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Attachment 1

Land Rehabilitation, Soil Conservation, and Biofuels Production Around the Masinga Reservoir in Kenya

1. OVERVIEW

For many years, Kenya has faced adverse conditions of rapid and severe land erosion. In particular, erosion is continuous and severe surrounding reservoirs near the Tana and Athi Rivers, a region for which development authority is delegated by an Act of Parliament to the Tana and Athi Rivers Development Authority (TARDA). Such erosion not only reduces the already strained livelihood streams of local inhabitants, but in-filling of the reservoirs with silt (estimated by TARDA itself to be at a rate of 5 million tons per year) jeopardizes the Authority's ability to provide maximum hydropower to the Republic over the long-term, thereby hampering Kenya in reaching its Millenium Development Goals. Concomitantly, the prices of petroleum products, including diesel fuel that is critical to transportation in Kenya, are rising relentlessly with no sign of a reversal on the horizon. This is therefore an opportune time for Kenya to consider energy alternatives, especially any alternatives that can alleviate to some degree the debilitating effect of erosion on the national economy.

WILMA would like to bring to your attention an initiative that its Kenyan partner, GreenFuels Kenya Ltd., has been pursuing since the beginning of the year – one that will produce enough biodiesel when fully operational to supply 14% of Kenya's current diesel requirements. With crude oil prices reaching as high as $70/barrel recently, such domestic production would save Kenya over $300 million per year in foreign currency reserves. In addition, the proposed project would provide a massive infusion of resources in the form of out-grown sourcing of the necessary raw material in the area surrounding Masinga Reservoir, the largest in TARDA's system, an effort intended to reclaim idle land and alleviate erosion.

Biodiesel is already a proven concept and is replacing petroleum-derived diesel, or "fossil diesel," in both developed and developing countries. Produced from vegetable oil, biodiesel can be used in ordinary diesel engines. Not only are no modifications required to newer engines to allow them to run on biodiesel (older ones may require the replacement of rubber parts with synthetics), but this fuel inflicts less engine wear and generates less air pollution than fossil diesel. Both advantages are due to the absence of sulfur, phosphorous, metals, and other contaminants commonly found in petroleum products.

The worldwide move toward the use of biodiesel is already well under way. Brazil is a major producer and user of biodiesel, and large commercial firms, such as Dow Chemical in the United States, are investing in biodiesel research and production facilities. In various developing countries, biodiesel plants have been proposed or established as a means of generating income and reducing dependency on imported oil. GreenFuels is pursuing such a strategy for Kenya, but their project differs from typical proposals in developing countries in that they have identified an indigenous oil-bearing tree as the source of the precursor vegetable oil. While many current proposals push the idea of *jatropha curcas* as the vegetable oil source, they recognize the implausibility of establishing a *jatropha* plantation of sufficient size because of the immense labor requirement of such an endeavor, and they furthermore fear that a large *jatropha* plantation is likely to spread beyond its boundaries. As an invasive species, *jatropha* can become an ecological pest and threaten to create an ecological catastrophe. Because Greenfuels relies on an indigenous tree, one that drops its seeds during its annual growth cycle, their plan offers a rational alternative to the use of transplanted, labor-intensive species. Greenfuels will produce biodiesel in economically significant volumes with a manageable labor force while posing no threat to the environment.

The plans for generating biodiesel that GreenFuels is bringing before the Board of TARDA will go far beyond posing no threat to the environment. Instead, the proposed system will ameliorate land degradation in the vicinity of Masinga Reservoir (see above map of Kenya). Once the efficiency and effectiveness of the method have been demonstrated, the project can be expanded throughout the Tana and Athi rivers' catchment areas, rehabilitating the land while providing sustainable livelihoods. The far-reaching results of this project will thus have environmental benefits on the local, regional, national, and global scale: whatever quantity of fossil fuels can be replaced by renewables reduces the volume of greenhouse gases emitted to the global commons.

2. THE INTEGRATED SYSTEM

The indigenous tree that will likely provide the lion's share of the raw vegetable oil is *croton megalocarpus*. Found growing scattered across the central region of the country, this species will yield 25-50 kg of oil per tree per year under optimal climatic conditions (3500-6000 feet altitude, 800-1600 mm rainfall). Among the favorable attributes of the tree is that it has a fairly open canopy architecture, meaning that many crops tolerant of partial shade can be grown beneath it. Croton is also long-lived, producing oil-bearing nuts for about 45 years.

