"BIO-FUEL LESSONS (Prelimary Thoughts): CONSIDERING THE TANZANIAN JATROPHA 'CRISIS' AND BEYOND" (Abstract ID º 106)

Nadra Hashim, PhD.
Assistant Dean/Associate Professor
Jindal School of International Affairs
Jindal Global University, Sonipat, India

When in 2007 the *Wall Street Journal* wrote that Goldman Sacs noted that a miracle plant Jatropha could be 'one of the best candidates' for biofuel production, it seemed like the next biofuel miracle plant was discovered and Africa farmers were poised to share in the millions of dollars the plant would yield. However, the story of Tanzanian Jatropha farming is a story of mixed success, where large plantations are not only not better than small biofuel farms; they are at present, not even possible. One firm suggests that small plots, farmer owned, with potential for measured growth may be the way forward should Jatropha demand ever begin to exceed current supply

Introduction:

Those concerned with 'energy reliance' are seized with two divergent impulses. Continuing to look for new sources of petroleum, coal and natural gas or finding the alternative so-called 'clean' forms of energy. In many cases this 'alternative and clean' source of energy is some kind of bio-fuel.[1] The unique, profitable and responsible aspect of biofuels concerns how the raw product is produced into fuel and how the fuel in turn produces energy in a 'clean' fashion:

> Biofuels are fuels produced from organic material, especially plants. Through photosynthesis, plants convert carbon dioxide from the atmosphere into energy. When those plants are burned, or made into fuel in other ways, they release the energy they produced as well as the carbon dioxide they utilized to create that energy.[2]

For those involved in cultivating and producing bio-fuels there are two additional and possibly 'divergent impulses' and these relate to the popular dislocations that producing bio-fuels entail: namely, whether to produce bio-fuel as a massive cash-crop enterprise, or to promote it as a cottage or 'boutique'

---

1 EPA, "Renewable Fuels: Regulations & Standards" 2012 Standards for Renewable Fuel Standard Program (RFS2): Final Rulemaking http://www.epa.gov/otaq/fuels/renewablefuels/regulations.htm and EPA, " Biodiesel: Technical Highlights" EPA420-F-10-009, February 2010 http://www.epa.gov/otaq/renewablefuels/420f10009.htm

2 Ecomii, "Biofuels," http://www.ecomii.com/ecopedia/biofuels

initiative. In the developing world, the history of growing cash-crops is rife with tales of unfortunate outcomes and unintended consequences. While there is much to be emulated in current biofuel production efforts – especially where its goals or ends are concerned, there are also particular aspects, especially in the means or production of bio-fuels that are cause for reflection or concern.

The story of Tanzania is not unique in this regard. It is with a view to Tanzania's colonial and post-colonial history with cash-crops, as well as its experience and prospects of producing clean energy, most specifically Jatropha bio-fuel, that production should be examined. Ultimately, the case of Jatropha biofuel production in Tanzania, like bio-fuel production elsewhere suggests some thought should be given to the following questions: [1] how best to establish bio-fuel cash crops without displacing edible subsistence and export producing farming/farmers and [2] having secured the first imperative, how to create incentives to induce farmers of edible crops to consider growing bio-fuel produce. To faithfully consider these questions it is important to examine larger trends where bio-crops have succeeded and also where they have 'failed.' Then analysis must turn to Tanzania's recent and troubled efforts with Jatropha bio-fuel production and consider it in the context of historical trends in cash-cropping in East Africa, and in Tanzania, specifically. After exploring the specifics of the 'Jatropha' crisis of recent history, analysis will turn to policy lessons from an examination of Tanzania's current bio-fuel/Jatropha efforts.

Current Trends

Tanzanians are still first and foremost farmers.

"Agriculture is the leading economic sector in Tanzania, providing a livelihood to 80% of the population subsisting on less than two hectares. It is the primary source of food and raw materials accounting for not quite half of the GDP and a leading export sector."[3]

[3] United Republic of Tanzania, "Guidelines for Sustainable Liquid Biofuels Investments and Development in Tanzania(draft)." Ministry of Energy and Minerals, 2008.

