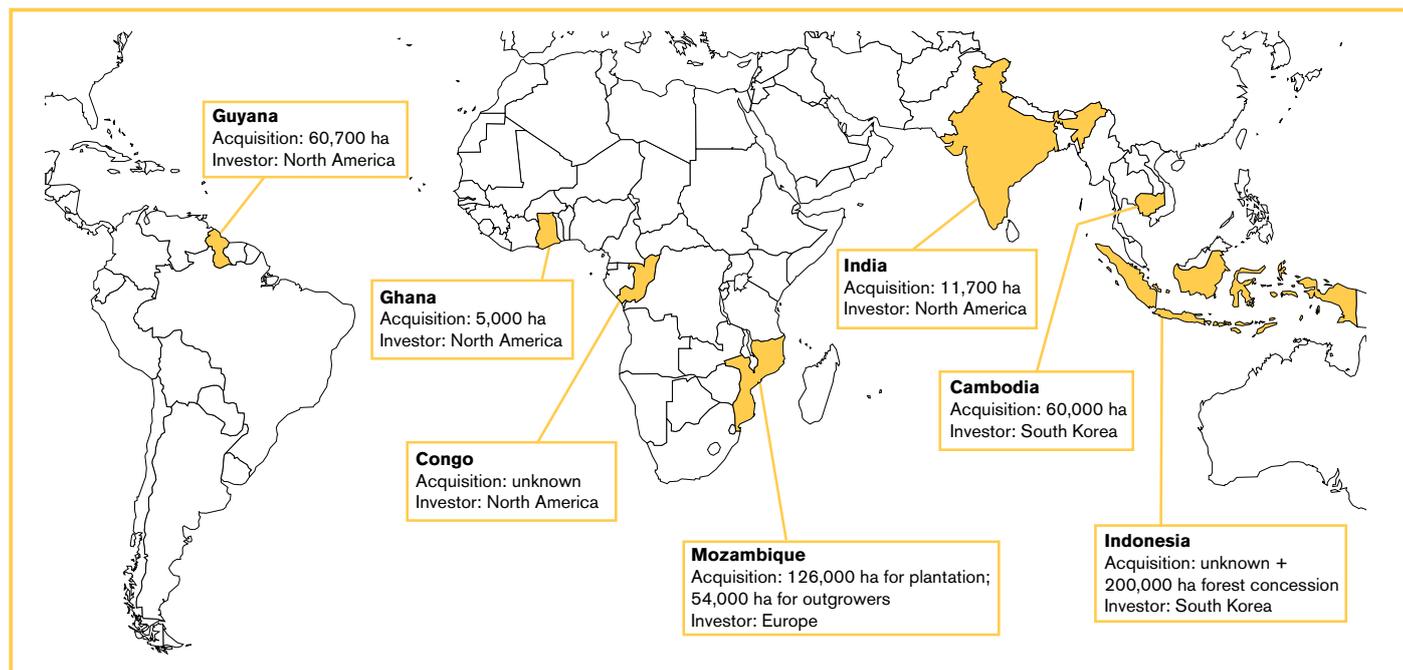
In Europe, the 2009 Renewable Energy Directive committed European Union members to increase the share of renewable energy to 20 per cent by 2020. Each country has a national Renewable Energy Action Plan (nREAP) that sets national targets; in some cases the targets for biomass are more ambitious than the directive.

In the United Kingdom, a new strategy for biomass energy is under discussion as part of the nREAP process, with planning permission granted to more than 7GW of biomass power plants.

In South Korea, the recently approved Renewable Portfolio Standard requires utilities to source ten per cent of their electricity supplies from new and renewable sources, including biomass, by 2022.²

In the United States, legislation has been passed requiring a quarter of all national energy to be supplied from renewable sources, including biomass, by 2025.

