AGROFUELS FOR AFRICA?

Prepared by Community Technology Development Trust (CTDT). Background paper for Civil Society Positions to CBD-COP9. Harare, Zimbabwe, May 2008.

Comments welcome: carol@ctdt.zw.co

AGROFUELS FOR AFRICA?

In April 2008, the World Food Programme announced that there are 100 million more people hungry this year than last, raising the total to about 950 million. News media are calling 2008 the 'year of the food riots,' as hungry people took to looting in protest against food/fuel prices in Burkina Faso, Cameroon, Côte d'Ivoire, Egypt, Mauretania, Mozambique, Senegal, Somalia (and Bangladesh, Bolivia, Haiti, India, Indonesia, Mexico, Uzbekistan).

The United Nations reported that food prices did rise 45 percent in nine months to April 2008, with the prices of wheat and rice rising 130 percent in the 12 months to March. Global food reserves are the lowest in 30 years. (Chakrabortty 2008: 4)

Continuing a long trend, global production of maize increased by 51 million tonnes, 2004-2007, showing that maize production is keeping pace with food demand. What is different for 2008 is that during this same period, consumption of agrofuels [1] increased, which rose by 50 million tonnes in the US alone, consuming all the maize production increase. A reporter for the *New Statesman* (Lynas 2008) pointed out that American cars now burn enough maize to meet all the import needs of the 82 countries classified as 'low-income food-deficit' by the UN Food and Agriculture Organisation (FAO); he concludes, 'there could scarcely be a better way to starve the poor.'

As many are quick to note, there are several reasons for food deficits from bad harvests (e.g., Australian droughts) to increased demand by China's and India's new middle-classes, to increasing populations. But as senior economist at the International Grains Council, Amy Reynolds, said, 'At the start of the decade, a small amount of grain—18 million tonnes—was used for industrial purposes. This year 100m tonnes will go towards biofuels and other industrial purposes. Can anyone really tell me that hasn't had an impact on what we pay for food?' (Chakrabortty 2008: 4)

As the poor suffer the most, the African continent is very much affected by this new agrofuel 'craze.' The World Bank Development Report (2008) on agriculture states that over the last two decades, the number of poor in Africa doubled to 300 million, comprising more than 40 percent of the continent's population. Yet as the demand for agrofuels seems to be insatiable, more global corporations are looking at Africa in a different way, not seeing the hungry, but rather, noticing the extensive land mass. Calling Africa the 'green OPEC,' they assert that just 15 countries in Africa have a total combined land area greater than all of India '*available*' for agrofuel production. (GRAIN 2007c: 36) What does *available* mean? What are the impacts of fuel crop production on food crops?

AGRICULTURAL MODEL

The agrofuel market surge demands large quantities of feedstock (seeds, fibers, roots) produced quickly. This goal of high yields will further entrench the dominant commercial agricultural model of chemical monoculture on large expanses of land. In the name of efficiency, the current producers of agrofuels use monoculture plantations for maize, soya,

[1] 'Agrofuel' specifically names the production of plants for fuel; 'biofuel' is more generic and includes use of waste materials and biogas.

and sugar, maximising fertiliser and water inputs for high yields. For crops, such as jatropha, most often planted on the fringes of marginal land, the planting patterns would have to drastically change to large-scale monoculture in order to grow sufficient feedstock. Growing jatropha on marginal lands might help a local community use jatropha oils for soap and replace paraffin, but such a cropping pattern could never sufficiently supply global markets.

Yet this industrial model of agriculture has become increasingly criticised around the globe for unsustainable production. Monoculture degrades biodiversity, in that only a few strains of a few crops are valued, with others neglected or forgotten forever. The high use of chemical fertilisers is profitable for a few corporations, but contributes to global warming, pollutes run-off and ground water, and degrades the organic composition of the soil. For example, nitrous oxide is the third most important human-induced greenhouse gas. In the US, a dead sea the size of the state of Massachusetts exists in the Gulf of Mexico from farm chemical run-off down the Mississippi River . Large-scale commercial farms in central US have reduced topsoil to as little as 20 cm. – in less than 80 years; similar to petroleum consumption, just four generations seriously depleted what took thousands of years to develop.