Since the 1990s, there has been exponential interest and growth in biofuel. Joining the ranks of long established developing now rising world powers such as Brazil, African countries have become the site for experimentation and exploration where innovative biofuel production is concerned. However, rather than a primary focus on domestic production, large plantation [or *latifunda* production] in Africa, especially where East African biofuel production is concerned is focused on cash-crop export. The legacy of cash-cropping in Africa, and East Africa, informs, illuminates, and depending on one's perspective, cast its own long shadow over any commercial agricultural process where foreign export is concern.

<u>History</u>

The history of German colonial rule in Tanganyika is well documented. Like many colonial powers, the German government initially induced Tanganyikans to grow cash-crops, specifically cotton. For a period just under fifteen years, 1890-1904, the Germans instituted a 'grow more crops' campaign, which raised significant revenue for the colonial administration.

However by 1905, after two years of missing payments to farmers, Tangayikans rebelled, enlisting the assistance of the religious and spiritual community, specifically 'witch doctors' who dispensed medicated water (or Maji in Swahili), and the Maji-Maji rebellion was born. The rebellion went on for two years until 1907 when the German government lifted martial law and devised a reconstruction program. German authorities ultimately adopted and adapted local patronage tribal and agricultural systems into the Kilimanjaro Native Planters Association which later became the Kilimanjaro Native Cooperative Union.[4]

When Tanganyika became independent of colonial authority and merged with Zanzibar it took the name Tanzania. Many Tanzanians, grandparents at the time of colonial independence still remembered the

[4] See Hashim, *Language and Collective Mobilization*, 2009, pp. 127-130; Mary E. Townsend, The Rise and Fall of Germany's Colonial Empire, 1884-1918 and Hugh W. Stephen, *The Political Transformation of Tanganyika: 1920-67*, 1968 p. 18 .

Maji-Maji rebellion they witnessed as children; it seems the story of rebellion has been communicated through the national cultural consciousness. As a result, Tanzanians possess what seems to be vibrant deep sense of personal autonomy and persistent skepticism which informs much of their politics, specifically their agricultural politics.

Jatropha in Tanzania: A Promising Start

Jatropha is a curious plant marked by paradoxes. It's Latin name is *Jatropha curcas L.,* where Jatropha derives from a Greek compound 'Jatros' meaning doctor, while the second part of the word derives from 'trophe' meaning nutrition. By contrast, while its Swahili name *mmbono kaburi* or *nyonyo kaburi*, where kaburi means grave, and as its name implies, it is used to mark graves of the dead.[5] Jatropha(JCL) is an evergreen shrub which thrives in semi-arid regions and produces bulbs that yield oil, medicine, antiseptic and rheumatoid treatment. These same bulbs or fruits are toxic to humans. [6]

JCL is hardy, resistant to frost, but is not self-prorogating. Jatropha (JCL), relies on pollination by bees, without which it has a reduced yield. Further, while JCL relies on bees it is also vulnerable to many varieties of " insect pests." [7] Another feature of Jatropha, it requires a great deal of water. A JCL plant

[5] From Cultivation of *Jatropha curcas* L, page 3, http://www.jatropha.pro/PDF%20bestanden/CultivationofJatrophacurcasinIIndia.pdf
And Mathias Kempf, "Jatropha Production in Semi-Arid Areas of Tanzania: A Feasibility Study" Rural Livelihood Development Company, Page 6, http://www.jatropha.pro/PDF%20bestanden/RLDC_Jatropha_Production_in_Semi-Arid_Areas_of_Tanzania_2007.pdf

[6] Mathias Kempf, "Jatropha Production in Semi-Arid Areas of Tanzania: A Feasibility Study" Rural Livelihood Development Company, Page 6, http://www.jatropha.pro/PDF%20bestanden/RLDC_Jatropha_Production_in_Semi-Arid_Areas_of_Tanzania_2007.pdf