Until fully established in a mature plantation (200 trees/ha, approximately 11 years to maturity), *croton megalocarpus* will be unable to stem the severe soil erosion on and surrounding TARDA's lands. Until then, other measures must be taken both to stem the erosion problem immediately and to prevent the trees planted from being swept down-slope before they have rooted deeply enough to resist. To achieve this aim, the project will plant vetiver grass. Vetiver has been used for the past century in East Africa for erosion control, but it has regained prominence only since the 1980s and has since been termed by engineers to be "the living soil nail." The form of vetiver to be used (*vetiveria zizanioides*) is reproductively inert, and thus it is impossible for a runaway ecological disaster to occur. Vetiver itself has a host of uses from natural pesticides to forage, from building materials to medicines.

The ability to grow crops beneath the croton canopy leaves open the possibility for the project to produce one of the key ingredients in the biodiesel production process, ethanol, which is used to convert raw vegetable oil into engine-ready biodiesel. The ethanol can be distilled from cassava, which will grow in the shade of the croton trees. Note, however, that cassava cultivation would need to be carefully controlled, confined to shallow slopes where augmentation of soil erosion would be unlikely, and in any event controllable with vetiver. The required ethanol, however, may be obtained from many different sources, and the project may utilize a different plant if it better fits technical and/or financial needs.

It is also feasible for the ground beneath the canopy to be used to grow other oil-bearing crops, such as soybeans or sunflowers, or another non-edible oil plant. In the view of the project proponents, the growing of such an oil crop during the period preceding maturity of the croton trees is imperative in order to allow the project to succeed (see sections 5 and 6).

3. Growing the Crop

For the core plantation, TARDA is initially providing GreenFuels 1000 ha for immediate use, with additional Trust Lands to be allocated if available once the initial area has been prepared and planted. TARDA has further offered to commit to mobilizing, sensitizing, and training as necessary local communities surrounding Masinga Reservoir so that a total of approximately 70,000 ha will ultimately be earmarked to generate croton nut oil.

Out-growers will be paid fair market value for the croton nuts they ship to the central refinery. Because the project is firmly rooted in social justice and corporate social responsibility, fair wages will be paid for the crop on the basis of the weight of the nuts brought to the facility or to established collection points (the precise calculation of this remains to be determined). Note that harvesting croton nuts is neither a risky nor arduous process: the tree drops the nuts, and they are simply gathered from the ground.

If cassava is the catalyst avenue pursued, the commodity price of cassava in Nairobi will be the metric used for payment in order not to influence the cassava market with demand-driven price rises.

4. The Product Line

In the biodiesel production process, the unprocessed oil extracted from the plant source is called "straight vegetable oil" (SVO). The University of Idaho in the United States, one of the world leaders in biodiesel research, has agreed to perform a rigorous analysis of croton SVO samples to determine its specific attributes. Under certain circumstances, SVO may be suitable for direct combustion in certain types of diesel motors, specifically large, fixed motors such as electrical generators. Given that the Government of Kenya has embarked on a strategy to distribute multifunctional platforms for small-scale electricity generation at the village level, croton SVO may be a relatively inexpensive substitute for fossil diesel.

Biodiesel, however, in all but a handful of cases (such as oils with unacceptably high viscosity or polyunsaturation), eliminates the problems that are likely to arise when using straight vegetable oil with the wrong characteristics, or using the oil in the wrong type of engines. Biodiesel is the end product of a reaction that can be used either as a 100% substitute of fossil diesel or mixed in with fossil diesel, normally at ratios from 5-20%. Biodiesel is in all ways except one superior to fossil diesel: it is safer to handle, it is non-toxic to humans and to the environment, it lubricates engines better and extends engine life, it has a higher cetane rating than does fossil diesel and thus helps engines start, and it produces much lower emissions than fossil diesel, with the exception of nitrous oxide, which in some cases may increase depending on how engine timing is set. Note, however, that when 100% biodiesel is used in older vehicles that still have rubber parts in their fuel systems, degradation of this rubber is possible. All newer vehicles have replaced the rubber with Viton, a synthetic, which does not degrade when exposed to biodiesel. Viton conversion kits are readily available for older engines.

