THE HURUMA VILLAGE PROJECT

Improving Sanitation in Informal Settlement and Promoting Carbon-Neutral Programme

Background:

Huruma Village is a slum about 2 km from the United Nations Offices in Nairobi, at Gigiri, with about 10,000 inhabitants. Currently, UNEP, UNDP and HABITAT are working as 'One UN' team, and with the participation of the Huruma village community, have planted 10,000 indigenous trees covering 10 hectares of the Karura Forest[1]. Karura is a remnant of closed canopy forests[2] in Kenya, which harbor large percentage of the country's biodiversity, including woody plant species, large mammals, birds and butterflies. Karura Forest, borders the United Nations Complex in Gigiri, and covers over 1,000 hectares. It is a water catchment for four major tributaries of the Nairobi River system: the Thigiri, the Karura, the Ruiruaka and the Gitathuru. In addition, the forest acts as a "lung" for the city and purifies the air by absorbing significant quantities of carbon-dioxide released from activities within Nairobi City.

Because of the initial success with the afforestation programme, the Kenya Forest Service (KFS) has agreed to give UNEP another 60 hectares of degraded forest near Huruma Village, and an additional 50 hectares at the Ngong Road Forest for planting with indigenous trees. KFS is in the process of providing a land-use document for the two areas totaling 110 hectares allocated to UNEP, as part of KFS's strategy of participatory forest management by neighboring communities. KFS will also provide a list of appropriate tree species indigenous to the area with the highest carbon absorption capacity. This will benefit the UNEP Carbon-Neutral initiative, to off-set carbon emissions during staff travel.

It would have been desirable to grow fruit trees in this area for their economic and nutritional value, however, KFS rules and regulation does not permit planting of fruit trees in gazzetted forests. Nevertheless, Mulberry bushes and bamboo could be grown for silk farming (*sericulture*) and soil stabilization values respectively. Harvesting mulberry leaves for silkworms or bamboo for construction stakes will be agreed upon between the Service and the community, as these are cash-generating schemes aimed at poverty alleviation. KFS is committed to incorporate these activities in the Karura Forest Management Plan which is currently being developed.

In the meantime, UNEP, UNDP and HABITAT, with the help of the private sector and civil society, are planning to build a bio-latrine for the Huruma Village community. Separately, a team consisting of UN staff has visited Katwekera Village in the Kibera informal settlement where successful bio-latrine projects have been constructed. They obtained information on their suitability and viability. A successful visit was also organized for a select community group from Huruma to the Kibera site.

The Project Development Process:

1. First, the project is initially aimed at improving sanitation at the informal settlement level in Huruma by building a bio-latrine. At present, the community has applied for a land-use permit from the City Council of Nairobi for the construction site of the proposed bio-latrine. Once built, the community will set up a good management structure to ensure sustainability. Further co-operation and collaboration with the Katwekera community in Kibera will be essential.

2. Second, the project is focusing on promotion of climate neutrality through tree planting to off-set carbon emissions generated through international travel by UNEP staff, and in the future, of all other UN agencies in Kenya under the umbrella of the 'One UN'.

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[1] Another 2 hectares have been planted with indigenous trees in the Ngong Road Forest.

[2] Closed canopy indigenous forests in Kenya cover less than 2% of total land area, making Karura very special indeed.

3. Third, the challenge is how to ensure that one metric tonne of CO_2 produced is neutralized by planting a specific number of indigenous trees. UNEP's Division of Regional Cooperation (DRC) has had initial consultations with International Centre for Research on Agro-Forestry (ICRAF) on two occasions and got useful information and support. A team at UNEP is working on methodologies and calculations of how many metric tonnes of CO_2 the organization emits every year, and how proposed intervention could best make UNEP 'carbon-neutral'.

4. Fourth, considerations must be made to ensure the project is sustainable. Various options are currently being looked at at UNEP on sustainable resource mobilization. Funds flow channels are being identified, and monies collected from UNEP's international institutional travel will be directed towards the Huruma tree-planting project.

By involving the Huruma Community in the project, and introducing them to various enterprises, such as sericulture, bee-keeping and improved sanitation facilities, the project will be attempting to provide poverty alleviation strategies for similar communities like Huruma. This will be measurable, and shall be a concrete step taken by UNEP towards poverty alleviation in Kenya.

Currently, efforts are being made by UNEP to inform the United Nations Country Team (UNCT) and invite participation by all the members of the UN agencies to participate in the climate change team on how to integrate this project into UNEP's Climate Neutral Initiative.