[7] K.C. Verma and A.K. Gaur, " Jatropha curcas L.: Substitute for Conventional Energy," *World Journal of Agricultural Sciences* 5 (5): 552-556, 2009 Page 554 http://www.idosi.org/wjas/wjas5(5)/5.pdf and Agroforestry Network, "Identifying the major insect pests of Jatropha curcas," excerpts from Philippine Council for Agriculture, Forestry and Natural Resources Research and Development. Highlights 2009, posted at http://www.pcarrd.dost.gov.ph/momentum/_afin/index.php?option=com_content&view=article&id= 806:identifying-the-major-insect-pests-of-jatropha-curcas&catid=87&Itemid=2

needs 4-5 years to mature, and with steady irrigation can produce up to three harvests annually; without depending on rain, one to two harvests.[8]

Not-withstanding all the aforementioned problems and paradoxes, international investors identified Jatropha as a potentially rugged and profitable "new" bio-fuel crop. In 2007 Goldman Sacs noted Jatropha as one of the best candidates' for biofuel production, around the same time Dutch, German, and British companies began investigating or establishing Jatropha growing possibilities in Tanzania.[9] Among the international/large scale ventures to establish Jatropha 'plantations' Sun Biofuels, Donesta and Bioshape Biofuels(among others). In 2004 the British are Sun Bio-fuel Company (Plc) began initial surveys of land, and waited for government approval, which took two to three years.[10] Ultimately by 2007 Sun Biofuels had an eighty-eight percent stake in a venture called Sun Biofuels Tanzania. [11] Having applied for 20,000 hectares in 2005, Sun Biofuels was only granted 9,000 in Kisarawe district, a coastal local, which is 150 miles from Dar-es-Salaam.[12] The planting area would include eleven villages, and all totaled a population of just under 12,000 persons, who were to be compensated.[13] The Tanzanian government initially stated that 'investors could only get a title deed — after the villagers have been compensated for loss of land.[14]

A relatively modest project in comparison to bio-fuel projects in other countries, most notably in Latin America, which cultivates millions of hectares; there was genuine excitement among local and

---

[8] Raymond Jongschaap, State of the Art of Breeding and genetic improvement of Jatropha curas L, Wageningen and Research Center, Plant Research International BV, the Netherlands, Slide 11, 2010, http://ec.europa.eu/research/agriculture/pdf/events/3jatropha_en.pdf.

[9] P. Barta, Jatropha Plant Gains Steam in Global Race for Bio-fuels, The Wall Street Journal, August 24, 2007, http://online.wsj.com/article/SB11878866208090671 6.htm l

[10] Kemp, 2007, p. 20 http://www.jatropha.pro/PDF%20bestanden/RLDC_Jatropha_Production_in_Semi-Arid_Areas_of_Tanzania_2007.pdf

[11] Sun Biofuels Invests $20 Million in Tanzania Jatropha Project, *Biopact*, 8/06/2007 http://news.mongabay.com/bioenergy/2007/08/sun-biofuels-invests-20-million-in.html

[12] 1 acre = 0.4 hectare (ha); 1 ha = 2.5 acres

[13] Just under 3,000 households were to be compensated slightly less than 650,000.00 US dollars,(Ibid), http://news.mongabay.com/bioenergy/ 2007/08/sun-biofuels-invests-20-million-in.html.

[14] Biopact (towards a green energy pact between Europe and Africa), Sun Biofuels invests $20 million in Tanzania Jatropha project Monday, August 06, 2007.

international investors regarding Sun's 'large' project in Tanzania. Further, there was speculation and academic study that though Jatropha was a promising 'niche' industry, with the right combination of investment and government protections it could transition into a technology that could help induce a 'regime change' - presumably a transition to clean green energy - that could then 'change the [energy] landscape' currently defined by a reliance on traditional fossil fuels.[15] Niche, landscape and regime correspond nicely with the idea of small, medium and large ventures. However it is useful to bear in mind that even the largest venture in Jatropha farming, thus far, would be relatively small as compared with corn or sugar cane based ethanol production in North and South America.

