

Leah Temper

Autonomous University of Barcelona, Dept. of Economics and Economic History

leah.temper@uab.cat

**Let Them Eat Sugar:
Life and Livelihood in Kenya's Tana
Delta**

Abstract

The Tana Delta in Kenya is one of Africa's most valuable wetlands. It is home to two dominant tribes, the Orma pastoralists and the Pokomo agriculturalists, both competing for control of water and land resources in the delta, sometimes in violent conflict. But the delta also holds much of Kenya's potential of irrigable land. A variety of projects have been proposed. Among them two sugar plantations, which will transform over 200,000 ha into a sugar monoculture, producing industrial and table sugar as well as ethanol. Another project would see the leasing of a large tract of land to the Qatari government, part of a trend of middle-eastern economies appropriation of land in Africa. This article, based on a field trip to the Tana Delta and on a CEECEC seminar organized with the East African Wildlife Society and Nature Kenya at the ISEE conference in Nairobi in 2008, examines the historical background of development projects in the delta and how ecological economic indicators such as virtual water, HANPP and Energy Return on Energy Input can be used to argue for sustainable development of the delta in line with existing livelihoods there.

Keywords: wetlands, Ramsar convention, land grabbing, irrigation, pastoralists, property rights, customary rights, bio fuels, HANPP, virtual water, GDP of the Poor, resilience

Contents

Introduction	4
The Delta and its People.....	5
Property rights, resource distribution and conflict	6
Past projects: Parks for Primates and World Bank White Elephants	7
Future projects: Outsourcing the Delta	9
An Ecological Economics Approach: EROI, Virtual Water and HANPP in the Delta.....	10
EROI	11
Virtual Water.....	11
HANPP.....	12
Impacts: Let them eat sugar (and drink ethanol).....	13
Conclusion: Key to Development – Saving the Swamp	14
References:	15

