

SPECIAL THEME ISSUE: PARTNERSHIPS FOR BIOENERGY IN AFRICA

Policies and partnerships for biofuels development in Africa

By Maria Milagros Morales, SEI

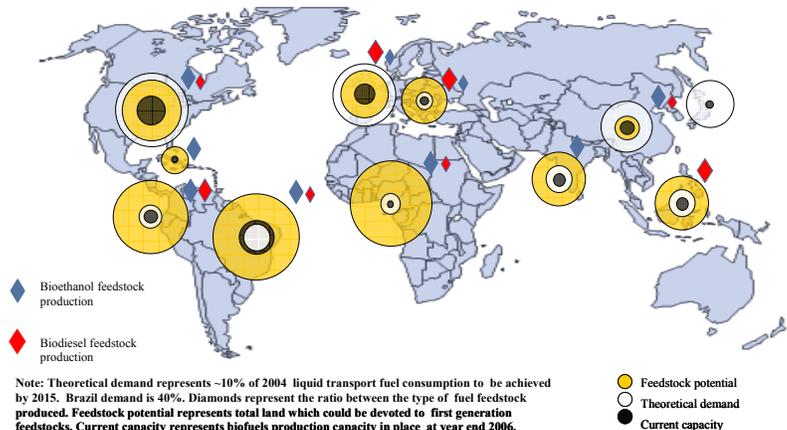
Globally, biofuels are becoming increasingly important as alternative, renewable sources of energy with the potential to displace polluting and expensive fossil fuels while supporting rural transformation in developing countries. Currently, liquid biofuels originating from biomass are the focus of worldwide interest due to concerns about energy security, climate change, and the need to support local agriculture and stimulate trade between northern and southern regions and among southern countries themselves.

In the coming years, as demand from the transport sector for fuel grows in the north, international trade in biofuels such as ethanol and biodiesel, as well as biofuel feedstock is set to increase. Countries in the north are increasingly interested in investing in biofuel production in the south, with the result that liquid biofuels are fast transitioning from being a local resource to a valuable global commodity. Although the challenges associated with establishing an international trade regime north-south-south are unquestionable, the related benefits of international trade are manifold. Developing countries will be in a position to diversify their energy matrix, exploit local renewable resources, and improve rural livelihoods while earning valuable foreign exchange from exports as well as from savings through fuel substitution.

Until recently, biofuels have not been commercially viable without significant government support. Thus far, Brazil is the only country with a large biofuels industry that is competitive without any type of subsidies. Policies to support the development of the sector include measures to stimulate domestic biofuel production through direct government support and import tariffs. Other policies such as fuel blending and tax reductions for biofuels directly target the replacement of fossil fuels.

Trade liberalisation within the biofuels sector would help to increase competition and, consequently, improve efficiency and decrease production costs. The role of government is crucial to enable favourable conditions for biofuels markets to develop, to attract the private sector to invest, and to facilitate public-private-partnerships for local sustainable development.

Policies must be carefully designed to ensure that the domestic supply and international trade in biofuels are harmonised and aligned with other agricultural and energy



Biofuels Supply and Demand markets (New Energy Finance)

sector priorities. Moreover, they should ensure that effective and fair mechanisms are in place to guarantee environmental sustainability. Thus, it may be possible for poorer countries to take advantage of the enormous potential of biofuels for socio-economic development while reducing the associated risks.

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Public-private partnership for the use of biomass gasification technology in Uganda

By Sunil Dhingra, The Energy and Resources Institute (TERI), India

The government of Uganda, under its Energy for Rural Transformation (ERT) programme is working to expand biomass energy use in Uganda through the increased use of biomass based gasification systems. The Ministry for Energy and Mineral Development, together with the World Bank, has partnered with The Energy and Resources Institute (TERI), India to establish several demonstration/pilot projects which are being implemented through public-private partnership.