Thus, even the largest of East Africa's ventures including Sun Biofuels Tanzania, are at least at this stage, big investors participating in a rather modest 'niche' industry. Another of the 'big' investors involved in a JLC venture in Tanzania was Donesta Ltd. Biofuels. Donesta Ltd established its JCL plantations in 2007 for the express purpose of exporting Jatropha biofuel directly for the expanding European biofuel market. Donesta, significantly smaller than Sun, acquired 2,000 hectares, and has the innovative strategy of planting sunflowers in tandem with the Jatropha.

The large producers Sun and Donesta focused on export; meanwhile a group of medium sized Tanzanian companies focused on national and regional sale. These included Kakute Ltd. a small to medium firm, sponsored by the British McKnight foundation and as of 1995 promoting Jatropha as a poverty-reduction/social justice enterprise which offers the possibility of 'alternative resources income project'

[15] Janske van Eijck , *Transition towards Jatropha Biofuels in Tanzania? An analysis with Strategic Niche Management,* Eindhoven University of Technology, pp. 15-17, (dissertation posted on website), www.ascleiden.nl/Pdf/Award2006SummaryVanEijck.pdf

for women of the Monduli region.[16] Work in the area of producing JCL biofuel has focused on domestic household use.

Other small to medium sized producers of Tanzanian JCL biofuel

Another small to medium producer included the Tanzanian Traditional Energy and Environmental Development Organization (TaTED), working out of Dar-es-Salaam, promotes JCL among urban communities, and has also acquired small 50 hectares plots for a 'demonstration farm' in the Kisarawe district. Yet another small to medium effort, Mviwata (Mtandao wa Vikundi vya Wakulima Tanzania), a farmers' organization, and established lamp/stove oil processing in the Morogoro region.[17]

The Jatropha Crisis in Tanzania

As the 'smaller' Jatropha projects thrived, one of the most promising, Sun Biofuels began to falter. Having acquired between 20-25% of the village land in the Kisarawe district, villagers began to grow alarmed when by 2009-2010 farmers had yet to receive compensation for their land. Taking on plantation work for a compensation of 42 British pounds monthly, Jatropha workers grew weary of promises of pay raises that did not materialize, along with local schools, drinking wells, and land compensation that also went missing. When Sun owners pulled up stakes in 2011, villagers who could not get their land back from the Tanzania government also reported they had not been paid severance and had yet to be compensated for land. However, the Chief Executive of Sun Biofuels disputed the claim and said all those qualified had been paid.[18]

[16] Fuels from Agriculture in Communal Technology: www.fact-fuels.org; Kakute Ltd at www.Jatropha.de/tanzania/Kakute/kakute.htm and ARI-Monduli at www.Jatropha.de/tanzania/Kakute/ari-monduli/ari-m-project.htm

[17] Status of Biofuels Industry in Tanzania, *Biofuels Stakeholders Workshop at Oasis Hotel, Morogoro, 9th–11thJune 2008,* Presented by: Mr. Francis A. Songela Energy for Sustainable Development (T) Ltd., Slide 10

[18] Damian Carrington, "UK firm's failed biofuel dream wrecks lives of Tanzanian villagers," *The Guardian/The Observer*, pp. 1-4, http://www.guardian.co.uk/environment/2011/oct/30/africa-poor-west-biofuel-betrayal

A general animosity toward foreign plantation style Jatropha ventures began as early as 2009, when despite government assurances to the contrary, rumors began to spread which suggested that "more than 5,000 rice farmers" across Tanzania could be displaced.[19] An indifference to plantation based bio-fuel projects turned to ferocious disapproval when it became clear that, due to the world-wide recession of late 2008 early 20009, success in international sales of biofuel might also be in doubt.[20] Finally as of October of 2009, the Tanzanian government announced that it was placing an indefinite 'moratorium' on land allocation for 'large scale' bio-fuel operations.[21] As of 2011 a large Dutch Jatropha plantation based firm- Bioshape also went bankrupt, where villagers also claimed they were left without compensation for land and a Swedish sugarcane plantation company, SEKAB Tanzania Ltd. also failed.[22] *The Observer* has reported as of October 2011 there have been at least thirty abandoned projects throughout fifteen African countries.[23]