KEY ELEMENTS OF THE PROJECT

Tree-Planting

In May 2005, Nairobi River Basin Programme planted the first 2 hectares of trees (2,000) seedlings in Karura Forest. Todate, more than 10,000 seedlings have been planted, and KFS has agreed in principal to add UNEP another 60 hectares in Karura, and 50 hectares in Ngong Road forests. Involving the youth from the local communities is very strategic in terms of education and empowerment. Survival rates of the trees planted by NRBP are 80% and fill-ins are currently being done.

Regular consultations with the Huruma community over the two years on the trees project have been responsible for the high rate of survival. Calculations are being carried out using approved methodology to determine what trees, and how many, would be necessary on this area of land equivalent to absorb one metric tonne of CO_2 by international agreed criteria.

Initial figures indicate that planting mulberry trees in 60 hectares in Huruma will cost US $ 100,000, and according to calculations from carbonneutral.com, 60 hectares mulberry trees can absorb **6,922.6 tonnes** of CO_2 a year.

Bee-Keeping

The UN's Nairobi River Basin Programme – Phase III (NRBP–Phase III) introduced bee-keeping at the Karura Forest as an alternative source of income-generation for the forest-adjacent communities. The project aims at improving livelihoods of community groups within the larger river basin. Once the communities are able to link the benefits of bee-keeping to that of forest protection, then the objectives of protecting the water catchments of Nairobi rivers and promoting biodiversity[3] will be achieved.

Handing Over Bee-Hives, November 2006

Eighty (80) bee hives were donated to the Huruma Vision Self-Help Group in November 2006 under the UN's Nairobi River Basin Programme. The aim was to promote bee-keeping as an alternative non-consumptive utilization of forest resources. The hives were placed in strategic locations inside the Karura Forest. Experiential training was provided by a technical team – the African Beekeepers Ltd[4] - harvesting, processing and packaging of the honey. Modern **Langstroth Hives** were preferred to the traditional Log-Hives or the Kenya Top Bar Hives. These hives are also gender-friendly and can be used by all, women, youth and men. Yield of honey using the Langstroth Hives is higher at an average of 30 Kg of honey/hive/year. Other by-products include high value hive products like Royal Jelly. In six months, significant achievements were made in bee-keeping, and prospects are high with good management.

First extraction of honey was done on the 20th of March 2007. Mr. Simeoni of African Beekeepers Ltd talked to the group regarding honey processing, that is, de-capping of capped frames, use of centrifuge machine, and finally on sieving the extracted honey.

Out of the three (3) supers harvested a total of twenty four (24) Kgs of pure honey was extracted, an average of eight (8) Kgs per super. After extraction the group members were instructed to take back the supers to the apiary for cleaning before they are placed back onto the brood boxes.

First Honey Harvest, March 2007

Based on these initial figures, estimates show that if 1 Kilogram of honey fetches between KShs. 100 – 120/-then eighty (80) hives have the potential of generating over KShs. 288,000 per year to the community.

[3] Bees are good pollinators and many flowering plants depend on them to transfer pollen, hence biodiversity. It is estimated that more than 75% of plants from the tropics, such as Kenya, benefit from bee pollination.

[4] The African Beekeepers Ltd. provided 1,000 bee hives to community groups in Kitui District supported through the Belgium Technical Cooperation (BTC).

Sericulture

Information is available on silk production with silk worm breeding technology in Mwingi and Kakamega. The community needs to build up its capacity to operate this project on a commercial basis and in a sustainable way. It is another step towards poverty alleviation. The silkworm farming proposes planting of mulberry trees inside the Karura Forest. The community group planting the trees will be allowed to harvest the mulberry leaves to feed silkworms in the enclosures within the community settlement. It is estimated that 5,000 mulberry trees are required to feed 20,000 silkworms over a period of time.

The mulberry trees may be propagated from cuttings or seedlings. These are available at the International Centre on Insect Physiology and Ecology (ICIPE) at KSh 2/= for cuttings and KSh 10/= per seedling. Seedlings take 6-9 months to mature, and with proper silvicultural practices the trees will provide enough leaves for the worms for over fifteen years.

A batch of 20,000 silkworms may be purchased from ICIPE for KSh. 500. To rear this batch, one needs a house measuring 20 ft x 25 ft. It is estimated that after 28 days, a batch of 20,000 silkworms will produce approx 40 Kg of cocoon which may be sold to ICIPE. The selling prices for cocoon vary depending on grades. [Grade A - KSh. 625 per kilo; Grade B - KShs. 500 per kilo; and Grade C – KSh. 475 per kilo].

