STATUS OF ENVIRONMENTAL HEALTH EDUCATION IN THE EASTERN AFRICA REGION: OPPORTUNITIES, CHALLENGES AND THE WAY FORWARD

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Abstract
Trees and forests have beneficial effects on the environment. They conserve biodiversity, protect soils and watersheds and act as a carbon sink. Deforestation on the other hand results in deleterious effects on the environment. The best-known effects of deforestation are those attributed to the green house gases and climate change. Deforestation also results in habitat changes, which affect disease vectors and parasites resulting in a change in disease incidences.

This paper explores the effects of trees, forests and deforestation on human health. It is based on a survey of available literature and a three-week market survey conducted in Nairobi. The paper starts by discussing the role of herbal medicines and forest foods on human health. The thrust of the paper is on the effect of deforestation on a few named diseases. Deforestation is the most important factor in some disease incidences due to the resultant alteration of the vector habitat. Human populations venturing into and opening up new forest areas for settlement are exposed to diseases such as yellow fever and malaria. Deforestation or bush clearance has been used to control tsetse flies, vectors of sleeping sickness and has also been shown to result in lower incidents of river blindness (Taylor 1997).

Only one incidence of afforestation resulting in increased malaria is reported in Trinidad (Taylor 1997). In view of the importance of forestry and trees in human life, the paper recommends the inclusion of relevant forestry topics in the material taught to students of Environmental Health.

Introduction
Forests are known to have beneficial effects on environmental factors such as climate, water and temperature. They conserve biodiversity, mop up harmful chemicals from the soil, protect watersheds and act as a carbon sink, all of which have beneficial effects on human health. Products from trees and forests such as foodstuffs and herbal medicines play a direct role in human health enhancement. What is generally not appreciated is the role deforestation plays in human health with particular reference to diseases.

Deforestation, which is the clearing of forests for agriculture, settlement and other uses, produces deleterious effects on the environment. The best-known effects of deforestation are those attributed to the green house gases and climate change. Deforestation is mainly anthropogenic and results in habitat changes, which may alter populations of disease-causing organisms. The purpose of this paper is to explore the role trees and deforestation play in human health in general and find out specific human health conditions that may be attributable to trees and deforestation.

Methodology
This paper is based on a review of literature and a market survey in Nairobi. The market survey was conducted for three weeks in January 2004. The aim of the literature review was to find specific references to trees and forests or deforestation with regard to human health. Interest was on specific diseases that may arise due to forestry or forest related activities.

Results and Discussion
Medicines and Foodstuffs from Forests
The role played by trees and forestry in human health is normally beneficial. The negative impacts are usually due to forest habitat removal. Some forest products such as herbal medicines and foodstuffs are of a more tangible nature and affect human health more directly. Forests are a rich habitat for different trees and herbs, which many in Africa use for medicine and livelihood. Herbal medicines obtained from forests and other wild lands are used exclusively for the well-being and health enhancement of human beings. It is estimated that 80% of the world's population rely on traditional forms of medicine for their primary health care needs (Posey 1999, Akelele and Synge 1992). In rural Kenya, Khalil (1996) estimated the population using herbal medicines to be 82%. The global market for herbal medicines currently stands at over US $ 60 billion annually and is growing steadily.

Twenty five percent of all prescription drugs have active ingredients that come from plants (FAO 1993). The global value of plant-based drugs is estimated at US$ 43 billion annually (Taylor 1997). These figures are mere guesses, as information on medicinal products is very difficult to obtain. Musabe (2002), Mworia (2000) and Cunningham (1993). The information is guarded by local medicine men and women while pharmaceutical industries regard it as trade secrets. 40 different forest species were recorded to be in use for medicines in Kakamega Forest, 108 in Arabuko Sokoke and 64 in the Mau Forest in Kenya (Forest Master Plan 1994). Waiganjo (1999) lists 77 plant species used in herbal medicine by communities living adjacent to Ragati Forest (Mt. Kenya) while Musabe...
blood pressure, infertility, impotence and even cure diseases but also to bring about fortunes or believe in the power of herbal medicines to not only
AIDS. Among many ethnic groups in Kenya and indeed among them asthma, stomach aches, diarrhoea, high blood pressure, infertility, impotence and even HIV/AIDS. Among many ethnic groups in Kenya and indeed other parts of Africa, traditional medicines obtained from herbs or animal parts are a way of life. People believe in the power of herbal medicines to not only cure diseases but also to bring about fortunes or misfortunes, ensure success in business, in politics, in schoolwork and in securing employment. The high cost of western medicine coupled with poor doctor coverage especially in rural and slum areas of Kenya ensures a continued reliance on herbal medicine.