<u>General Opposition to Biofuel (land-grabs) staged in Europe:</u>

In 2010 a Danish anti-poverty organization, ActionAid created a campaign against European Union policies which encourage fuel from crops, such as Jatropha. The campaign included 'mock land-grabs' where ActionAid members set up plots of land, which they worked with farm implements, building model petroleum pumps at the entrance of Danish parliament.[24] ActionAid, citing the fact that Denmark

---

[19] Mike Mande, "Tanzania: Rice Farmers May Be Evicted By New Bio-fuel Companies," http://allAfrica.com/stories/printable/20090927003.html

[20] See Emmanuel Sulle and Fred Nelson, Biofuels*, Land access and rural livelihoods in Tanzania*, International Institute for Environment and Development, 2009, p. 9.

[21] Mike Mande, "Public Fury Holds Onslaught on Farmers," in *East African*, October 5, 2009.

[22] Damian Carrington, "UK firm's failed biofuel dream wrecks lives of Tanzanian villagers," *The Guardian/The Observer*, p. 4, http://www.guardian.co.uk/environment/2011/oct/30/africa-poor-west-biofuel-betrayal For further discussion of the various biofuel land acquisition versus contract non-acquisition models of biofuel/ethanol production see Emmanuel Sulle and Fred Nelson, Biofuels*, Land access and rural livelihoods in Tanzania*, International Institute for Environment and Development, pp. 24-29

[23] Damian Carrington, "UK firm's failed biofuel dream wrecks lives of Tanzanian villagers," *The Guardian/The Observer*, pp. 3, http://www.guardian.co.uk/environment/2011/oct/30/africa-poor-west-biofuel-betrayal

[24] James Kanter, Of biofuels, Land-grabs and food prices, Green: a blog about Energy and the Environment, New York times, April 5, 2010, http://green.blogs.nytimes.com/2010/04/05/of-biofuels-land-grabs-and-food-prices Biofuel experts maintain

has acquired tracts of developing country land which approximates, or exceeds, the area of Denmark, takes the view that encouraging demand for bio-fuel production in Africa will detrimentally affect " land rights and food security."[25]

Owing to targets to reduce carbon emissions from automobiles and the like, the twenty-seven countries of the EU have articulated an interest in pursuing biofuel production of tropical crops which will be grown in developing countries; so the concern regarding developed world exploitation of LDC cash crops is to Biofuel skeptics a palpable threat. Of course the threat of cash-crops displacing food crops is a real threat and includes process or pattern of growth which threatens the essence of 'human development' as articulated by various measures, not the least of which is the UNDP's human development index(HDI). Here the HDI's measure of 'basic sustenance' is at issue. Even in the developed world there is cause for caution. A case in point is British production of wheat, where the British are self-sufficient. However the recent creation of a Billion dollar wheat-to-biofuel industry as of 2010 has the British National Farmers Union concerned that Britain may have to import wheat for human consumption.[26]

A Problem of Size or of Definition?

British Petroleum, one of the investors in the British wheat to bio-fuel venture is also investor in a joint venture to produce sugar-cane bio-fuel with a U.S. company, Verenium. Verenium will operate in Massachusetts and Florida. Meanwhile, Chevron and Shell, the latter of which was the first to get involved in such bio-fuel projects, as well as Dupont all seem poised to begin large scale production of

---

that maintain that British wheat used for biofuel is not like Jatropha in which is fundamentally inedible, it is not of food quality grade.

[25] Ibid.

[26] Pete Browne, Biofuels Push Britain Toward Wheat Imports, October 16, 2009, http://green.blogs.nytimes.com/2009/10/16/biofuels-push-Britain-toward-wheat-imports/

biofuel in anticipation that continued concern about climate change may one day induce government mandates where Biofuel production and utilization is concerned.[27] Verenium as of 2008 has established a partnership with Brazilian producers, while British Petroleum has committed several Billion dollars to a variety of bio-fuel projects.[28]