Demanding high yields also gives impetus to the industries wanting to profit from genetically modified organisms (GMOs), which could not take off in the global market place as food (maize, soya, canola), but seek to find new life in the agrofuel market. The plans are to genetically modify cassava to a higher sugar content and to genetically modify other plants so their cellulose composition can be more easily broken down to extract the liquids. These GMOs, grown on vast tracts of land, will genetically pollute indigenous strains, altering their characteristics as well as contributing to the loss of biodiversity.

This agricultural model assumes the ability to transport large quantities of produce over long distances, while often not calculating this fuel expense as part of the cost of production. Of course, local processing plants will reduce some bulk, but corporate plans include shipping wood chips (Republic of Congo to Europe by BP) or seeds (jatropha) to overseas processing plants. The US is using the Central American Free Trade Agreement (CAFTA) and the North American Free Trade Agreement (NAFTA) to entice Central America and Mexico to grow agrofuels because they can “freely” enter the vast US market to feed American cars. For example, Costa Rica is already exporting ethanol to the US. Free trade agreements, including the Economic Partnership Agreements (EPAs) of the European Union (EU), then become the instruments for advancing agrofuel production within South countries. On the other hand, there are no trade regimes currently regulating agrofuels.

STATISTICS – IN THE EYE OF THE BEHOLDER

The debates over agrofuels include data and statistics which support arguments for both sides. Like GMOs, much of the confusion is the result of insufficient data over the long term. Given that jatropha helps to retain moisture in the soil, yet it is also an invasive plant, even outlawed as a noxious weed to other crops in some countries, (Low and Booth 2008), what impact will widespread plantations have? Scientific studies report that generally using agrofuels instead of petroleum may reduce emissions of sulphur, carbon monoxide and volatile organic compounds, but may increase nitrous oxide and acetaldehyde emissions,

depending on the materials used. (Dufey in CBD 2008: 3) Scientists are being careful in their assessments, yet policy to promote quick profits tends to select the convenient data.

The first basic problem is that industrialised countries have set 'green' targets for agrofuel consumption which they cannot fulfill with their own local production. For the EU to meet its green goal of agrofuels providing 5.75 percent of its transport fuels by 2010, it would take 70 percent of its farmland. The US goal of producing 35 billion gallons of agrofuel per year by 2017 would consume the entire US soya and maize crop. To provide a 10 percent replacement of petrol fuel with agrofuel would require about 43 percent of the entire US cropland. (CBD 2008: 4; Tsiko 2007: 32) The agrofuel 'craze' therefore very much depends on industrialised countries taking command of land in South countries in order to grow agrofuel crops.

The second problem is that the amount of plant material needed is massive. It takes 12 kg of sugarcane and 2.8 kg of maize for 1 litre of ethanol. (Rothkopf 2007: 44) To bring the numbers into our lives, Lester Brown (2007) offered the comparison that the amount of grain required to fill the 90-litre petrol tank of a 4x4 vehicle *once* with ethanol could feed one person for a year. The grain it takes to fill the tank every two weeks over a year would feed 26 people.

Third, the amount of land required depends on yield, but the number used to estimate litre per hectare of maize assumes 10 tonnes per hectare yield, a production level that many commercial farmers in Africa never reach. In the 1980s, the Zimbabwe Commercial Farmers Union had a '10-Tonne Club' to award those master farmers for their yields. An often quoted sum is 3570 litres of ethanol per hectare of maize, which assumes this production of 10 tonnes of maize per hectare. (Rothkopf 2007: 44)

The major arguments used to endorse agrofuels are to create energy without consumption of fossil fuels and to reduce emissions that cause global warming. For both of these goals, the projected data looks bleak, either in terms of efficiency or of renewable energy. Prominent US scientists have completed several experiments showing that more energy is consumed by producing ethanol with maize than the ethanol provides, calling the process 'unsustainable subsidised food burning.' (Pimentel and Patzek 2005) The US Department of Agriculture counters their data.