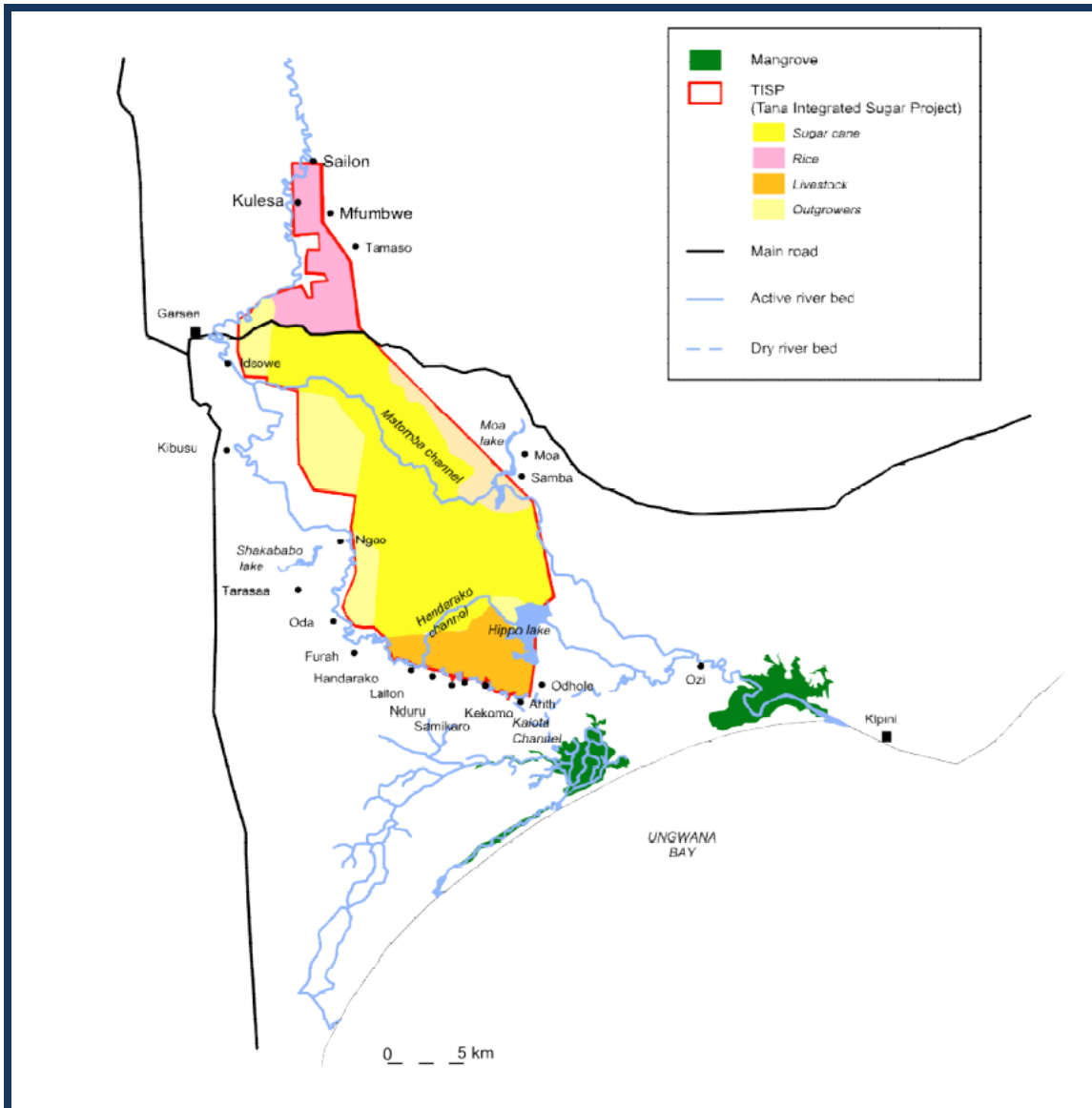


Figure 1: Map of Tana Delta. Source: Olivier Hamerlynck & Stéphanie Duvail)

1. Introduction

The Tana Delta is frontier land. Bordering Somalia on the edge of the Kenyan Coast, this marginal and isolated district has long been an axis of contraband, banditry and arms smuggling. While safety has improved in recent years, even today travellers to the area are told that they should be accompanied by an armed military officer. But the delta is also where over 50% of the potential of undeveloped irrigable land in Kenya lies. With food and land prices still high despite the financial crisis, with population growth, the question is not, when agricultural development will come to the delta, but what sort? There are already many players trying to get a piece of the pie: Kenyan sugar companies, international agro-fuel companies, and foreign governments **land grabbing**

to ship food abroad. But the delta is inhabited by farmers, fishermen and pastoralists living an ages-old way of life, with their own “biomass and water conflicts” among themselves. Some of them, mainly the pastoralists, say they will fight to the death to defend their land and livelihood.

The question is how the wealth of the fertile delta should be distributed, for the well-being of the inhabitants and their livelihoods, for the economic development of the country, and finally, what will be left over in nature for the other species that cohabit with humans. This paper will describe the ecology and peoples of the delta, briefly discuss some of the previous (failed) development plans for the delta, then focus on the current plans and offer an alternate vision for the delta’s development.

1.1. The Delta and its People

The Tana is Kenya’s mightiest river. It flows over 1000 km from the foothills of Mt. Kenya to empty into the Indian Ocean in Kenya’s remote east. At its base, lies the Tana Delta, one of the most important wetlands in Africa, covering 1,300 sq. km. The range of habitats within it, including riverine forests, grasslands, savannahs, bush land, lakes, mangroves, dunes, beaches, and estuaries, mean it is a hotspot for biodiversity, supporting uncounted plant and animal species including over 350 bird species. The Tana is also home to two endangered primates – the Tana River Red Colobus and the Crested Mangabey monkey. Other wildlife includes buffaloes, zebras, and hyenas, hippopotamus, and the Nile crocodile.

There are two primary ethnic communities living in the delta, the Pokomo, Bantu-speaking Christian sedentary farmers and the Orma, Kushitic speaking Islamic nomadic pastoralists. The remaining inhabitants include the Wardei pastoralists, Luo fishermen and other tribes. The Pokomos practice flood recession agriculture along the banks of the river, growing maize and bananas and other vegetables for subsistence and mangoes and rice as cash crops.