Figure. Land areas under known tree plantations wholly or partly for biomass energy in the global South.¹⁸



other species in India, Ghana, Guyana, the Philippines and Tanzania.¹⁵

Other companies already operating in Africa include the subsidiary of a Canadian business, which runs a eucalyptus plantation in Congo that, in 2009, supplied around 350,000 tonnes of wood chips to Europe.¹⁶

It is not just the private sector taking the lead in land deals for biomass plantations — in 2009, the South Korean and Indonesian forest ministries signed a memorandum of understanding that reportedly allocated 200,000 hectares of forest land to the production of wood pellets and included a 99-year lease on separate land, with private companies expected to construct and operate a pellet-making plant.¹⁷

Money matters

The extent to which these types of activities become and remain profitable depends on soil fertility and local microclimate as well as the species, rotation length, trees per hectare and harvesting system used. Perhaps most importantly, the economic attractiveness of biomass plantations significantly depends on the stability and nature of policy incentives and on the comparative prices of fossil fuels⁹ — if fossil fuel prices are relatively low, it becomes more difficult for biomass energy to compete.

But several factors are expected to increase the attractiveness of investing in biomass plantations in the coming years. Fossil fuel prices are expected to rise. The cost of biomass production is likely to fall as strategic breeding and production methods develop. Biomass plantations may also be able to generate additional revenue streams, for example through

selling carbon credits. They can also sell into different markets such as timber or pulp if energy prices fall. Some tree plantations are already doing this. For example, one European company is acquiring land in Mozambique and Tanzania¹⁹ for tree plantations that involve several economic activities — supplying wood products and pulp but also carbon credits and biomass energy.

Social implications

What are the implications of expanding biomass plantations for recipient countries in the global South? Some benefits may materialise — for example, apart from creating hoped-for jobs, biomass plantations could open the door to improved energy access.

But there are also real concerns. In particular, that the search for cheap land, suitable climates and competitive transport costs will increasingly lead investors to focus on Africa and Southeast Asia, where many countries are characterised by food insecurity and vulnerable land rights.

Where land is formally owned by the state, as it is in much of Africa, decisions about biomass plantations will be taken by central government agencies. People that may have used land for generations and see it as their own tend to have weak and undocumented land rights, little capacity to exercise these rights, and are marginalised in decision making. Some national laws require local consultation — for example in Mozambique — but in practice implementation often falls short of expectations.

In some countries, such as Ghana, land is controlled by customary chiefs and they may become the ones

who sell or lease land to, and negotiate deals with, biomass operators. But there are still questions about the extent to which these chiefs are accountable to their constituents and maximise local public interest.

In all these cases, there is a real risk that people will lose the land they depend on to survive. Compensation may be inadequate to restore local livelihoods. And although new jobs may partly offset adverse impacts, plantations and processing plants may not generate jobs for all affected people.

Biomass plantations may also compete for the best lands with food crops (and with biofuel feedstocks), adversely affecting local food security and further marginalising smallholder farming. Where biomass production is for export, these tensions are not compensated for by improvements in local energy security.

There has been some debate in Europe about sustainability standards for production, through the Renewable Energy Directive, but little attention has been paid to the wider implications of biomass plantations.

If left unchecked, the growing pressure on land access could undermine livelihoods and food security in some of the world's poorest countries.

It may be early days, but the sheer pace and scale of growth in biomass energy makes this no ground for complacency. We certainly need greater public scrutiny and debate about what the plans for biomass energy in the global North will mean for developing countries in the global South.

■ LORENZO COTULA, LYNN FINNEGAN AND DUNCAN MACQUEEN

Lorenzo Cotula is leader of the Land Rights Team in IIED's Natural Resources Group (www.iied.org/natural-resources/staff/lorenzo-cotula), Lynn Finnegan is a consultant researcher at IIED and Duncan Macqueen is leader of the Forest Team in IIED's Natural Resources Group (www.iied.org/natural-resources/staff/duncan-macqueen).

We would like to thank Rocío Díaz-Chavez for her helpful comments on an earlier draft of this note.