Another scientist reports that if fertiliser is used extensively to raise yields, the global warming potential of nitrous oxide (N2O) is 296 times that of carbon dioxide, with a longer atmospheric lifetime. When used in tropical climates, chemical fertilisers have 10-100 times (Smolker *et. al.* 2007: 56) the impact on global warming. The higher concentration of nitrous oxide in the atmosphere results mainly from monoculture production. Any discussion about agrofuels reducing global warming must, therefore, calculate in the use of fertiliser for high yield production.

If land were retained in forests, it would sequester two to nine times more carbon over 30 years than the emissions avoided by using agrofuels planted on the same land. (Righelato and Spraken 2007: 902, quoted in CBD 2008: 5) How land use is transformed, therefore, must also come into the calculations as a report from the Convention on Biological Diversity (CBD 2008: 4) concludes:

> If energy crop plantations are established on forested land or carbon rich soils, any reduction achieved through the use of biofuels could be negated or

> even greatly out-weighed by the release of greenhouse gases stemming from land-use change and the production of feedstocks.

Using indicators for the energy balance (returns per unit of energy input) or for global warming is still highly debated. What is essential is to include all the costs and not treat ecological factors as 'externalities,' meaning they are not calculated and are considered 'free.' Every aspect of natural capital used in production of agrofuels must be included in the cost-benefit analysis. When empirical data are not available, then the precautionary principle should be invoked: If a long-term cost cannot yet be calculated, then it should be estimated at the high range of cost, not ignored.

OWNERSHIP AND CONTROL

Investment in agrofuels involves new coalitions among already vast conglomerates: agribusiness, biotechnology corporations, the energy and automotive industries, and finance capital. Given new mandates from governments to increase the proportion of agrofuels in petroleum products, the corporations are busy capturing these guaranteed markets. In addition, governments are providing billions of dollars of direct subsidies, tax exemptions, soft loans, and carbon-trading schemes while continuing to finance transportation infrastructures. Guaranteed markets replete with subsidies are about as far from 'free trade' as corporations can get, but they will also take advantage of the agricultural markets pried open in South countries by the free trade regimes of the World Trade Organisation, EPAs of the EU, and free trade agreements (FTAs) of the US.

The cost of the feedstock for agrofuels is what makes or breaks the investment, even with the guaranteed markets and subsidies, for competition is real for the same crops to be used for food or animal feed. To control costs, the corporations are trying various ways to avoid competition. This first surge in agrofuels comes from maize, soya, palm oil and sugar, commodities whose production and marketing are already controlled via vertical integration by a few conglomerates. (GRAIN 2007: 12) For example, they alone can directly decide how much American maize will be sold on the global fuel versus food markets.

An alternative approach is to seek crops which are not yet part of the global commodity chains, such as jatropha or cassava. The ability to designate hectarage for production is central to reducing risks of supply quantities and cost, and therefore, corporations are demanding direct control over the land.

Another new advance is the role of finance capital, with investment houses like Goldman Sachs or George Soros speculating in 'renewable' energy sources. Soros has landholdings (over 100,000 hectares) in Argentina and is partnering with large landowners in Brazil. (GRAIN 2007: 13) One estimate suggests that speculation in commodities (e.g., maize, soya) futures – where traders bet only according to price movements – has increased from $5 billion in 2000 to $175 billion to 2007. (Stewart and Waldie 2008, quoted in GRAIN 2008: 2) Finance capital is not just speculating, however, but also directing research for the next generation of agrofuels, mainly coming from patented genetically modified plants. These interests pursue profit in the name of reducing global warming or mitigating climate change.