Presscake, the remnant of the croton nut after the oil is extracted, has a number of potential uses. It may be incorporated as a high-calorie, high-protein supplement in chicken feed (provided it contains no undesirable compounds, which will be determined by the upcoming tests at the University of Idaho). It can be used to generate biogas, which can be burned to power the biodiesel refinery or to produce steam and electricity in a co-generation process. Or the presscake can be incorporated with the hull of the croton kernels (which itself has been reported as possessing a natural black dye) and converted through a composting stage to organic fertilizer of approximately 20:4:2 N:P:K. Such fertilizer can replace the equivalent amount of imported chemical fertilizer. Note, too, that another minor co-product from the transesterification process is a salt composed of potassium and phosphorus, which can be added to the fertilizer to boost the K:P ratios if there is no requirement to market the product as “organic.”

Glycerol is a co-product of the transesterification of croton oil to biodiesel. The glycerol produced is 85%-pure “salt crude” and needs to be refined to attain maximum value. Refining to food grade is one possibility, and because the resultant item contains no animal products, selling it at a higher price labeled as ‘Halal’ or ‘Kosher’ is possible. The best price, however, would derive from purification to USP or PH.EUR standards, i.e., to a pharmaceutical grade.

Because croton trees are pollinated by bees, a honey and related products (such as pollen, wax, and royal jelly) industry will be established. Pure croton honey is said to be among the world’s best tasting.

According to the rules of the Kyoto Protocol, carbon credits through the Clean Development Mechanism are available for biodiesel production as proposed above. The project would need to pass through the standard operating procedures put in place by the Marrakech Round of the Conference of Parties, but GreenFuels does not see any reason why this requirement cannot be met. The project should have no difficulty in demonstrating that it meets Kenya’s development goals, that it reduces greenhouse gas emissions (because the oil and biodiesel derive from an organic source, one that absorbs the carbon dioxide emitted through combustion in the next growing season, they are considered to be "carbon neutral" in the Protocol), and that indeed Kenya approves of the endeavor. One of the remaining requirements in qualifying for carbon credits is to demonstrate "additionality." This is defined in one or both of two ways: (1) that the project would not be financially feasible without the input of funds from selling the carbon credits, and/or (2) that the project, if approved by government, can be successful only upon the removal of "hurdles," which is generally taken to mean amending the tax and/or regulatory framework. In general, first-of-its-kind projects are given a slight edge, in that the Executive Board of the Clean Development Mechanism understands that such projects face unforeseen circumstances that increase the risk of failure.

In this proposed project, both of these pathways will be taken in order to increase the probability of success. First, carbon sales made for the initial 7-year crediting period will be used as capital within the project in order to attract, and reduce the perceived risk to, commercial finance institutions (the project would not be able to proceed if it would be forced to borrow at rates of return typically expected from venture capital portfolios). Second, Government will be asked to set in place an enabling environment to permit the project to proceed. Without these two complementary sources of support, GreenFuels would be unable to compete successfully with the multinational oil giants currently holding tight to their fossil fuel oligopoly. The Appendix lists the actions that GreenFuels requests to create the enabling environment for biodiesel in Kenya.

5. RISK FACTORS

Croton megalocarpus has never before been grown in a plantation environment. Nothing is known about the effects of placing the trees in close proximity in what is essentially a monocultural setting. In a worst-case scenario, such as has occurred when attempts have been made to grow rubber trees in Amazonian plantations, absolute failure results (in the case of rubber, it's because an Amazonian virus attacks and kills the trees, a virus which does not – yet – exist in Southeast Asia, where the trees can successfully be cultivated). Croton trees may also be vulnerable to fungal attack, but the projects will try to "vaccinate" against this by applying chitin (the crushed, powdered shells of crustaceans) to the soil.