As in most Sub Saharan African countries, the development of the rural energy sector in Uganda is considered vital for poverty reduction and is thus viewed as a long term policy priority. To this end, the government has launched an ambitious scheme to expand rural electrification coverage from the current low rate of 1%, to 10% within 10 years through the increased use of biomass-based gasification systems for electricity generation. The initiative is being implemented by The Energy and Resources Institute (TERI), India, a leading international energy and environment research organisation with specialised expertise in the introduction and scale up of such systems.

The program aims to demonstrate the commercial feasibility of the systems in Uganda by adapting the technology to make use of various local biomass materials and is training local engineers to raise awareness about the potential of biomass



Photo: Fiona Zuzarte

Jatropha plantation in semi-Arid region in India

gasification for various heat and power applications including rural electrification. Several pilot projects are underway to demonstrate this energy-supply model in a variety of settings including universities, where the electricity generated is supplied to the campus buildings. While operational and technical support costs are supplied by the programme, the system hardware costs are shared with the end users.

This public-private cost sharing model is important for the future sustainability of the programme and is

innovative in that it involves government investment in the appropriate technical expertise and, crucially, the participation of local communities. The pilot projects have been setup to meet the demand for the electricity generated and the feasibility of the model. TERI plans to work with other countries in the region including Tanzania, Mozambique and Nigeria to replicate the biomass gasification programme through the same model of public-private cooperation.

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A biofuels prenuptial

Questions for policy makers before the marriage

By Margaret N. Matinga, University of Twente, Netherlands

The current biofuels debate is often framed between two opposing views which seem impossible to reconcile. For countries in both the north and the south, developing coherent biofuels policies will depend not on persuading one extreme end to join the other, but rather on finding optimal solutions for a complex issue. For Southern policy makers in particular, the question that should be asked is: under what circumstances can biofuels be produced for optimal sustainable development benefits? Addressing this issue will help Southern policymakers enter into better partnerships.

Ultimately, the motivation for the south, in particular Africa, to trade in biofuels should be based on whether and how it contributes to sustainable development as a whole, rather than a consideration of GHG emission reductions. Although exporting biofuels to the North seems particularly attractive, Africa must avoid the all too familiar trap of biofuels becoming another “extractive” industry. In current discussions, the focus has been on Africa as a feedstock producer and very little debate has centred on who will produce these biofuels and how they will be produced. This risks a return to the age-old pattern of exporting unprocessed and semi-processed products to the north, leaving African farmers with marginal benefits. Ideally, biofuels should benefit poor and small scale farmers and their households. For this to occur, the biofuels value chain must, to a large extent, shift to the countries of feedstock origin, so that processing is undertaken by small scale farmers therein.

Can biofuels benefit poor farmers?

The challenge is that these small farmers often lack the capacity to

¹Extractive here is used in a broader sense not just of mining but a general extraction of resources in form of raw materials and commodities with little or no processing within the continent.



Farming Soya

meet standards and are often geographically scattered, requiring more complex logistical arrangements (e.g. transporting feedstock to a production plant or pooling together liquid biofuels made at different satellite depots). Without supportive policies, these smaller farmers seeking partnerships with the north are unlikely to be competitive against larger, well organized private entities that own substantial land on the continent. Northern and Southern policy makers and partners should therefore look for new ways of efficiently and sustainably supporting these farmers. Fair trade initiatives in the food industry and elsewhere may provide starting points for such innovative partnerships in the biofuels sector.

Biofuels produced for whom?

The discussion on benefits for poor farmers leads directly to the next question which is: for whom should biofuels be produced? There seems to be an assumption (especially in line with the EU biopact) that biofuels should primarily be produced in the South for export to the North, particularly the EU. It is also assumed that biofuels should be produced for the transport sector. These comfortable positions not only raise concerns over scales of production (and the inherent equity, social and environmental problems of large scale biofuels productions) but also ignore two important points as far as the sustainable development agenda of the potential producer countries is concerned.