Figure 2: Nomadic pastoralists of the Tana Delta (Source: Leah Temper)

The delta is an important dry season grazing area for the pastoralists and hosts about 60,000 heads of cattle during the dry season, while 20,000 head of cattle graze permanently in the area. In general, the pastoralists maintain a higher standard of living than the agriculturalists. They oppose any project which could threaten their livestock and reduce grazing areas. The Pokomo, in contrast, are more sympathetic towards agricultural development projects but are wary due to unfulfilled promises in the past.



Figure 3: Gamba Village, (Source: Leah Temper)

1.2. Property rights, resource distribution and conflict

Co-existence in the delta between the communities is uneasy, sometimes leading to violence. An examination of the causes behind a series of tribal conflicts in 2000-1 between the Pokomo and the Wardei-Orma allow us to understand the role of **property rights** and **access rights** to the resources underlying them.

Property rights in the delta are often complex and overlapping, with concurrent systems of private, public, and common land and different rights to access, usufruct, leasehold and freehold. Much of the land in the delta is trust land, whereby it is held in trust and administered by the county council for the community. This trust land may be set aside for purposes deemed to benefit the residents, or transferred to the government. Yet there are many instances where this “trust” is abused.

Apart from property rights over land, are access rights to water. For example, among the Orma wells are owned by the person who first dug it and their patrilineal descendents (Ensminger&Rutten, 1991). While the Pokomo lay claim to the land along the riverbanks to practice agriculture, the Orma stake their claim over the river waters.

Violence erupts when the Orma try to gain access to the river for their cattle, often trampling and grazing in the Pokomo farms in the process.

Some property rights theorists (who perhaps have read **Coase** second-hand) hold that clearly defined property rights should reduce conflict by creating shared expectations and through the creation of markets for damages. However, in practice, property rights are not easy to “clearly define”. Socio-environmental conflicts are often over the property rights, as we see at world level with the disputes on the rights to dump carbon dioxide in the oceans and atmosphere. It is naïve in the extreme to think that all that is needed for efficient allocation of natural resources and compensation of damages are “clearly defined” property rights and markets. In the context of property rights to water, “when a fixed expectation comes up against a fluctuating resource, that in itself can be a source of conflict” (Meinzen-Dick & Nkonya, 2005). This is why rights of access to water are often ambiguous and based on principles open to negotiation rather than clearly defined rules. The attempt to formalize rights that were previous **customary rights** thus can be a source of conflict in itself. sometimes described as a “**tragedy of enclosures**” as when mangroves are turned into shrimp farms.

Thus one of the triggers for the flare-up of inter-tribal violence in the Delta in 2000-01 was related to the activities of the Land Adjudication Commission which, began in 2000 to favour a liberal land policy based on individual ownership. This policy created a sharp split between the Pokomo and the Orma/Wardei. The Orma/Wardei accused the Government of fuelling ethnic conflict by imposing a liberal land tenure system on an area where land is communally owned without adequate consultation. The year was also dry one, adding fuel to the fire. After the clashes, over 100 people lay dead and many rendered homeless.

2. Past projects: Parks for Primates and World Bank White Elephants

The Tana Delta could house a museum featuring failed World Bank (WB) projects. From conservation parks constructed as zoos to keep the local population out, to shrimp farms that destroyed valuable mangroves, to misconceived irrigation projects, the delta is testament to the failure of the Bank’s strategy of top-down projects that fail to take the local peoples and environment into account. Thus the Kenyan government’s attempts to civilize and bring the Eastern frontier closer to the centre has met with little success, due to a combination of bad planning, resistance on the part of local people and environmentalist campaigns.

Dam construction

The Kiambere dam, completed in 1993, was a success in that it now provides 140 megawatts of electrical power to Kenya’s growing urban population. However, the people of the delta paid heavily in the name of national interest. Over 6,000 were displaced without any compensation, with those families losing over 82% of their money-equivalent income (Kagwanja, 2003). As Hadley Becha, the director of the East African Wildlife Society points out, the waters of Tana River were supplying this

country with electricity from before independence. And yet the communities of Tana only got electricity last year (interview, 2009).