Croton will not thrive optimally when accumulated rainfall consistently fails to accumulate to at least 800 mm per year. Initial research on a gridded Wilmott dataset from NASA demonstrates that between 1950 and 1999, there were very few years when 800 mm failed to fall in the Masinga area, and when this occurred, at least 650 mm did accumulate. However, this pattern may not continue in the future as a result of global warming. There is no certainty that this rainfall threshold will continue to be reached; and in any event, if temperatures warm even marginally in the Central Region, the added heat stress on the trees would require some amount of additional rainfall to compensate. Furthermore, because both air and soil temperatures would be higher and therefore result in extra evaporation, there would be even less stored moisture in the soil and therefore (all else being equal) less water would be available to the trees.

Vetiver is a grass that, when young, livestock find very palatable. Since the population around Masinga Reservoir follows a mixed livestock-farming livelihood strategy, control of grazing and browsing animals must be imposed. If livestock were allowed to roam freely around the landscape as they are currently, then the nascent vetiver hedges would be destroyed – if not from direct herbivory, then from trampling. Without the vetiver hedges to check soil erosion, the project's chances of success would be small. While the technical issues surrounding the project are surmountable, even when considering the added complexities imposed via an out-growing scheme (described in the next paragraph), this control of livestock is likely to be contentious and therefore challenging to manage.

Out-growing of a tree-based crop has been tried and tested in many locales in Africa and elsewhere in the world. In short, these schemes have failed more often than they have succeeded because smallholder farmers cannot afford to wait (in most cases) for the slow-growing tree to reach maximum yield, a process that will normally take years, if not decades. This is true for croton, which if planted from seed or from plantalet (i.e., established via tissue culture techniques) will first yield nuts after three years and reach mature height only at about 11 years. Farmers' enthusiasm for the project will wane during this period unless the farmers get a financial return that motivates them to continue to oversee the trees, an incentive that can best be provided by a fast-yielding crop that grows well under the trees.

6. OVERCOMING RISK

Vetiver has been demonstrated around the world to conserve soil moisture because rainfall that would otherwise directly run off is trapped behind the hedges and can then infiltrate into the soil. Vetiver when applied as a mulch also augments soil fertility and organic matter (additional organic materials in the soil allow for the retention of greater quantities of soil moisture). Thus, vetiver becomes an essential component in the integrated scheme.

The growing of another oil crop such as soybean or sunflower from year one of the project is crucial because it will bring farmers an immediate source of income. It is only through this assured income stream that farmers will be induced to protect the vetiver hedges and the croton saplings. The in-filling of ground with this additional oil crop will be the incentive for communities to exclude livestock, for the young plants would be equally as vulnerable to herbivory and trampling as are the vetiver and croton. Because sunflowers grow tall, and because both vetiver and croton are full-shade intolerant, soybean would be the more logical of the two crops to plant. However, soy oil could be preferentially sold in the higher-priced edible oils market, while GreenFuels needs a fast-yielding oil to provide input to the biodiesel refinery while the trees are maturing. Thus, GreenFuels would prefer to cultivate a low-growing, non-edible oil-bearing plant and is investigating options with researchers at Jomo Kenyatta University.

The biodiesel refinery will be constructed as soon as the project commences (various turnkey options are being considered). For best efficiency the refinery should input enough raw oil to run at full capacity from year one, producing at least 103 million litres, or 27 million gallons, per year. The croton plantation, once mature at around 11 years, is expected to meet this capacity, but assuredly this will not be the case during the early years, especially since outgrowing farmers are likely to adopt the integrated system only gradually. The solution for the initial year(s) is to import another vegetable oil, such as crude palm oil; however, in order to validate this solution, the right enabling environment of policy must exist in advance (see the Appendix).

In sum, overcoming risks faced by this innovative and complex project requires much preparatory work by its local stakeholders, especially among subsistence farmers who have been using the arid land for unrestricted grazing of their livestock. It may even be necessary for them to reduce their livestock holdings, voluntarily and temporarily, as part of their commitment to earning higher incomes from cash crops and agribusiness in the future. Such an economic transformation cannot be imposed by government or outsiders, and a high caliber of local leadership through education and advocacy will be necessary to protect the project's longevity, to qualify for carbon credits under the Kyoto Protocol, and to earn a satisfactory return on capital.