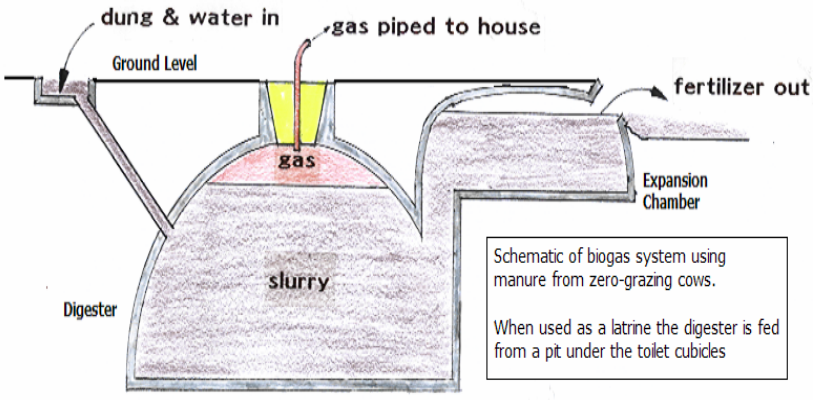
Bio-Latrine

The bio-latrine consists three principal components: a conventional pit latrine, the bio-digester and the expansion chambers. The pit latrine is a dry ventilated improved type (VIP) with ventilation pipes to remove odours and trap flies. The only real divergence from a standard pit latrine is that a bio-latrine unit is relatively shallow and feeds directly into the bio-digester.

The bio-digester is a large underground dome, which in normal use will be filled to about half its height with the combined urine and faecal sludge - the bacteria in the sludge break down the pathogens in an airless process, which produces the methane-based gas.

The sizing of the bio-latrine is based on the requirement to keep the sludge in the system for at least 120 days on order to ensure that it is treated sewage, and therefore harmless, when it leaves the system.

The gas collects in the space above and is lead out to the reticulated supply through the tapered plug, which seals the top of the dome. Gas generated by the latrine is principally methane. The gas exits the digester through a plug inserted into its neck and then is piped directly to the appliances. The most efficient use of the gas is the generation of heat for: cooking, hot water, lighting, heating laundry irons or powering fridges.



Sludge level outside the bio-digester, in the latrine pit and the expansion chambers, pressurizes the gas and this level will fluctuate depending on the volume and pressure of gas. From the bio-digester the sludge is fed into one, two or three inter-connected expansion chambers (the larger the system the more expansion chambers are required), which are also underground, but at a higher level. In most situations the sludge exits the system from the expansion chamber/s via a pipe leading into a holding tank - this is a convenient container from which to dispense the slurry if it is being used for fertilizer. In situations where there is no local use or market for fertilizer the slurry can be safely discharged into whatever drainage system currently exists.

To build a bio-latrine, the construction work will take 5 months. The estimated cost is USD 25,000. The key issue at the moment is how to sustain this bio-latrine, since the fee paid for use of shows and toilet is not sufficient to cover the management cost. It is planned to use second floor and the third floor as income source and use the rent fee to subsidize the management fee of bio-latrine. The bio-latrine to be built is an effective step to protect Nairobi River from human pollution, is a useful demonstration of a clean and renewable energy, a small step towards reducing deforestation. A bio-latrine is a simple, sustainable, raw sewage treatment system, which has the additional advantage of creating two useful by-products.

The Technology

Bio-latrines use the well-proven technology of anaerobic, or airless, digestion to transform human waste into a highly effective fertilizer and a gas suitable for uses like cooking, heating and lighting. Bio-latrines use standard biogas-system designs of which there are millions in China, India and Vietnam. The only significant difference between biogas digesters and bio-latrines is that the latrines use human instead of animal waste.

The system has no moving parts, is constructed using conventional building materials and requires virtually zero maintenance. The systems are scaleable so they can cater for populations ranging from small settlements up to large institutions. For example bio-latrines are ideal for urban and rural schools where cooking energy is required and as an example from the top end of the scale the Rwandan Government is installing the latrines in all of that country's prisons.

The Benefits

1. The bio-latrine will utilize human waste and thus improve the overall water quality and health of residents in Huruma.

2. It will complement the efforts to reduce the consumption of biomass by shifting from fuel-wood to biogas for cooking as follows: addressing existing sanitation problems, generating fertile manure for better nutrition and additional income to be invested for community purposes and giving incentives for environmental awareness and education.

3. Preliminary calculations, assuming 500 users of the latrine, indicate potential generation of about **12.5 m^3** of gas per day. If the gas is used to replace charcoal for cooking, then the approximate potential emission reductions over the estimated 20-year lifecycle is 201 tonnes.

4. The natural fertilizer, which is a by-product of the bio latrine, is very fertile manure which could be used to build an indigenous tree nursery at the village to provide the community with a rich investment of indigenous tree seedlings for sale throughout the year.

5. Kitchen gardens could produce local fruits and vegetables thus ensuring a more balanced diet for the community.