**Prunus africana**
Cunningham (1993) gives a comprehensive account of trade in *Prunus africana*. The tree grows in high altitude (from 1000 meters above sea level and above) climates in Kenya, Uganda, the Congo, Cameroon, Southern Africa and Madagascar. The bark is harvested and exported for use in prostate gland cancer treatment. Traditional harvesting removed only a small potion of the bark which action allowed the tree to survive. However, the export trade has resulted in either whole trees being cut down and stripped of their bark or the whole bark being stripped from standing trees. Consequently, the trees die. The overexploitation of *P. africana* in the whole of its range means that good old seed trees are removed endangering the species. To forestall this eventuality, *P. africana* has been placed on the Appendix II of the Convention on International Trade in Endangered species so that trade in the tree bark can be regulated.

The overexploitation may result in the extinction of this medicinal tree, which will be a loss to the pharmaceutical industry, the traditional medical practitioners and the environment. It is thus in the interest of all these groups of forest users to conserve the forest habitats. Domestication has been suggested as a solution to overexploitation for some herbal plants (Cunningham 1993). At present, there is an on-going project to by the World Agroforestry Center (ICRAF) in collaboration with Kenya Forestry Research Institute (KEFRI) to domesticate *P. africana*. Poor farmers, commercial enterprises and the environment stand to gain if the trees are domesticated and widely planted. The harvesting and sell of the product can then be well planned and managed while protecting trees in the wild.

**Hygiene Enhancing Products**
The Nairobi market survey showed that chewing sticks are sold alongside other traditional medicinal products. In most rural areas of Africa, the chewing stick is the choice brush for cleaning the teeth. The chewing stick is recognized and researched in many countries from India, Ghana, Nigeria and Southern Africa (Cunningham 1993). In Kenya, although many rural people use chewing sticks, their importance in dental hygiene is not given prominence. The status of trees or shrubs species such as *Salvadora persica* that provide chewing sticks is not known.

**Food from Trees and Forests**
Trees and forests support food production through nutrient and soil fertility enhancement, in addition to erosion control. However, it is foods from forests that have a more direct influence on human health. Forests provide foodstuffs such as edible plants, leaves, fruits, nuts, sap and roots. They also provide wild animals in form of bush meat. They provide honey, mushrooms, grasshoppers, termites, and other insects that supply much needed proteins and vitamins. Mushrooms are often valued as meat substitutes. The market survey revealed that dry mushrooms, traditional vegetables and termites are transported from Western Kenya to urban markets in Nairobi by women traders to earn them some income. In addition, large quantities of game meat are also consumed, in spite of regulations prohibiting the hunting of wildlife. The Ministry of Environment and Natural Resources (MENR 1994) estimated that up to 50 different species of forest animals and birds were hunted in Arabuko Sokoke forest alone while 22,000 animals belonging to eleven different species were hunted and trapped in the Mau forest of Kenya every year. In Nigeria people living near forests consume as much as 84% of their animal protein in form of wild game” (FAO 1993).

Most forest and wild foods are often used as supplements during times of food scarcity. They add flavour to foods and enhance the appetite. Some foods are said to increase the absorption of vitamins, e.g. gum arabic from *Acacia senegal* (Maundu et. al 1999). Some forest and tree food items not only contribute significantly to the nutritional and health status of users but they also contribute to the household income. This is the case among the Batwa of Rwanda (Musabe 2002)). Riley and Brokensha (1994) observed that children and herders in Mbeere, Kenya consumed large amounts of wild fruits while Taita children consumed fruit of 77 different species (Fleuret 1986). Maundu et al (1999) have compiled a comprehensive list of 175 traditional food plants of Kenya, many of which are trees or are found in forest habitats. In
of the diseases whose prevalence is closely linked to forestry or deforestation are briefly mentioned in the next section.

**Diseases Linked to Forest Activities**

From the literature review, the following diseases may be closely affected by deforestation: yellow fever, malaria, sleeping sickness and river blindness. The yellow fever virus is transmitted by the *Aedes aegypti* mosquito. The virus normally lives in forest monkeys. As people invade the forest habitat they may be bitten by infected mosquitoes and get the disease, which is fatal if not treated (Heslet et al 1999). Wherever *A. aegypti* abounds we may get outbreaks of Dengue hemorrhagic fever occurring.