7. DELIVERABLES

The project's industrial products are described in Section 4. Additionally, a major line of services will result from this project that stems from GreenFuel's commitment to Corporate Social Responsibility in ways that go beyond land rehabilitation, soil conservation, achieving independence in renewable energy, and commitment to fair wages. GreenFuels will allocate a percentage of its profits to WilmaFund, an African Community Development Finance Institution that invests in start-ups of community-based businesses and social enterprises in marginalized areas lacking access to mainstream finance. WilmaFund will operate with Community Development Associations in the Masinga area to finance SME incubators for business ideas linked to the biofuels industry, complemented by clinics, school enhancements, scholarships, and micro-loans. This philanthropic activity will not be confined to the Masinga Reservoir area but rather will extend throughout Kenya and beyond, becoming a model for the nascent biofuels industry in Africa.

8. GREENFUEL'S RELATIONS WITH TARDA AND THE GOVERNMENT

TARDA will provide the core plantation area of 1000 ha, and has offered to undertake the preparatory work for the out-growing scheme to commence. It has also agreed that it will supply the project with water from Masinga Reservoir (approximately 47 million litres, or 12 million gallons, per year, exclusive of the requirement, if any, of the cassava-to-ethanol plant) and with electricity from its transmission network. It will allocate heavy machinery that will be necessary in the construction of the biorefinery and the plantation/out-growing scheme. It will second its environmental staff to the project to ensure strong and inviolable environmental protection, especially of riparian woods and culturally important groves. It will make available support services such as the Masinga guesthouse free of cost for accommodation. It will also allow the distribution onto its transmission network of excess electrical power that may be co-generated by the biorefinery. Finally, TARDA has agreed to help GreenFuels deal with the line ministries of the Government of Kenya whose cooperation will be needed to create the necessary enabling environment (see the Appendix).

In return, GreenFuels offers TARDA environmental benefits that will help TARDA to fulfill its primary mandate to produce hydropower for the foreseeable future. Controlling soil erosion and land degradation is an incalculable benefit to TARDA and to the nation, both in terms of money and in terms of international reputation. Furthermore, savings in foreign currency reserves earned by replacing imported fossil fuels with home-grown energy can be used to achieve the Country's social priorities in education, health, and public service, as reflected in its Millennium Development Goals. Finally, reducing the nation's dependence on imported oil contributes to national security.

Equity and loan financing of the project are presently under consideration and will be decided after further technical research has been completed. Private equity and term loans should provide the needed finance if the business plan is deemed by investors to be bankable. The possibility of equity participation by public "social partners" (referring to the parastatal

TARDA as well as local and national government bodies) will be addressed in terms of the value of their potential contributions to the governance of GreenFuels Kenya Ltd. Ownership by social partners will be considered if it will contribute to the credibility of the business plan, as evidenced by the cost of financing it.

TARDA may well be more concerned with generating reliable cash flow than with taking an equity position in a risky new business. The Government has tasked TARDA with capitalizing on its assets in order to cover a significant part of its operating costs. This could be done by imposing an "environmental tariff" on biodiesel of 3%, which is KSh3 per litre. Such a tariff would not significantly reduce sales of biodiesel, especially if retailers were mandated to blend biodiesel with fossil diesel. Given the biorefinery's planned throughput of 103 million litres per year, this tariff would raise KSh309 million per year, which amounts to 60% of TARDA's current annual operating costs. To offset the drag of this tariff on this new and vital industry, GreenFuels is requesting that the GOK not impose a VAT on biodiesel. This would be part of a broader plan to use available policy instruments to underwrite this industry's contributions to growth, civil society, and the environment.

9. DIVERSIFYING PRODUCTION THROUGH PALM OIL

In tropical coastal regions, a plantation of African oil palms will produce 6000 liters of biodiesel fuel per acre. This is said to be the easiest and highest yield of biodiesel fuel that can be produced in tropical or any other climates. Moreover, it has useful human and animal feed byproducts.

Keith Addison's *Journey to Forever* presents the relative yields of all biodiesel crops. Its website lists the yields of plants that produce oil suitable for the production of biodiesel at http://journeytoforever.org/biodiesel_yield.html. For your convenience, I have copied the information here:

Vegetable oil yields
Biodiesel yield = oil yield x 0.8 approx.
Note: These are conservative estimates -- crop yields can vary widely.