IMPACT ON AFRICA

Land

Because the industrialised countries must look south to find land to even begin to consider their agrofuel targets, the question is how will Africa become the 'green OPEC'? The chart at the end of this paper suggests the amount of land coveted by agrofuel investors: 1.2 million hectares in Ethiopia, up to 3.5 million hectares in Mozambique. Other examples of land areas proposed for growing fuel crops are a bit less overwhelming, but immediately raise many land use questions: Benin, 600,000 ha.; Tanzania, over 400,000 ha.; Zambia, 184,000 ha. How the land will be made available for agrofuel production varies greatly from government leases to private corporations, to outright sale of land or contract farming. No matter how the land is allocated, however, its use will be overwhelmingly for foreign consumption. Such major tracts of land designated to meet foreigners' transport and energy needs signals, once again, the expatriation of African lands. Export crops for overseas consumption while Africans go hungry is a historical pattern all too familiar on the continent; it is certainly not the hope of 21st century African agriculture.

Contract farming sounds like it leaves the farmers in command of their fields and production, but in fact, it does the opposite. Contracts are dictated, not negotiated, by the global corporations who demand rigorous standards; the kind and amount of fertiliser, of irrigation and much more, can be designated in the contract. The farmers agree to provide x amount of the crop at y time. If weather or pests reduce the yields, the farmers take all the risk, often still required to deliver equal value of cash that the crop would have provided, plunging them into debt. (Mushita and Thompson 2007: 93-96, 147) Contract farming can transform farmers into powerless labourers on their own land, retaining little or no role in decisions about production but simply executing what the global corporation requires.

The advertising that agrofuels will assist small-scale farmers is only accurate if decisions about the use of land remain decentralised within the community. The farmers can then decide how to plant x kilometres of jatropha tree fencing to produce oil for lamps or soap or biodiesel for their own vehicles. They can decide to install a small processing plant for local agrofuel production for several wards or districts, with the consumption of the fuel staying at the local level. But this scenario is not the one that global corporations are setting; theirs is the usurpation of huge tracts of African land for overseas consumption, and if they ruin the ecosystem, they will move on. Further, experience across the African continent for many plantation crops, from sugar to tea, has proven that centralised plantations 'assisting' small-scale outgrowers is almost impossible to maintain, for the two production systems vary considerably, and often compete with, not complement, each other.

Lessons about land use come from other areas of the world to inform African policy makers. In some Organisation for Economic Co-operation and Development (OECD) member states, the demand for oilseed is threatening areas designated for conservation. (Steenblik 2007) As discussed across the international media, the demand for palm oil contributes to extensive deforestation in South-East Asia and Brazil is highly criticised that its soya production is cutting down the Amazon forest.

Ecology

The above discussion begins to outline the possible impacts of agrofuels on African ecological systems. If planting can occur on 'marginal' lands, under decentralised control of local communities, reduce nutrient leaching, and increase carbon content. If these conditions

prevailed, growing crops for local consumption of biodiesel or ethanol could actually assist food crop hen certain plants can assist in water retention, add nutrients to soil, offer crop rotation production.

The perils are many, however, and tend to increase as the land use comes under greater foreign control. The demand for quick high yields will certainly require vast amounts of fertiliser. Yet the seasonal advantages of fertilisers quickly dissipate as the chemicals pollute precious ground water and catchment basins. Those corporations which sell the fertilisers do not pay this price; the local communities do. As mentioned above, fertilisers also contribute drastically to global warming with the nitrous oxide emissions.

Moving crops from small-scale 'marginal lands' to plantations brings in irrigation, even for those with drought tolerance. In Nicaragua, for example, jatropha grown on plantations requires irrigation. (Foidl 1998) With global warming, agrofuels will compete with food crops for diminishing quantities of available water. Further, the processing of agrofuels, done most efficiently near the source of the crops, requires about 3-6 litres of water for every litre of ethanol produced. (Steenblik 2007) Local public debates should decide whether a litre of ethanol or water is more precious, not the global markets.