Conservation and research

The Tana River Primate Reserve (TRPR) was another WB funded project abhorred by the local people. Based on the conservation logic of the incompatibility of human and animal co-existence, the local Pokomo were displaced from their ancestral territory to make way for a reserve for the Mangabey and Colobus monkeys. As the Lonely Planet guidebook shares in a quirky aside about the delta, things came to a head when 300 naked Pokomo women stormed the research centre in protest. Ironically, according to the Pokomo oral history, they themselves brought the Mangabey and Red Colobus to the banks of the Tana River when they migrated there from central Africa more than 600 years ago. This claim is substantiated by the fact that the primates are more numerous near villages than in abandoned forestlands (Horta, 1994).

The TRPR logic is based on the conception of Africa as a zoo for foreigners and scientists, a common complaint in a country where 7% of the land, an area the size of Denmark, is designated as National Parks and protected by armed guards from the Kenya Wildlife Service (KWS) who shoot poachers and encroachers on sight. The TRPR case also highlights the often opposing positions of conservationists and local communities in Kenya, with some saying that the plane crash which led then director of the KWS, Richard Leakey to lose both his legs was an act of sabotage by those opposed to the reserve. However, their interests can also sometimes align, as in the fight against the Mumias sugar company in the delta, where environmentalists and pastoralists have entered into a marriage of convenience. Here we see the combination of two streams of environmentalism joining together to mutual benefit: cult of wilderness with **environmentalism of the poor** (Guha and Martinez-Alier, 1997)

Irrigation

The next project hatched was the Bura Irrigation Scheme, with the original aim of settling around 5000 farmers in 23 villages to grow cotton and maize on 6700 ha of land. An additional 4500 ha of irrigated forestry were to provide for the fuel wood of the estimated 60 000 settlers. The Bura scheme was an utter failure, crippled by corruption and mismanagement. The wrong choice of the pumps was made whereby components and spare parts came from different continents. Siltation destroyed the pumps and the dredgers were rendered useless (BISS, year). According to Horta (1994), in a country where per capita income was only about \$350 per year, the project spent an incredible \$55 000 for every settler. Yet today, the settlers are poorer than before and the area is a wasteland, overrun by the invader bush mathenge (*Prosopis juliflora*).

The most recent “white elephant” project was the Tana Delta Irrigation Project (TDIP) rice scheme, managed by the Tana and Athi River Development Authority (TARDA). The TDIP represented a switch in policy from irrigation schemes with settlement and freeholders to new plans for “economically motivated” commercial estates with a few

out growers. These new estate schemes, while unlikely to be a cure for unemployment and landlessness, were thought to be more likely to produce an economic return. This was not to be as the TDIP rice scheme collapsed due to flooding after the El Niño rains in 1997.

Land in dispute

The communities list a number of unfulfilled promises by TARDA, including not paying for crops in a timely fashion and not building promised schools and hospitals. Moreover, after the construction of an embankment, TARDA claimed the land as their property. The communities are still in court trying to claim back the expropriated land. Despite the fact that the case is still pending, the new Mumias sugar project is planned on the same disputed area.

3. Future projects: Outsourcing the Delta

Little has been learnt from the errors of the past. Future plans for developing the delta continue in the same line. None of them try to achieve food or livelihood security for the peoples of the delta but instead focus on bio fuels development and food for export.

The Mumias Sugar Company, in a private joint venture with TARDA, plans to turn 20 000 ha of the delta over to sugar production. Outputs would include industrial sugar, the co-generation of 34 megawatts of electricity from the bagasse (the fibre left over after the juice has been squeezed out of sugarcane stalks), an ethanol bio fuel production plant and a livestock element. On 11th June 2008 Kenya's National Environment Management Authority (NEMA) approved the project's Environmental Impact Assessment (EIA). Environmental organisations have gone to court citing the impact of the project on the Tana Delta's ecology, biodiversity and local people's livelihoods and on 11th July 2008, they were granted a temporary injunction stopping the project. For the moment, the fate of this project and another proposed sugar project in the region by another company - MAT international - are unknown.