Ascending order

Crop	kg oil/ha	litres oil/ha	lbs oil/acre	US gal/acre
corn (maize)	145	172	129	18
cashew nut	148	176	132	19
oats	183	217	163	23
lupine	195	232	175	25
kenaf	230	273	205	29
calendula	256	305	229	33
cotton	273	325	244	35
hemp	305	363	272	39
soybean	375	446	335	48
coffee	386	459	345	49
linseed (flax)	402	478	359	51
hazelnuts	405	482	362	51
euphorbia	440	524	393	56
pumpkin seed	449	534	401	57
coriander	450	536	402	57
mustard seed	481	572	430	61
camelina	490	583	438	62
sesame	585	696	522	74
safflower	655	779	585	83
rice	696	828	622	88
tung oil tree	790	940	705	100
sunflowers	800	952	714	102
cocoa (cacao)	863	1,026	771	110
peanuts	890	1,059	795	113
opium poppy	978	1,163	873	124
rapeseed	1,000	1,190	893	127
olives	1,019	1,212	910	129
castor beans	1,188	1,413	1,061	151
pecan nuts	1,505	1,791	1,344	191
jojoba	1,528	1,818	1,365	194
jatropha	1,590	1,892	1,420	202
macadamia nuts	1,887	2,246	1,685	240
brazil nuts	2,010	2,392	1,795	255
avocado	2,217	2,638	1,980	282
coconut	2,260	2,689	2,018	287
oil palm	5,000	5,950	4,465	635

Alphabetical order

Crop	kg oil/ha	litres oil/ha	lbs oil/acre	US gal/acre
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pumpkin seed	449	534	401	57
rapeseed	1,000	1,190	893	127
rice	696	828	622	88
safflower	655	779	585	83
sesame	585	696	522	74
soybean	375	446	335	48
sunflowers	800	952	714	102
tung oil tree	790	940	705	100

Oil palm’s output per hectare is highest by far, more than twice the second-ranking crop, coconut, which is closely followed by avocado and brazil nuts (not likely to be used for fuel!). Oil palm is three times as productive as jatropha, and, unlike jatropha, does not prevent the same land from growing food and other cash crops.

The African oil palm is native to West Africa and is grown for food in Nigeria, Ghana, and Ivory Coast. Apparently, it is not grown in East Africa. Production in Malaysia and Indonesia dwarfs Africa’s production. Since palm oil is found to be unhealthy for humans, demand in high-income countries for use in cooking has been declining. But in Brazil, perhaps the world leader in biofuel development, it is being used for production of biodiesel. Palm oil is reported to yield an exceptionally high grade of biodiesel and does not require expensive refining through transesterification.

Adding palm oil to its production activities would diversify the business of GreenFuels Kenya, reduce corporate risk, and extend its social benefits to coastal, higher-rainfall regions. There is no apparent reason why Kenya should not become the Brazil of Africa in the biofuels arena.

Following is an extract from the article “Biodiesel: Energy Solution for the Tropics,” by Professor Gunter Pauli and Dr. Ashok Khosla, published in June 2005. See the link to the entire article below.

Whereas the traditional monoculture practiced in palm plantations throughout Africa, Latin America and South-East Asia was considered optimal for maximizing profits from the production of edible oil or soaps, the mixed species plantation is far more appropriate for biodiesel, generating not only profits but also all-round economic growth. The multiple revenue streams generated by the various materials (some of them of very high market value) produced by the mixed forest, plus the drinking water thanks to increased precipitation and outstanding filtration through a healthy soil leads to sustainable livelihoods. These ecosystems once characterized by poverty and scarcity now produce large economies of "scope", i.e. of product mix, and in effect reduce the cost of each product simply by spreading the overhead costs. In a sense, the different products "cross-cash flow" each other, making individual products, such as biodiesel, less costly.

The biodiesel becomes even more competitive because of the elimination of transportation costs thanks to a system of local production and local consumption. Carrying diesel fuel to remote areas is costly. The supply is inconsistent, and the opportunity cost of interruptions is high. Diesel fuel purchases represent a large drain on the disposable income of farmers. In the case of the Colombian Orinoco, the landed cost of one gallon of diesel is about 17,500 pesos (5.5 Euro). The total cost of one gallon of biodiesel is no more than 4,500 pesos (1.30 Euro). Whereas the experience with biodiesel from tropical vegetable oils is limited in the world, the biochemistry is very compelling. Tropical oils are more productive but are also more combustible since they have a natural viscosity and a cetane number that is ideal. In addition, most tropical oils have a higher incidence of oxygen in the molecule that permits a more complete combustion and thus a cleaner exhaust than fossil diesel would ever permit.