Firstly, it ignores the fact that in the south, access to clean energy remains extremely low and biofuels production for local utilisation can go a long way to meeting this gap. Providing clean energy in the South may have broad developmental benefits beyond GHG emission reduction. Indeed one may ask why the South should produce biofuels simply to assist the North to meet its GHG emissions obligations when the production and use of biofuels in the South may not only reduce global GHG emissions, but also meet energy needs, improve health

due to clean energy use and protect local environments. Moreover, the transport of biofuels from the South to the North has added to the litany of criticism against biofuels. The localisation of production and use of biofuels can contribute to reducing the CO₂ emissions from the lifecycle of biofuels while yielding local benefits in poorer areas.

Secondly, while transport fuels are indeed a major drain on national revenues due to importation costs of petroleum based transport fuels, there are other needs in the South that are equally if not more important. Bioethanol for use in the household sector can improve health, particularly for women and children who are exposed to high levels of indoor air pollution from solid fuel use. Biodiesel can also power clinics to enable wider, as well as emergency use, of health facilities.

Conclusions

The debate surrounding biofuels remains complex and ill-understood with no clear “yes or no” answer. As with many products and industries, its impacts can be negative or positive depending on how they are exploited. For the Southern partnerships perspective, the starting point should not be GHG reduction targets in the North. Rather, it should be maximising sustainable development benefits for the poor in the South. It is issues such as these that policy makers both in the South and North need to address as they enter partnerships with each other for biofuels development and trade.

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Development of Local Biofuel Markets: A Case Study from Ethiopia

By Fiona Lambe, Stokes Consulting Group/Gaia Association

African governments play a crucial role in supporting the emergence of local biofuels markets by facilitating public-private partnership and introducing policies to increase biofuel production. This is the case in Ethiopia where the government is currently working with the private sector to support the development of a household market for domestically produced ethanol.

Since 2004, Gaia Association, a local Ethiopian NGO, has been working to provide households in Ethiopia with access to ethanol, a clean, affordable and environmentally sustainable cooking fuel, to replace traditional, unhealthy, and increasingly unaffordable solid biomass and kerosene. In late 2008, the first ethanol fuelled cooking stove, the CleanCook (CC) stove by Swedish company, Dometic AB, will be commercialised for the household market in Ethiopia in a venture led by Ethiopian company, Makobu Enterprises PLC. This progress came about as the result of public-private sector partnership in Ethiopia as well as cooperation at both the international and local level.

The ethanol utilised for the stove project is produced at one of three state-owned sugar factories, Finchaa Sugar, from molasses, a by-product of sugar cane production. Initially, Project Gaia began work in Ethiopia in response to a request made by Finchaa and the Ethiopian Sugar Industry for assistance in developing a domestic market for its ethanol by introducing alcohol fuelled cooking stoves to Ethiopian homes. This was at a time when no other domestic market was being considered for the product and the export price for ethanol was prohibitively low. Thus, from the beginning, the government has had a clear stake in the stove project. Since the sugar industry in Ethiopia is state-owned, it was vital that Gaia Association, at an early stage, established

Box 1: Urban Clean Cooking Initiative: Providing Ethanol Stoves to Condominium Residents in Addis Ababa

The Municipality of Addis Ababa EPA (Environmental Protection Authority) and a Sub-City district selected by the EPA is working closely with Gaia Association, Dometic AB, Makobu Enterprises, and Finchaa Sugar Factory to develop a project whereby initially 2000 CleanCook stoves will be installed in newly built condominium apartments. These apartment units are conceived as private developments that are facilitated by government to play a role in the city's urban renewal. Wood and charcoal stoves are not permitted in these condominium buildings. The CC stove will be financed within the price of the condominium unit; financing will be provided by the condominium association with the assistance and facilitation of the Municipal EPA, the Sub-City Administration and a financing entity. The finance rate is regulated by the government and is kept low.