Much of the criticism about agrofuels is to be answered by genetically modifying (GM) crops, to grow faster, to resist pests, and to create plant materials less resistant to crushing (seeds) or to pressing (sugar cane). The 'next generation' of agrofuels will reduce costs by introducing crops more conducive to fuel consumption. None of the data is yet in, and if one takes into account the slow returns on other GM research (after more than 20 years, none yet enhances nutrition offered by Mother Nature), it may be a long time until we know. Frustrated by global consumer resistance to GM plants in food or oil crops, the biotech industry sees agrofuels as a major impetus to promote these patented specialties, opening up vast areas for GM production. Concerns about GM technology, therefore, are especially important for crops which are both food and fuel crops, for the GM crops could easily contaminate local maize, soya, cassava, or castor beans.

Jatropha is not a food crop (poisonous to animals and humans), but it is an invasive specie, treated as a noxious weed. What would be the impact on food crops if a virulent GM strain of jatropha is released across Africa? No one knows the answer yet, which means it is extremely important to invoke the international biosafety protocol before genetically-modified fuel crops are released across the continent. The precautionary principle advises that regulation does not have to wait for scientific results showing deleterious impacts; a government can regulate to protect its ecological systems.

SOCIAL/ECONOMIC IMPACTS

Loss of Food Security

Making hungry children compete with cars for food draws a clear image of loss of food security. As the continent of Africa strives to reduce hunger, the global corporations see plentiful land – millions of hectares—free for the taking? Fuel crops across the continent most certainly will compete for the best land with food crops. Marginal lands can produce both, but not at the quantities needed and therefore, commercial agrofuels will compete for the better land. Agrofuels therefore directly threaten the human right to food.

Loss of Food Sovereignty

Bringing vast tracts of land under foreign direction also destroys food sovereignty. Jatropha trees take about five years to attain average yields and can produce up to 30 years. Will the land concessions be for 30 years? Cutting down forests for feeding cars does not keep the people in charge of their food supply, but rather, sells that right off to the global marketplace. How do communities, stewards of these forests for centuries, reverse the clear-cutting of their forests? In Uganda, organised protests did stop the clear-cutting of Mabira Forest, an important water catchment area for Lake Victoria and the Nile River, but thousands of hectares of trees on Kalangala and Bugala Islands had already been cut down to clear land for palm oil plantations.

Loss of Biodiversity

The FAO, in various studies, has concluded that industrial agriculture and livestock breeding are the chief cause of the loss of biodiversity in plants and animals. (for the most recent, see FAO 2007) In contrast, small-scale farmers promote biodiversity with inter-cropping and by valuing the varied characteristics of different strains of one species. In the US only two strains of potatoes are commercially produced making the crops quite vulnerable to any disease or pest, while farmers in the Andes still nurture and propagate thousands of varieties. The same could be said for teff or sorghum/millet or many other African crops. Biodiversity is the future of food, especially with global warming. Agrofuels value only monoculture.

Threat to Small-Scale Farmers

With the consolidation of land under foreign control, small-scale farmers have little hope of expanding their fields. Industrial production of agrofuels enhances the agricultural model which pushes small-scale farmers aside as 'inefficient' and 'insufficient' producers. If plantation farming is the model, rural communities will once again become workers for foreign corporations which export the product and the profits. If contract farming is pursued as a means for producing agrofuels, farmers become subservient labourers on their own land, often succumbing to debt, for they are burdened with all the climate and market risks.

Primary Commodity Exporter
Anti-Development

It appears that factories will need to be set up near the crops, but the processing will be minimal, to extract the oils, leaving the residue for local uses (e.g., sugar cane stalks to fuel the sugar mills). However, the 'processing' is mainly extraction, for the blending into usable fuels will mostly occur near the fuel consumption in the North. This agrofuel 'craze,' therefore, once again leaves Africa as a primary commodity exporter, at the bottom of the commodity chain, in terms of value-added production. Such a position in the global market is not a step toward development, which requires increasing production in value-added goods and increasing technological inputs and innovation. It does not improve upon Africa's neocolonial role as an exporter of minerals and oil and unprocessed agricultural goods.