Walsh et al, (1993) carried out a comprehensive global survey of the effects of deforestation on infectious disease rates by sifting through research on arboviruses and such diseases as malaria, Chagas disease, leishmaniasis, loiasis, lymphatic filariasis, onchocerciasis, and schistosomiasis. They found that deforestation reduced the incidence of loiasis, a disease transmitted by horseflies. Deforestation destroyed the forest mud habitat where the horseflies bred. As the horseflies died off, the disease was eradicated.

**Sleeping Sickness.**

Sleeping sickness is a severe disease long associated with savanna woodland cover in Africa. It is caused by a trypanosome parasite. The disease is scattered throughout the sub-Saharan tsetse belts of Africa, an area of some 10 million sq km., found between latitudes 10 degrees North and 25 degrees South (WHO 1999). The disease is spread by bites of tsetse flies. Some tsetse fly species prefer forest habitats; others live in vegetation near streams, rivers and valleys while one group prefers savanna woodlands. Female tsetse flies depend on trees and logs under which they deposit full-grown larvae one at a time. The adult flies also require shade in order to survive dry weather conditions.

The disease is closely related to a wide spread cattle infection known as Nagana, which restricts cattle rearing in many areas of the continent. An estimated number of 25,000 people scattered in 36 countries of Africa suffer from sleeping sickness (WHO 2000).

In the past, reduction of the tsetse populations involved extensive bush clearance to destroy the flies' breeding and resting sites, and widespread use of insecticides (both environmentally unfriendly methods). More recently, efficient traps that can keep tsetse fly populations down to very low levels have been developed.
Onchocerciasis (river blindness)

River blindness, responsible for many cases of blindness in Africa is caused by *Onchocerca vulvulus*, a parasitic worm transmitted by blackflies that abound in fertile river valleys. In the 36 countries where the disease occurs, large areas remain uninhabited. In Tanzania, studies showed that deforestation was linked to the decline of onchocerciasis. The female fly sometimes lays eggs on fronds of vegetation. Forest clearance eradicated the vegetative cover the flies depend on, resulting in reduced incidences of river blindness (Walsh 1993).

Malaria

Malaria remains the most important of the tropical diseases - widespread throughout the tropics, but also occurring in many temperate regions. The disease exacts a heavy toll of illness and death - especially amongst children in endemic areas. Malaria is estimated to affect 267 million people in 103 countries all over the world causing a mortality rate of one to two million people per annum mainly among children and pregnant mothers (WHO 2000). Epidemics are frequent in rural areas experiencing intense economic development. Treatment and control have become more difficult with the spread of drug resistant strains of malaria, and insecticide resistant strains of the mosquito vectors. Geography, climate, topography and land use determine the mosquito fauna of a locality and therefore the severity of malaria. Some mosquito species prefer open pools while others thrive in shaded conditions. Epidemics of clinical malaria are often associated with numbers of non-immune people moving to highly endemic areas (e.g. in search of work) where they quickly succumb to the infection. Over the last few years, epidemics have been reported from several areas, including the Amazon region, Ethiopia, Madagascar, Sri Lanka and the Solomon Islands. According to Taylor (1997), malaria in the Amazon has reached epidemic proportions in the past 20 years as a result of forest clearing and the creation of large numbers of still pools where mosquito vectors multiply unchecked. So far there is only one case of an epidemic linked to reforestation and that is in Trinidad where, *Erythrina* trees planted as shade trees for cocoa plantations are said to have created a habitat for malarial mosquitoes and caused an epidemic that was relieved only when the trees were removed (Taylor 1997). Taylor (1997) further linked changes in forest habitat as a result of deforestation, to the spread in Mysore India, of a tick-borne hemorrhagic viral disease identified as Kyasanur Forest Disease.

Conclusion

The foregoing briefly shows the extent to which deforestation can increase or decrease disease incidents. The paper started by discussing the contribution of forestry and trees to human health. It showed the important role played by forest products such as herbal medicines and foodstuffs in enhancing human health and the role they play in the pharmaceutical industry. Many of the manufactured drugs are derivatives of plants or herbal medicines. Foods from the forests are important as famine foods and in the provision of essential vitamins to diets of some communities. The continued supply of these products is however, threatened by deforestation. Deforestation changes the forest habitat, contributes to green house gases and may cause an increase in diseases such as malaria. The invasion of forest habitats by human beings in pursuit of development and livelihoods exposes them to new diseases. It is concluded that environmental health students should learn about some aspects of forestry such as the effects of deforestation in order to appreciate their role in the general health of human beings.

REFERENCES


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