Ethanol fuel will be purchased from Finchaa Sugar Company at a contractual price by Makobu Enterprises and delivered to the condominium association distribution point. The fuel storage and distribution infrastructure will be financed by the condominium association. The Ethiopian EPA will work with one Sub-City Administration to package the stove financing into the condominium financing through the national bank. As a result, a major energy need (cooking) will be acknowledged in urban condominium development and financing. Two thousand CC stoves will be financed in 2008 and approximately 360,000 liters of state-owned domestically produced alcohol will supplant kerosene, charcoal and firewood use. The other nine Sub-City administrations could then replicate this model.

Since the CC stove is clean burning, its introduction will improve indoor air quality and, consequently, household health. Another advantage of this model lies in the potential for Clean Development Mechanism (CDM) financing. The effect of switching from kerosene to ethanol for cooking in households is to reduce both indoor air pollutants and GHGs. Because alcohol is a cleaner fuel (CO₂ emissions) than all other liquid and solid household cooking fuels presently available in Ethiopia, the ethanol fuel and stove have the potential to qualify for CDM financing

a dialogue with the most relevant ministries to communicate the enormous potential of domestically produced ethanol in the household market. At the commencement of the pilot project, key contacts were developed at the Ministry for Trade and Industry and the Ministry for Mines and Energy, and efforts were made to ensure that both Ministries were well briefed on the progress and success of the project.

In 2006, the government began to consider allocating ethanol for fuel blending in the transport sector. Given that ethanol supply will remain constrained until early 2010, convincing the government to prioritise the household sector at the



Local manufacture of CC stove parts, Addis Ababa

Photo: Fiona Lambe

early stages was crucial, and was achieved through round table discussions with the relevant ministries. Crucially, Gaia Association demonstrated the considerable foreign exchange savings which would accrue at the national level by replacing expensive kerosene imports with locally produced ethanol. As a result of this policy dialogue, ethanol for

Private Sector Participation

Makobu Enterprises, a local company, will lead the way in scaling up the commercial venture, initially in the condominiums, and later, to the broader private household market in Addis Ababa. Currently the CC stoves are imported from Slovakia where they are manufactured, but local production will soon commence in Addis

confidence are established among all parties and the lines of communication remain strong. Gaia Association has proven that the CC stove is appropriate technology for the Ethiopian market and has lobbied the government to ensure a reliable supply of ethanol is available in the early stages of commercialisation. This in turn has built confidence in Makobu Enterprises that the risk they are taking in investing in the start-up of the business is low and that there will be a market for their product. Dometic, facilitated by Gaia Association, has developed a strong working relationship with Makobu and has brokered a fair and workable licensing agreement for the local manufacture of their product.

Sectors that benefit

Although the challenges associated with starting a business in Ethiopia are undeniable, the potential rewards are great, not just for Dometic and Makobu, but for the households that will benefit from an improved fuel and stove, and for the government of Ethiopia which will save foreign currency by making use of a local renewable resource. The role of government policy has been central for the development of a domestic bioethanol industry in Ethiopia, as well as for building a local market for ethanol as a household cooking fuel. At a time when many African countries are embarking on large scale biofuel production for the export market, the Ethiopian government has recognised the need to give priority to the domestic household sector where locally produced ethanol will bring the most significant socioeconomic and environmental benefits. Continued cooperation and dialogue between the public and private sectors will be essential for the future success of this initiative. Gaia Association and its partners are working to forge a common approach that will create a locally owned, sustainable business model to provide affordable and clean household energy to millions of Ethiopians.

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Photo: Fiona Lambe

Domestic use of clean cook stove, Addis Ababa

the household sector is now considered a national priority.

Gaia Association has partnered with the City Government of Addis Ababa to supply stoves and ethanol to newly developed urban housing projects around the city (See Box 1). These developments are part of the governments' initiative to reduce the number of slums in the city by moving families into condominium apartments. The use of traditional biomass is prohibited in these dwellings and kerosene is strongly discouraged for safety reasons. Thus, the government acknowledges the need for a local clean cooking alternative and recognises the ethanol stove as such.