Further, under free trade regimes, if there are no controls over exporting the agrofuels (leaving 50 percent for local use?), they cannot contribute to increased energy demands of a developing continent. Lessons from Nigeria are all too clear. The largest oil producer on the African continent and tenth in the world, Nigeria *imports* 70 percent of its fuel

requirements; only 20 percent of rural Nigeria is electrified and most rural communities remain dependent on wood for fuel. (Rothkopf 2007: 333, 335) Producing yet another export crop will not change these dominant patterns.

POLICY OPTIONS

The market will not resolve the problems of agrofuels, for rich consumers who want to feed their cars have disposable income and therefore, greater power in the market place than the poor. When the market choice is food versus fuel, the players are not at all equal. The rich still have enough food to eat and fuel for their travels; it is the poor protesting in the streets.

In April 2008 when the United Kingdom put into effect that 2.5 percent of all petrol and diesel had to be 'biofuels,' the international community called for a review of EU and US policies about 'green' fuel requirements. Because neither can come close to producing the agrofuels they will demand by 2020, they are putting the burden of production on to others, on to poor countries. Their civil societies are calling for revision of the current unrealistic and onerous policies.

Because African governments have no regulations about agrofuels, that step could be one of the first ones. Public debates need to occur to inform the legislators, for growing agrofuels in a decentralised way under local control can complement food production. Yet large plantations under foreign control, polluting the water, increasing global warming, and with all the proceeds (product and profit) off-shored, does not seem to be a path toward development. Instead, it returns Africa to 19th century plantation exploitation of its labour and lands. Where to grow agrofuels? How? Under what regulations? Restrictions on export? Very many questions have not seen the light of transparent debate.

One part of the debate will refer to the precautionary principle of the Biosafety Protocol concerning new GMOs for fuel crops. Genetically modifying plants for agrofuel will affect the local varieties of the same plants, and therefore, government capacity for careful research and monitoring should be in place before any discussion about admitting new GMs into an ecosystem. Further, under current trade regimes, the GM plants will be patented, violating farmers' rights. Food sovereignty requires strict monitoring and control over any and all GM germplasm. Some peoples might decide that food sovereignty requires banning of all GM materials.

The CBD 'biofuel' report (2008) lists several international protocols which could assist in the development of policy frameworks: the Addis Ababa Principles and Guidelines for Sustainable Use, the Guiding Principles on Invasive Alien Species, the Akwé Kon Voluntary Guidelines, the Voluntary Guidelines for Biodiversity-inclusive Impact Assessment. As noted by their titles, they are voluntary guidelines, not enforced international laws.

The policy option that a group of African civil society organisations (African Call 2007) advocate is a moratorium on the production of agrofuels. After examining the practices of production and marketing, they call for:

- A moratorium on new agrofuel developments in Africa. Our governments urgently need to stop and think before delivering our continent to the fuel demand of foreign investors.
- No agrofuel targets for governments in Europe and the rest of the world.

- An international moratorium on agrofuel exports, until the true social and environmental costs can be assessed, and disaster averted.

The new United Nations special adviser on food, Olivier de Schutter, agrees with the African call, advocating an immediate freeze on investment in agrofuels: 'I believe that any new investment in first-generation agri-fuels should be [frozen] immediately and that we should discuss in an open and transparent manner whether the current levels of production of bio-diesel, bio-ethanol - which are not so bio - should continue.' (ABC News 2008: 1)

Policy formulations about agrofuels seriously lag behind their increasing domination over production and markets. Given their impact on food supplies and ecosystems across the globe, it is past time for open, serious debates to choose and implement policy options.

AGROFUELS AND FOREIGN LAND USE IN AFRICA

(This preliminary chart of estimations gives only a hint of the many discussions across Africa about foreign use of African lands to supply foreign markets.)