3.1. Livelihood risk

Despite the fact that Mumias, in its operations in Western Kenya near Lake Victoria, sources 90% of its sugar cane from smallholders, the plan envisaged for the delta is that of the 20 000 ha under cultivation, 16 000 would be under nucleus farming – a centralized operation controlled by the company with hired labour. The remaining 4000 ha of cane would be produced by out-growers from among the company's employees. So, the 20 000 jobs on offer would almost certainly be work cutting cane. This is back-breaking work, for low pay, but it also seasonal. So the Pokomo farmers would be giving up their land for a risky labour situation.

3.2. Land grabbing and bio-diesel

A more recent proposal involves leasing an area of 30 000 ha to the government of Qatar in exchange for a loan to build a 3.4 billion dollar port in Lamu. The government of Qatar would provide the technical know-how and the technology for the agriculture

project and all the produce, probably fruits and vegetables, would be shipped back to Qatar. This plan is part of a much wider phenomenon dubbed “**land grabbing**” (GRAIN, 2008). Stemming in part from the food crisis of 2008 which saw food prices rise enormously, it has caused food importers primarily in the Gulf countries and Asian countries, to feel they can no longer depend on the market to guarantee food supplies. Instead they are acquiring huge swathes of cheap farmland, much of it in Africa, and plan to outsource their food production there. However, as GRAIN outlines in their report, another motivation for this land grab is the financial crisis. Companies and private investors see land as a commodity that is undervalued and it is being touted as an investment vehicle for a financial return.

Another project in the pipes is the leasing of land at 1\$ a hectare to a Canadian company, Bedford Fuels, hoping to plant jatropha for biodiesel in a \$300 million project. Despite being praised as a plant that grows without water, jatropha needs water if it is to give a good crop. In South India it competes with food crops (Ariza and Lele, forthcoming).

3.3. Alternative analyses

Nature Kenya have conducted an alternative **cost benefit analysis** that argues that the wealth created in the delta is much greater than the potential returns from the Mumias sugar plantation (Mireri, 2008). They argue that the profitability foreseen in the EIA is predicated on the fact that the Tana Integrated Sugar Project (TISP) will not have to pay for the use of abstracted water from River Tana: some 28 m³/sec or approximately 2 420 000 m³/day. If they were to pay the Water Board, this would cost no less than KES 1 815 000 (16 000 €) per day or KES 662 475 000 (close to 6 million €) per year. They also consider the land to be undervalued. They are interested in undertaking a more complete valuation that will also take into account the foregone **environmental services** of the Delta’s ecosystems.

There are other technical ecological economics arguments against these projects: the low **EROI** (energy return on energy input) of sugar cane ethanol when factoring into the accounts the energy value of the pastures produced naturally that would be destroyed; the “**virtual water**” expenditure for growing the sugar cane; the increased **Human Appropriation of Net Primary Production (HANPP)** at the expense of the biomass needs of other species.

4. An Ecological Economics Approach: EROI, Virtual Water and HANPP in the Delta

From an ecological economics perspective, an analysis of the flows of energy of different sources and flows of materials and water in the delta, both in the current situation and under the sugar plantation scenario can help underline the relative sustainability of different development schemes for the delta, the impact they will have on the local populations, the **resilience** of the ecosystem and the wildlife. The following section outlines the relevance of three eco-eco methodologies.

4.1. EROI

EROI stands for Energy Return on Energy Input. As availability of easily accessible fuels decreases, the concept of EROI becomes more relevant. Essentially, it asks – how much energy does one need to invest to get a certain amount of energy back? For example, when extracting oil, when you first strike a well the crude may come gushing out like a geyser, as the oil level goes down, one needs to invest increasing amounts of energy to pump the oil out of the ground, refine the oil, and so on. In fact it may reach a point where more energy would be needed to be invested in pumping, refining, and so on, that it makes more sense to leave the rest of the oil in the ground. This is the point when the EROI is below 1. If one energy unit is needed to get three or four (as it occurs in the best of cases with bio fuels), then the amount of energy available for other sectors of the economy is too little to maintain a high standard of living.