Ababa, which will make the technology more affordable to the average Ethiopian household. Dometic has assisted with Makobu with modifying the stove design to better meet local needs and is providing technical guidance for developing the local stove production line. A successful venture in Ethiopia will encourage Dometic to initiate a market for the CC stove and possibly other Dometic products elsewhere in Africa and other emerging markets.

Gaia Association in its capacity as an NGO is playing a key 'bridging' role between Makobu, Dometic and the government of Ethiopia to ensure that the project becomes commercially sustainable. It is crucial that trust and

Lessons from China:

Rural Household Biogas, an Integrated Solution for Sustainable Livelihoods

By Lailai Li, SEI

Food production and energy shortages are among the most serious challenges facing African farmers today and should be viewed as intrinsically linked. Failure in rural development programs has often been found due to lack of a holistic approach or coordination between government, local communities and the private sector. The two case studies are reviewed below to first examine the factors affecting an integrated rural development plan in South Africa (2007, Ziervogel, G., Taylor, A., Thomalla, F., and T. Takama), and then draw on the lessons learned implementing a successful rural biogas programme in China (2000, Lailai Li) to explore how this model may be applied in the context of African rural development programming.

With more than 55% of the population considered very poor, an unemployment of 69% and almost 68% of the population without access to education, the rural district of Sekhukhune, South Africa is characterised by extreme poverty. Variability of rainfall and high evaporation severely limits subsistence farming and most families live entirely on government grants. Poverty and environmental degradation reinforce one another with energy shortages at the household level leading to deforestation and soil erosion.

Integrated Rural Development in South Africa

In 2002, the district of Sekhukhune, South Africa was selected as a node for Integrated Sustainable Rural Development, a policy developed by the national government to facilitate sustainable economic growth and address rural unemployment in the area. Key programme areas included employment generation through training and the funding of income generation projects to support food production and business development. Despite recognizing the main causes of poverty and identifying the major areas to be addressed, the programme was largely unsuccessful for a number of reasons. The approach was generally fragmented with little coordination between the government, community and household levels. This in turn led to inefficient resource allocation and a divergence in the expectations and priorities of the local government and the villagers. The villagers, more concerned about income, found it difficult to see how they fit into the governments' broader development plans. The community viewed the programme as disconnected from their needs and as a result, participation was low.

These problems were confounded by a lack of government support for the farmers' initiatives. Waiting lists for project approval were long, and where businesses did receive seed

funds, there was often no viable market for their products. Moreover, financial and technical support for essential water conservation projects was lacking and as a result, communal garden schemes and agricultural activities had very limited success.

The Sekhukhune case raises a number of important issues related to the way in which integrated rural development programmes should be implemented. Clearly, a strategic programme for linking various rural development initiatives and ensuring participation of all stakeholders, public and private, is needed. Looking to successful initiatives in other regions can be a useful way of identifying workable models for adoption in the African context.

Rural Biogas program in China.

In the early 1980s, a similar pattern of environmental degradation and extreme poverty to that of Sekhukhune district existed in Gongcheng County, southern China. At the time, the local energy structure was characterised by heavy dependence on gathered fuelwood which led to deforestation and soil erosion. The loss of soil severely impacted upon the livelihoods of the local communities which relied on subsistence farming and fed into the cycle of poverty.