COUNTRY	CORPORATIONS	CROPS	LAND	COMMENTS
Benin	Interest by Malaysia, China, S. Africa, Brazil	Jatropha, palm oil, sugar, manioc	240,000 ha – jatropha by 2012 400,000 ha – palm oil 'appropriate' 3 mil ha 'available'	Agrofuels central to govt's 'agricultural revival programme'
Cameroon	Socapalm, Socfinal both Belgium	Palm oil	To expand beyond 30,000 ha	Forest peoples resisting
Central African Republic	EU Commission study	Cassava, sugar, soy, sorghum	29.8 mil ha 'very suitable'	Congo River Basin (6 countries) has 18% of global rainforests
Dem. Republic of Congo	Aurantia (Spain) , ZTE Intl (China)	Palm oil	3 mil ha palm oil plantation planned 12 mil ha 'available'	World Bank giving loans for commercial logging.
Ethiopia	Flora Ecopower - Germany	Jatropha	14,000 ha of which 87% destroyed forests of elephant sanctuary	No restitution yet – will increase to 200,000 ha
	Sun BioFuel UK – drafted Ethiopian agrofuels strategy	Jatropha, castor beans, palm oil	325,000 ha	
	LHB Israel Hovey Ag. – both Israel	Jatropha	140,000 to expand to 500,000	
	Becco Biofuels Natl Biodiesel Corp – both USA		125,000 ha	
total			1.2 million ha 'potential'	Negotiating with foreign corps
Kenya	Bioenegy Intl - Switzerland	Jatropha	93,000 ha	
Liberia	Equatorial Biofuels - UK	Palm oil	700,000 ha	
Mozambique	State land concessions to foreign corps.	Jatropha, palm oil, sugar, cassava, copra	3.5 mil ha 'potential'	Mozambique Bio-fuel Industries managing concessions
Nigeria	Telefonaktiebolaget, LM Ericsson, MTN, China	Sugar, cassava, palm oil	50,000 ha planned 400,000 ha 'potential'	For rural electrification for telecommunications
Republic of Congo	Magindustries -Canada	Eucalyptus	68,000 ha	Wood chips shipped to Europe for biomass
South Africa	D1 Oils Africa - UK	Maize, sugar, jatropha, sunflower	650,000 ha – maize 3 mil ha 'former homelands' available	Govt seeking investments Govt announcement, May 2007
Swaziland		Cassava	several 1000s ha allocated by govt	Chronic food deficit country
Tanzania	Sun Biofuels UK	Jatropha	18,000 ha	Lindi
	Sweden (goal of no fossil	Sugar cane	400,000 ha	In the Wami Basin

	fuels by 2020)	proposed	proposed	wetlands & will displace rice farmers
	Malaysia, Indonesia	Palm oil	8,000 ha	Kigoma
	PROKON – Germany	Jatropha	10,000 ha	Jatropha to expand greatly
Uganda	SCOUL - E. Africa BIDCO	Sugar Palm oil	7,100 ha Mabira Forest saved but 6000 ha cleared on Kalangala, Bugala Islands	Stopped by civil society
Zambia	D1 Oils Africa - UK	Sugar, jatropha, cassava	45,000 ha now 500,000 ha 'available'	Forest reserves available for cultivation

Sources: Summarised from Africa Biodiversity Network 2007, Grain 2007b, Rothkopf 2007, Smolker *et al.* 2007.

BIBLIOGRAPHY

African Biodiversity Network. 2007. 'Agrofuels in Africa – the impact on land, food and forests,' July.

African Call for a Moratorium on Agrofuel Developments. 2007. November. Available at www.grain.org/agrofuels.

BiofuelWatch et al. 2007. *Agrofuels - Towards a reality check in nine key areas.*

Brown, Lester. 2006. 'Supermarkets and service stations now competing for grain,' Earth Policy Institute, July. Article available at www.earthpolicy.org/Updates/2006/Update55.htm

Chakrabortty, Aditya. 2008. 'Fields of gold,' *The Guardian* (London), 16 April, p. 4.