Bio fuels (or agro-fuels) require large energy inputs in the form of irrigation, fertilizers, pesticides and so on, and after that need to be processed and converted into biodiesel or ethanol. Also, they are grown in areas where some net energy was produced before in the form of pastures or other crops. This is now sacrificed. Many question whether the low EROI of bio fuels because of such intense use of inputs and water justifies their perceived low carbon footprint. Particularly because fertilizers are made with non-renewable fuels. The low EROI of bio fuels is a sign that they are really not reducing carbon dioxide emissions, and therefore an argument can be made against incentives that have been offered to Mumias – for example in 2009, Mumias signed a ten year agreement with the Japan Carbon Finance Company, which will allow the company to sell Certified Emission Reduction Credits (CERS) from the electricity Cogeneration Project from bagasse (Mumias website). This falls under the Clean Development Mechanism (CDM), which allows Japan to “offset” emissions through funding initiatives in developing countries to achieve sustainable development through greenhouse gas-reducing projects. Another problem with this, apart from the low EROI, is that the soils of the delta hold vast stores of carbon which will be released into the atmosphere when the land is levelled and vegetation cleared to prepare it for the sugar project. Calculating the net carbon savings from such a project is thus a complex process, reliant on factors that CDM projects do not always take into account.

4.2. Virtual Water

Water availability in the delta is irregular, highly dependent on the twice yearly rainy periods. Even currently, there are conflicts over water in the delta between different groups. The EIA of the Mumias project already expresses concerns over the possibility of increased conflict for water under the sugar scenario. One way to express this would be to use the **social metabolism** concept of virtual water.

Virtual water allows us to quantify the water used in traded goods between countries or regions. Thus if water is being diverted for irrigation purposes to the sugar cane plantation, it may no longer reach downstream users. When the sugar is exported, it contains some water, but this water is only a small fraction of all the diverted water that

was required to grow and process the sugar/or ethanol. All the water that has gone into the whole process is called the Virtual Water Content or the Water Footprint of the commodity. In the case of the Tana Delta, it would be interesting to look at the Virtual Water of the sugar plantation or of the Qatar plan. The virtual water would be water no longer available in the same form for the human inhabitants and to the biodiversity of the delta. Even if some of the water were to enter back into the system, it could be polluted with fertilizers and pesticides and no longer serve the same purpose for the peoples and the wildlife of the delta. The virtual water argument is an increasingly useful tool because we must keep in mind that one corollary to land grabbing is water grabbing – and those whose water is being appropriated are not being compensated for this additional loss of a scarce resource.

4.3. HANPP

The HANPP indicator is a measurement of the impact of human activity in a given territory. It indicates pressure on the biodiversity. It is calculated by seeing how much of the net primary productivity – biomass flows created through solar energy, are appropriated by human activity, and how much is left in the ecosystems for other species.

As humans passed from hunter gatherers to agricultural and then to industrial societies, they altered more and more the area around them. In this way, HANPP has been likened to a way to measuring the “scale” of human activities compared to natural processes (i.e. the “physical size of the economy relative to the containing ecosystem;” Daly, 2006). Global calculations have been undertaken for HANPP as well as some localized studies. In the case of the Tana Delta study one application would be to look at the distribution of the HANPP between the two competing groups (agriculturalists and pastoralists) sharing the same territory.

The distribution of the energy flows is of particular interest because the inhabitants of the delta rely almost entirely on the biomass production of the Delta for their biomass/energy needs. Thus, the HANPP and its distribution among the tribal groups give us insight into the conflict between them, as pastoralists and agriculturalists. The biomass can also be seen as a type of **GDP of the poor** (TEEB, <http://www.teebweb.org/>) – how does the ability to appropriate biomass outside the market relate to the well-being of the distinct groups.