In 1985, the county government of Gongcheng, China, recognising that household energy shortage is a key factor contributing to rural poverty and environmental degradation, adopted a series of

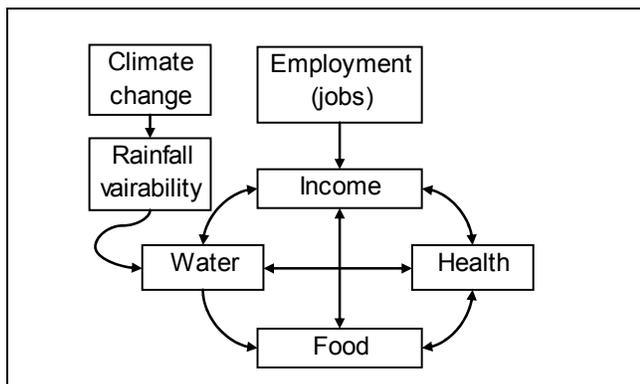


Figure 1: Poverty perceived in Sekhukhunes

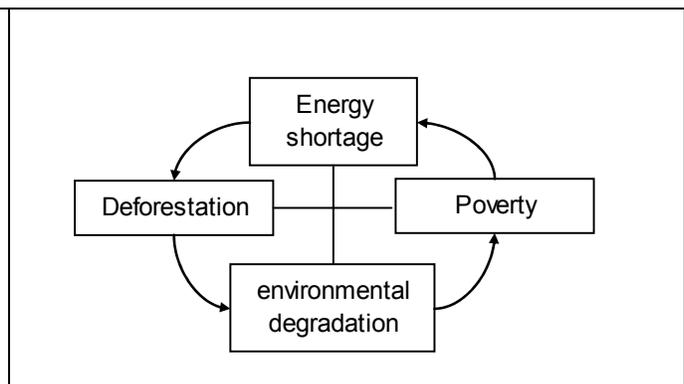


Figure 2: Poverty cycle driven by energy shortage



Biogas use in China

ture was involved in introducing improved agricultural and livestock varieties, while the Department of Planning facilitated the market development for the fruits produced using biogas wastes.

To encourage private sector participation in the initiative, the government contracted the Rural Energy Service Company (RESCO),

a private company specialising in research and development for renewable energy technology, to run demonstration projects and provide training and technical support for the participating villages. RESCO, as an independent economic entity, is responsible for its own profit and loss, but enjoys tax reductions for supporting the household biogas program. Employment was created for farmers who received training and the rural villages worked closely with RESCO to develop new techniques for the effective use of biogas systems.

The role of the communities, regarded as the main implementation force for the program rather than its beneficiaries, was crucial for the implementation of the project. They are fully engaged in every aspect of the programme, from energy production to agricultural development and land and water resource management.

The programme was highly successful and in the 10 years following its launch, local farmers saw their annual income increase from RMB 200 to RMB 3400. Moreover, in this time, fuelwood consumption decreased by 80%, forest cover rose

from 44% to 80% and the village of Gongcheng became energy self sufficient. The Chinese government, with support from international development cooperation agencies including UNDP, FAO and the World Bank, has invested heavily in the scheme and the “Gongcheng Model of Ecological Agriculture” has since been replicated throughout China.

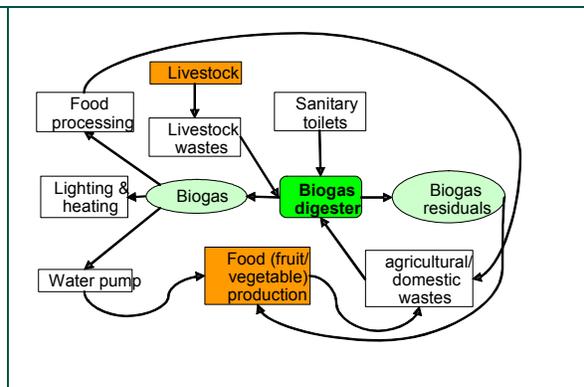
Conclusion

If energy access is the key factor for poverty of the communities, then household energy must be considered central to rural development and the holistic approach adopted in Gongcheng should be considered by African policy makers when designing integrated rural development plans. As demonstrated by the involvement of RESCO in Gongcheng, the private sector can play a central role in strengthening livelihoods and enhancing community participation in rural development programmes. Coordination between government departments and local stakeholders and participation of the communities in planning were obviously lacking with the Sekhukhune district programme, which were affecting the implementation process and were seen as major reason for the failure of the initiative. In addition, development of local markets to support livelihoods was neglected, where the government can actually play an important role. The county government of Gongcheng, by focusing on involving the village-level beneficiaries and providing training and technical support, ensured local ownership and future sustainability of the projects. Moreover, by investing in research and development, the rural biogas technology was adapted to serve local needs in an effective manner.