Convention on Biological Diversity (CBD). Conference of the Parties to the Convention on Biological Diversity. 2008. 'The potential impacts of biofuels on biodiversity,' UNEP/CBD/COP/9/26, 12 March.

Dufey, A. 2006. 'Biofuels production, trade and sustainable development: emerging issues.' International Institute for Environment and Development. London. Available at http://www.iied.org/pubs/15504IIED.pdf

Foidl, Nikolaus. 1998. 'The potential of jatropha curcas for the production of a diesel substitute – Nicaragua,' for workshop on the potential of *Jatropha curcas* in rural development and environment protection, Zimbabwe, 13-15 May.

Food and Agriculture Organisation. Commission on Genetic Resources for Food and Agriculture. 2007. *The State of the World's Animal Genetic Resources for Food and Agriculture*. Rome: FAO. Available at http://www.fao.org/docrep/010/a1250e/a1250e00.htm

German Federal Ministry for Food, Agriculture and Consumer Protection (GMELV), WorldWatch Institute and GTZ. 2006. *Biofuels for Transportation – Global Potential and Implications for Sustainable Agriculture and Energy in the 21st Century*. Summary of Report. June. Available at www.worldwatch.org

GRAIN. 2008. 'Making a killing from hunger," April. Available at www.grain.org

GRAIN. 2007a. 'Scientists contest IPCC biofuel advice,' November. Available at www.grain.org.

GRAIN. 2007b. "Corporate power – Agrofuels and the expansion of agribusiness,' *Seedling* – Agrofuels special issue. July, pp. 10-15.

GRAIN. 2007c. 'The new scramble for Africa,' *Seedling* – Agrofuels special issue. July, pp. 36-45.

Hawley, Charles. 2008. 'Pressure grows on EU to ditch biofuels,' *Business Week*, 16 April.

Low, Tim. and Booth, Carol. 2008. *The Weedy Truth about Biofuels*. Invasive Species Council, Melbourne, Australia, March (revised edition). Available from http://www.invasives.org.au

Lynas, Mark. 2008. 'How the rich starved the world,' *New Statesman*, 17 April.

Mushita, Andrew and Carol B. Thompson. 2007. *Biopiracy of Biodiversity – Global Exchange as Enclosure.* Trenton, NJ: Africa World Press.

Pimentel, David and Tad Patzek. 2005. 'Bioethanol as subsidised burning of food, with no energy gains,' Cornell University. Article available at www.sciencedaily.com/releases/2005/07/050705231841.htm

_____. 2001. Similar earlier study as above, available at www.news.cornell.edu, Cornell University, 6 August.

Panos Environment Programme. 2007. 'Fuelling controversy – can biofuels slow the speed of climate change? Bibliography of related publications and resources,' London: Panos. Available at www.panos.org.uk/environment

Righelato, R. and D. V. Spracklen. 2007. 'Carbon mitigation by biofuels or by saving and restoring forests?' *Science* 317.

Rothkopf, Garten. 2007. 'A Blueprint for green energy in the Americas,' Inter-American Development Bank. Available at http://www.iadb.org/biofuels

Smolker, Rachel; Brian Tolker, Ann Petermann, Eva Hernandez. 2007. *The Real Cost of Agrofuels – Food, Forest and the Climate.* Global Forest Coalition.

Steenblik, R. 2007. 'Biofuels – at what cost? Government support for ethanol and biodiesel in selected OECD countries,' International Institute for Sustainable Development, Canada, September. Available at http://www.globalsubsidies.org

Stewart, Sinclair and Paul Waldie. 2008. 'US Food producers, speculators square off,' *Globe and Mail* (Toronto), 23 April.

Tsiko, Sifelani. 2007. 'Agro-fuels debate…' *CBCD Africa Region Magazine*. Harare: Community Biodiversity Development and Conservation, Vol. I (Oct-Dec): 32-33.

World Bank. 2008. *Agriculture for Development. The World Development Report 2008.* Washington, DC: World Bank.