In Tanzania land acquired by the Sun, Sekab and Bioshape enterprises has been 'village land' defined as: a) any land within the boundaries of a registered village…., b)land agreed to be the land of a given village according to agreement by the village and its neighbors, c) any land which villagers have been using or occupying for the past 12 years.[29] These definitions refer to the Village Land or Reserve land Act which was promulgated in May 2001 and represented a reform of the 1923 land tenure act meant to give to local authorities (as opposed to executive or presidential) discretion over land ownership and trade or at least management. As of an amendment in 2004 it also provided for 'joint agricultural ventures[which] may be established between local and foreign firms where land could be used for commercial purposes.' However in the case of each firm, Sun, Biofuel and Bioshape, the land lost from villagers has been 'lost' or sold to the government. Here presumably and eventually despite the bankruptcy of these three companies, villagers can 'sue' the government for restitution of their village land that has now been tagged as 'general' land to be dispensed with as the federal, rather than local (village) authorities see fit. However the latter is a point of law that has yet to come before Tanzanian courts.[30]

<u>Small to Large Scale Possibilities: Due (to) Diligence?</u>

---

[27] Clifford Krauss, Big Oil Embracing Biofuels?, May 27, 2009, *The New York Times*, http://green.blogs.nytimes.com/2009/05/27/big-oil-embracing-biofuels/ Shell's involvement in investing in biofuels began in 2002 with a venture in Canada, see Brian Merchant, Big Oil to Become Big Biofuels?, Corporate Responsibility section of Treehugger.com, may 27, 2009, http://www.treehugger.com/corporate-responsibility/big-oil-to-become-big-biofuels.html

[28] Merchant, 2009.

[29] see Emmanuel Sulle and Fred Nelson, Biofuels*, Land access and rural livelihoods in Tanzania*, International Institute for Environment and Development, 2009 pp. 37-9

[30] Land transferred or sold from villages becomes 'general land.' The process of redistribution to villages is not clear, see Sulle and Nelson, 2009 p. 40

As of February 2010 there was a complete freeze on international investment in Jatropha. Professor Pius Yanda of the Institute for Research on Environment at the University of Dar Es Salaam suggested that ' as we assess what our options are for Jatropha, minimum guidelines need to include clear definitions of no-go areas for investors, and a policy for Jatropha use here in Tanzania, so we run our own cars, buses and factories on Jatropha. At present Fair-trade International is researching Jatropha as a fair trade product, we shall see.'[31]

Diligent, a medium sized firm, however, is still operating and has been able to avoid much of the backlash associated with larger projects because, Diligent does not own Tanzanian land. Instead it 'outsources' piecework to villages that hold on to their land, continue to produce subsistence and other commercial corps, while producing Jatropha for sale and for personal utilization in stove and lamps among other things. Not the most profitable cash crop, Jatropha as an 'out-sourced' or 'piece/contract' crop may avoid the deleterious socio-economic impacts of larger Africa cash-crop projects.

Diligent has demonstrated even greater corporate social responsibility, hiring a liaison who works with farmers to ensure they continue to grow food crops, a concern of the Tanzanian government which found in some cases, where offered to grow Jatropha, certain farmers might begin growing little else. [32]

In Diligent, the successful agricultural model is not so much new as it is a revival of a classic success, namely the German reconstruction model post 1907 when German authorities adapted the local patronage tribal and agricultural systems into the Kilimanjaro Native Planters Association (later the

---

[31] Egon Cossou, Tanzania puts faith in Jatropha Plant, BBC News, Africa Business Report, BBC World News, Tanzania, www.newsvote.bcc.co.uk/mpapps/pagetools/print/newsbbc.co.uk/2/2hi/business/8407855

[32] Egon Cossou, Tanzania puts faith in Jatropha Plant, BBC News, Africa Business Report, BBC World News, Tanzania, www.newsvote.bcc.co.uk/mpapps/pagetools/print/newsbbc.co.uk/2/2hi/business/8407855

Kilimanjaro Native Cooperative Union), and encouraged a balance between cash-cropping and subsistence farming.[33]

Areas of Concern as identified by government, NGO and private investors and the recommendations that followed included supporting the kind of Out grower schemes/ Cooperative efforts promoted by Diligent. These included:

"Purchase from small holder farmers (contract farming), International development funding to support small farmers, Technical assistance, Appropriate government support to small holder farmers, Promote local consumption of biofuels; Land acquisition; Adequate compensation for land; Protocol designed (pros and cons),Schemes for paying communities; Regular payments made over a long period; Community has a small share in the plantation/ company, Promises made to the communities need to be written down in a legally binding document."[34]

Diligent is now assisting farmers to produce for the domestic and the international market, of all the small-medium producers has the most potential of business, or market success because of its collaborations, which includes Bosch and Siemens Hausgerate GmbH. The German 'mega-firm' has developed an oil stove based on plant oil called the 'protos' which has actually been sold in the Philippines in past decades. BSH is working with the South African Development Community, as well as the program for Biomass to continue to improve the stove, with Jatropha oil they get from Diligent.

So far Diligent has made the case that the contract, piece work or outsourced model may be the mode of success, especially given the failures of Sun, Sekab and Bioshape. Yet, size alone is not the only consideration when considering the risk of establishing a bio-fuel venture. Other considerations include whether the crop, specifically Jatropha is considered lucrative and the firm and farmers continue to commit to growing these despite opportunities to grow other crops. A case in point is the German firm Prokon, which also began a Jatropha project in 2006 only to quit it in 2011 because the firm suggests

[33] Thembi Mutch, Jatropha biofuels: the true cost to Tanzania, The Ecologist, 15th February, 2010, The Ecologist, http://www.theecologist.org/trial_investigations/414648/jatropha_biofuels_the_true_cost_to_tanzania.html.

[34] Mr. Francis A. Songela Energy for Sustainable Development (T) Ltd , Status of Biofuels Industry in Tanzania (powerpoint presentation at meeting of) *Biofuels Stakeholders Workshop at Oasis Hotel, Morogoro(Tanzania) 9th–11th, June 2008,* Slide 27.

the JCL was low yield, especially relative to cost and that farmers wished to revert to more lucrative crops including cotton, rice and corn.[35] Other considerations include the fact that studies suggest that Jatropha will not be competitive in regions that are already growing so called tropical 'cash fruits' for export.[36]

The Sustainable Model applied to non-edible crops?

In Britain, *The Observer*, suggested that developing world projects that promote bio-fuel may, along with the international demand for fresh vegetables/fruits is amounting to a twenty-first century land grab. It's clear, whatever the crop or product, foreign investors in African agriculture, must still be wary of the appearance of a 'new scramble' and any efforts that threaten former land ownership or food security. Diligent has offered one model where land acquisition is not an issue and where further edible crop rotation is promoted. However, the matter of volume of Jatropha needed, should demand begin to exceed supply suggests firms must continue to think of diversity of crop rotation and/or augmentation within biofuel production. Here, Japanese bio-fuel producers may have arrived at a potential compromise – blended biofuels. On January 30, 2009 Japan Airlines tested a flight using bio-fuel, which was a blend of Camelina, Jatropha and algae – all crops that have been and are being grown in East Africa for commercial, if not bio-fuel usage.[37] The claim is that these combination of non-edible crops will not contribute to deforestation. The other two claims, that they will not displace food production, can be verified in the case of algae, which is grown in the sea or large vats – but what of Jatropha and Camelina. The claim that Camelina and Jatropha will not displace food stuffs, in a hypothetical scenario

---

[35] Prokon Renewable Energy Ltd., "From Jatropha to Biofuel," http://www.prokon-tanzania.com/

[36] Harry Hoffmann, Gotz Uckert, Stefan Sieber and Anja Fasse, "Development and Adjustment of Sustainability Indicators to Evaluate Out-grower Schemes in Bioenergy Production: The Case of Tanzania,' in Sustainable Biofuel Production in Developing Countries: "Green" Energy as the Key for Development," European IFSA Symposium, 4-7 July 2010, Vienna(Austria)

[37] Clifford Krauss, Japan Airlines Joins the Bio-fuel Race, New York Times, January 30, 2009, http://green.blogs.nytimes.com/2009/01 /30/Japan-airlines-joins-the-biofuels-race/

where cars are bio-fuel ready, must be tested against earlier experiments including Tanzania's own Jatropha "crisis."