HANPP also allows us to measure sustainability and sustainable resource use in a particular region. Since we are interested in the ecological **resilience** of the delta, a clearly demarcated area, this would allow us to see the pressure exerted upon the delta, showing the usefulness of the HANPP as a changing indicator of pressure on biodiversity probably increasing with time. It clarifies how among the various forms of appropriation of biomass (grazing, agriculture), which are more compatible with different types of biodiversity (birds, crocodiles). By resilience we mean the ability of an ecosystem to withstand changes, or the ability to recuperate after changes. If an

ecosystem is deprived of the biomass energy and the water required, it might resist for a while but then it loses resilience and flips over to a different system.

We can also examine what the new HANPP will be under the sugar scenario. In the case of irrigated sugar plantation, human intervention would probably increase the net primary production over that which would be produced in the original eco-system. However, this biomass will be much simplified in its biological richness and moreover it will be appropriated and no longer available to either the inhabitants or the wildlife of the area. To the contrary, the export of HANPP (the direct and embodied HANPP) will substantially damage the livelihoods of the pastoralists of the area and impair their ability to appropriate biomass through grazing. Thus what we will have is a model of the competing claims for the HANPP among different groups (human and animal) within the delta and their relationships to each other.

These methods for the study of social metabolism provide alternative ways to appraise proposed projects in other ways besides pure monetary valuation that is undertaken for example in a cost-benefit analysis. We can examine the changes in bio-physical terms as a means to gauge the (un)sustainability of a given development plan. This can be complemented in campaign work by valuation of the ecosystem services of the delta and alternative management plans developed through extended peer networks of stakeholders with vast local knowledge.

5. Impacts: Let them eat sugar (and drink ethanol)

The impacts of these intensive agricultural projects are numerous and they raise both environmental and social issues. Even the Environmental Impact Assessment of Mumias questions whether the proposed abstraction of irrigation water from the Tana River can be maintained during dry months and drought periods (EIA, p. 136). Reduced flow could lead to damage of downstream ecosystems, reduced availability for livestock and wildlife and increased conflict, both inter-tribal and between humans and wildlife. Meanwhile pollution from fertilizers and pesticides may lead to the accumulation of nitrates in ground water and the use of phosphorous can cause eutrophication and algal blooms in the lakes and rivers.

Despite the recognized conservation value of the riverine forests, the plans contain no provisions for alternate energy sources for the 20,000 workers who will be hired for the sugar plantation. Assuming fuel consumption of 67kg per household on a weekly basis, this translates to 194,769 kg per week, which works out to 10,127,988 kg per year (EIA). The biomass available for cattle will also be squeezed and put under enormous pressure. This is the only dry season grazing area available to the pastoralists of the delta.

Ironically, as pastoralists settle, their grazing area becomes reduced and milk availability falls. One of the major substitutes for calories in the diet is heavily sugared tea. To make the tea involves boiling water, further increasing pressure on the forest

resources. Thus at one time, their integration in the market increases, as does the pressures exerted on the environment. It is a chain reaction; the analysis of which is often lacking in development project planning. Johansson's study of irrigation projects in the delta concludes that "irrigation schemes in arid and semi-arid areas lead to high population densities in areas with low carrying capacity" (Johansson, 1991).

6. Conclusion: Key to Development – Saving the Swamp

Historically, wetlands have been seen as problems to be solved, drained, dredged and dried out. Only recently, have scientists and policy makers begun to understand their value. Some wetlands are now protected through the international Ramsar convention. Even *The Economist* magazine, not noted for its environmentalist bent, questioned the Kenyan government's wisdom of planting sugar in the delta, noting how in Florida the Governor was buying over a hundred miles of sugar plantations to allow them to convert back to wetlands in the Everglades (*The Economist*, 2008). The choice to develop a region is often irreversible and the water filtration and other environmental services that the delta provides are still poorly understood.

Despite the conflicts in the delta, it should be kept in mind that such wetlands have enriched, rather than impoverished by the diversity of land uses and livelihood strategies that occupy them. The mosaic of grazing, agriculture and forests contributes to the ecological balance and diversity that thrives in the delta. Thus in one sense, the conflicts between pastoralists and farmers and between humans and wildlife, contribute to the sustainability of life there.