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Box 2: Household Biogas System

Household biogas systems are simple, featuring a biogas digester connected to livestock barn (or sanitary toilet), kitchen and agricultural production field. Livestock and organic wastes from agriculture and cooking are main raw materials of biogas production. A family of 5 members, raising 2 pigs and with household waste would generate enough biogas to provide energy for cooking, lighting and small food processing. The biogas wastes are good organic food fertilizers. Farmers can also sell the livestock which thereby supplementing income.



Assessing the African Biofuel Debate

The Need for Sustainable Biofuel Development Strategies

By Bothwell Batidzirai, Chinhoyi University, Zambia

Access to modern energy services is now widely recognised as being a prerequisite for sustainable development and essential for addressing the MDGs.

However, for most of Sub-Saharan Africa, traditional biomass accounts for 50-90% of national energy supply and as populations grow, fuelwood shortages and environmental degradation are increasingly common. Moreover, since most SSA countries rely on petroleum imports, the rising price of crude oil is having a severe impact on national economies and further reducing household energy access for the poor. The recent emergence of biofuels as an alternative energy option for the region has sparked an intense debate on the socioeconomic and environmental implications for African economies.

While locally produced biofuels have the potential to enhance energy security and boost socioeconomic development for African economies by reducing dependence on oil imports, there are fears that their development could jeopardise food security, damage biodiversity and destroy rural economies by increasing competition for land. It is argued that the demand for land to grow

fuel crops could also result in deforestation. Concerns that biofuel development will compromise agricultural production are growing and this is compounded by the fact that global food stocks are currently dwindling.

Pro-biofuels analysts contend that

development is very context specific and a successful programme in one area may not be replicable elsewhere. It is crucial that African governments take full advantage of all of the enormous benefits of indigenous biofuels industries, while taking all measures to reduce potential risks. This



Jatropha Seed and plant

developing countries have nothing to lose from promoting biofuels since land, particularly degraded land that can be utilised for fuel crops such as sugar cane and jatropha, is in excess supply. In addition, biofuel production has the potential to boost rural economies by creating employment and a market for agricultural products. Since biofuels are considered carbon neutral, developing countries could take advantage of carbon finance as well as international markets for biofuels.

Although this debate is necessary, often analysts generalise their conclusions, forgetting that bioenergy devel-

will require carefully thought through programs and effective policies, encompassing capacity building and localization of technology. African countries must examine their national resource structure, particularly in terms of land and water availability, and technical expertise while ensuring food security and environmental sustainability are not threatened as a result of biofuel development.

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Announcements: Recent Events and Publications from Climate and Energy Programme in Stockholm

SEI has participated in the following events:

- Washington International Renewable Energy Conference (WIREC), Washington, USA, March 2008.
- Commission on Sustainable Development (CSD), New York, USA, May 2008
- World Bioenergy Conference, Jönköping, Sweden, May 2008

More information can be found on the 'News and Events' link at www.sei.se

The following recent reports are available on the 'Publications' link at: www.sei.se

- Joint report with UNIDO entitled *Industrial Biotechnology and Biomass Utilisation: Prospects and challenges for the developing world* (keyword search: 'Industrial Biotechnology')
- Working Paper entitled *Market Barriers to Clean Cooking Fuels in Sub-Saharan Africa: A Review of Literature* (keyword search: 'Household cooking')

A new series of reports have been issued on Bioenergy from Sugarcane in southern Africa and are available at: www.carensa.net