Notes

- ¹ Macqueen, D.J., Korhalliler, S. 2011. *Bundles of energy: The case for renewable biomass energy*. Natural Resource Issues 24. IIED, London. ■ ² Hawkins Wright. 2011. *Energy from Forests: Bioenergy and the global forest products industries*. Hawkins Wright, London. ■ ³ This briefing focuses on the woody biomass market for electricity and heat generation in OECD countries. It is not concerned with biofuels — liquid fuels, such as bioethanol derived from sugar or starch crops, and biodiesel derived from vegetable oils — or with charcoal. Neither does it discuss the growing interest of some non-OECD countries to use biomass energy for off-grid electrification in developing countries. ■ ⁴ Bingham, J. 2011. Trends in wood energy. Presentation at the Forestry, Biomass and Sustainability Conference, London, 13–14 May. ■ ⁵ Bonsall, R. 2010. Biomass for heat and power – using biomass efficiently. Presentation at the Forestry, Biomass and Sustainability Conference, London, 13–14 May. ■ ⁶ CEPI. 2007. *Bio-energy and the European pulp and paper industry — An impact assessment*. Study conducted by McKinsey & Co. and Poyry Forest Industry consulting for the Confederation of European Paper Industries (CEPI). ■ ⁷ Rechberger, P. 2011. Bioenergy in the EU. Presentation at the Forestry, biomass and sustainability conference, London, 13–14 May. ■ ⁸ FERN 2011. *Woody Biomass for Energy: NGO Concerns and Recommendations*. FERN, Moreton-in-Marsh. ■ ⁹ Junginger, H.M. et al. 2011. *Summary, synthesis and conclusions from IEA Bioenergy Task 40 country reports on international bioenergy trade*. IEA Bioenergy, Task 40: Sustainable International Bioenergy Trade, Utrecht. See <http://www.bioenergytrade.org/> ■ ¹⁰ See, for example, www.buchananrenewables.com, www.irinnews.org/report.aspx?reportid=89530 and www.privateequityafrica.com/countries/afriren-bolsters-ghana-rubber-estates/. ■ ¹¹ Evans, J. 1982. *Plantation forestry in the tropics*. Oxford Science Publications, Oxford. ■ ¹² For example, a European energy company operates about 20 plantations in Germany and is planning to develop more. See www.rwe.com/web/cms/en/214950/rwe-innogy/renewable-energies/biomass/fuel-wood-plantations. ■ ¹³ See www.clenergen.com/ghana/energy-crop-plantations. ■ ¹⁴ See www.clenergen.com/clean-energy/commercial-projects. ■ ¹⁵ Memorandum of Agreement dated May 2010, 'Scope of Work' schedule. See www.faq.org/sec-filings/110214/CLENERGEN-Corp_10-Kv211066_ex10-11.htm. ■ ¹⁶ See www.magindustries.com/news.aspx?newsid=40&pageid=3. ■ ¹⁷ Deparine, S. 2009. *Indonesia, South Korea Collaborates on Wood Biomass Energy*. BiofuelsHub. See www.biofuelshub.com/component/content/article/1-news/987-indonesia-south-korea-collaborates-on-wood-biomass-energy. ■ ¹⁸ Sources for the figure include www.kenertec.co.kr/english/relations/whatsnew_read.asp?page=2&num=12; http://kenertec.site50.net/vmdt.php?pro_id=5; www.clenergen.com/ghana/energy-crop-plantations; <http://hugin.info/141872/R/1341211/320732.pdf>; www.clenergen.com/clenergen-india/energy-crop-plantations; www.biofuelshub.com/component/content/article/1-news/987-indonesia-south-korea-collaborates-on-wood-biomass-energy; EIA/Telapak. 2009. *Up for Grabs: Deforestation and Exploitation in Papua's Plantations Boom*. Environmental Investigation Agency/Telapak; www.greenresources.no/Plantations.aspx; www.magindustries.com/news.aspx?newsid=40&pageid=3. ■ ¹⁹ This includes 180,000 hectares in Mozambique (126,000 hectares for a plantation and 54,000 hectares for planting by local farmers and companies) and various plantations in Tanzania. See www.greenresources.no/Plantations.aspx.

The International Institute for Environment and Development (IIED) is an independent, nonprofit research institute working in the field of sustainable development. IIED provides expertise and leadership in researching and achieving sustainable development at local, national, regional and global levels. This briefing has been produced with the generous support of Danida (Denmark), DFID (UK), DGIS (the Netherlands), Irish Aid, Norad (Norway) and Sida (Sweden).

Contact: Lorenzo Cotula
lorenzo.cotula@iied.org
3 Endsleigh Street,
London WC1H 0DD, UK
Tel: +44 (0)20 7388 2117
Fax: +44 (0)20 7388 2826
Website: www.iied.org