Environmental groups would like a section of the delta declared a Ramsar site as a protected wetland. But environmentalists, herders, farmers and monkeys can all co-exist peacefully, as long as conflict-resolution methods and improvement in the uses of the resource base are integrated. The inefficient local practice of burning down trees to create charcoal for example, can be curtailed through the introduction of more efficient stoves or LPG. Meanwhile, increased crop livestock integration such as the selling of crop residues from the farmers to the pastoralists would enrich both sides (Gefu&Kalowale, N.D.).

Based on interviews with the residents of the delta in July 2008, their demands to add value to their production are clear and easy to implement. According to a young Orma, "We want help with marketing and distribution and factories for skin production and beef production." Local farmers already produce the apple mango for export, and other compatible cash crops could be developed. Currently, environmental groups are drawing up a Master plan for the delta based on surveys of the local communities' shared vision. As Hadley Becha, the director of the East African Wildlife Society, says, "We need development that brings added value to the livelihoods already existing in the delta, not development that aims in a day to turn a pastoralist or a fisherman into a sugar cane cutter" (Interview July 2008).

References:

- ARIZA, P. and LELE, S. (Forthcoming), “JatrophaCurcas Plantations for Biodiesel in Tamil Nadu: Trade-Offs In Peasants’ Livelihood And Food Sovereignty.” *Ecological Economics*.
- ENSMINGER, Jean & RUTTEN, Andrew (1991), “The Political Economy Of Changing Property Rights: Dismantling A Pastoral Commons” *American Ethnologist*, Vol. 18, No. 4 (Nov., 1991), Pp. 683-699. Blackwell Publishing.
- GEFU, Jerome, O. Conflict Common Property Resource Use: Experiences From An Irrigation Project. Paper Prepared For The 9th Biennial Conference Of The International Association For The Study Of Common Property.
- GRAIN (2008), “Seized: The 2008 landgrab for food and financial security” <http://www.grain.org/briefings/?id=212>
- GUHA, R. and MARTINEZ-ALIER, J., *Varieties of Environmentalism: Essays North and South*, Earthscan, London.
- HORTA, Korinna, (1994) “Troubled Waters: World Bank Disasters Along Kenya’s Tana River,” Http://Multinationalmonitor.Org/Hyper/Issues/1994/08/Mm0894_08.Html.
- HVA INTERNATIONAL (2007), “Tana Integrated Sugar Project EAI Study Report.”
- JOHANSSON, Stig. (1991), “[Ecological Implications For Tana River Basin Forestry And Irrigated Agriculture](#)” in P. Trevor & W. Baxter (eds) *When The Grass Is Gone: Development Intervention In African Arid Lands*. NordiskaAfrikainstitutet.
- KAGWANJA, Peter Mwangi. (2003), “Globalizing Ethnicity, Localizing Citizenship: Globalization, Identity Politics and Violence in Kenya’s Tana River Region.” *Africa Development*, Vol. XXVIII, Nos. 1 & 2, 2003, pp. 112–152
- LUKE, Q., R. HATFIELD, And P. CUNNEYWORTH (2005), “Rehabilitation Of The Tana Delta Irrigation Project Kenya. An Environmental Assessment.”
- MEINZEN-DICK, Ruth. & NKONYA, Leticia. (2005), “Understanding Legal Pluralism In Water Rights: Lessons From Africa And Asia.” *International Workshop On ‘African Water Laws: Plural Legislative Frameworks For Rural Water Management In Africa’*, 26-28 January 2005, Johannesburg, South Africa
- MIRERI, Caleb, ONJALA, Joseph, OGUGE, Nicholas (2008), “The Economic Valuation Of The Proposed Tana Integrated Sugar Project (TISP), Kenya.” *Client Nature Kenya*.
- Mumias Website: http://www.mumiasugar.com/index.php?page=About_Us

NG'WENO, Fleur (2008), "Tana Delta Report, Brief On Tana River Delta Biodiversity." Nature Kenya Submission To NEMA

THE ECONOMIST. (2008), "Slippery when wet: Kenya plants sugarcane; America uproots it." 30 June 2008