This huge saving is not all. The impact on the local economy is even more dramatic. Pretty much the whole of the 5.5 Euro paid for diesel leaves the local economy, whereas most of the 1.30 Euro paid for locally produced biodiesel stays there, generating local jobs and multiplying itself several times through the other sectors of the community's economy. The net injection of cash into the rural village is 6.80 Euro per gallon of fuel3. This has a tremendous catalytic effect and represents a lever in the economy unimagined by conventional economists.

And then, the palm oil in the tropical forest often does not require any esterification. After a simple filtration without the need for any additives to change viscosity, and a minimal adaptation of the diesel engine like the elimination of some rubber bands, the crude can be used directly in the engine further cutting down costs -- to less than one Euro per gallon. Biodiesel can thus really fuel the development of a local economy.

Link to full biodiesel article: www.scizerinm.org/biodiesel.html

TTT-WILMA is beginning to work on a project on the Tanzanian coast that may feature a palm oil plantation as an extension of an existing effort to clear and use diseased and senile coconut trees for the manufacture of briquettes, flooring, furniture, and other products. GreenFuels Kenya can pursue a similar strategy on the Kenyan coast. You can read more about this current Tanzanian project in a Powerpoint presentation available online at www.wilma.us/doc/LD_presentation.ppt (8.4Mb).

Appendix: Creating The Enabling Environment

The Government of the Republic of Kenya should undertake the following steps to enable a vibrant biofuels industry in Kenya, and more specifically to permit the success of the BioFuels project described above:

A. Assist in Meeting the Project's Labor Needs

1. Because the project is of national interest, allocate National Youth Service labour to the land-preparation phase of the project;

2. Because the project is of national interest, offer the use of the Army Engineers as needed during the land preparation/road construction phase of the project;

3. Because the project is of national interest, assign NEMA staff to lead the EIA during the project's preparatory phase.

B. Provide Beneficial Tax Incentives to Facilitate the Project's Success

1. Allow for the project's use of TARDA land and any other project-designated land, including land cultivated by out-growers, free of all land taxes and transfer and/or use fees;

2. Permit the construction of "improvements" (biorefineries, road networks, pipelines, etc.), and do so with a waiver of any fees, taxes, or costs that would normally be imposed for such industrial development;

3. Allow for importation or local purchase free from customs duties, VAT, and any other taxes, of the necessary machinery, supplies, computers, and any other materials necessary for the construction and operation of the biorefineries;

4. Allow for the importation of necessary chemicals and reagents (specifically: potassium hydroxide, sodium hydroxide, sodium ethylate, sodium methylate, and enzymes and yeast for the production of ethanol) free of all customs and excise duties and any other tax;

5. Allow for importation or local purchase free from customs duties, VAT, and any other taxes all vehicles necessary for implementation of the project;

6. Confer a business tax holiday for a specified period not less than 25 years;

7. Zero rate VAT and removes all other taxes from biodiesel.

C. Promote the Use of Biodiesel

1. Mandate a regulatory mechanism allowing biodiesel to be sold within Kenya both as a replacement of, and/or in proportions of 5-20% as an additive to fossil diesel;

2. Guarantee a regulatory mechanism allowing biodiesel, if produced in excess of Kenya's demand, to be exported without impediment.

D. Smooth the Use of Imported Seed Stock

1. Allow for the importation and planting for exclusive non-edible use as the raw input into the biorefinery any high-yielding cultivar that can be shown to have no cross-pollination risk because the plant is not grown within the region.

E. Facilitate the Sustainable Use of the Land Resource

1. While noting that the project does not intend to displace people, allow for and support the relocation of existing households to planned eco-villages if this proves necessary due to uncontrolled and uncontrollable grazing of livestock;

2. Provided there is no contravention of the Republic's laws, allow out-growers to rapidly acquire tenure to their smallholdings by express-laning their applications;

3. Waive all fees associated with the registering of land ownership by smallholder out-growers.