Introduction

“Over the past few years, there has been a major revolution in the world’s thinking about HIV. The epidemic has been understood, not just as a health issue that will always remain, but as a major threat to development and to human security.”

Chapter 23

The challenge of HIV/AIDS: Where does agroforestry fit in?

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Abstract

In its early stages, the global HIV/AIDS epidemic was predominantly an urban problem. It affected more men than women, and those with relatively higher incomes. The epidemic has moved rapidly into rural areas and now, the majority of people living with and dying from HIV/AIDS are the rural poor. Among them, women comprise a disproportionately high number. Although up to 80 percent of the people in the most affected countries depend on agriculture for their livelihoods, there have been limited responses from governmental and non-governmental actors in the agriculture and natural resource sectors. This chapter discusses the impact of HIV/AIDS on rural livelihoods and the ways in which agroforestry could help mitigate those impacts. The chapter concludes that agroforestry interventions can improve communities’ long-term resilience against HIV/AIDS and other external shocks in ways that agricultural interventions alone cannot. Agroforestry technology can be better tuned to respond to the cash, labour, food and asset shortages faced by AIDS-affected communities. By providing options for producing nutritious food, managing labour, generating income and enhancing soil fertility, agroforestry technologies can help reduce hunger and promote food security. The authors recommend that current and future agroforestry programmes and forest policies should be reviewed to assess their effects on key determinants of HIV vulnerability. They also recommend some responses that can be made by agroforestry research and development organizations.

Introduction

In its earlier stages, the HIV/AIDS epidemic was predominantly an urban problem, affecting more men than women, and those with relatively high incomes. The epidemic is now moving rapidly into rural areas, hitting those who are least equipped to deal with its consequences. Today, 95 percent of people living with – and an even higher proportion of those dying of – HIV/AIDS live in developing countries. The overwhelming majority are the rural poor and, among them, women comprise a disproportionately high number. The epidemic is responsible for undoing decades of economic and social
development and causing rural disintegration. For example, in sub-Saharan Africa, HIV/AIDS is depleting the region of its food producers and farmers and decimating the agricultural labour force for generations to come (FAO 2004a).

Although up to 80 percent of the people in the most affected countries depend on agriculture for their livelihoods, the greatest response to the epidemic has come from the health sector. The agricultural sector cannot continue ‘business as usual’ in communities where large numbers of adults have died, leaving the elderly and children to produce food. Agriculture and natural resource responses can play essential roles in controlling the epidemic, so researchers will have to revise the content and delivery of services and the process of transferring agricultural knowledge.

This chapter illustrates the specific impacts of the HIV/AIDS pandemic on agroforestry and proposes relevant strategies that could mitigate them. Since agroforestry is the science and practice of integrating trees into farming systems and agricultural landscapes, and there are many types and products of trees, there are many ways in which agroforestry can contribute.

The impact of HIV/AIDS on rural livelihoods

The impacts of HIV/AIDS are many and intertwined. While health and demographic impacts have been studied most, the effects on agriculture and food security have become clearer over the last few years (FAO/UNAIDS 2003; Mushati et al. 2003; Yamano and Jayne 2004). The impacts can be felt most dramatically in the reduction of the labour force, impoverishment and the loss of knowledge that is transferred from one generation to another.

All exacerbate food insecurity and poverty. Moreover, the consequences of HIV/AIDS contribute to making the rural poor more vulnerable to HIV/AIDS infection. This devastating cycle must be broken, and agroforestry has a critical role to play.

The impacts of HIV/AIDS that have a long-lasting effect on forestry, agroforestry and rural livelihoods stem largely from: a) reduction of the productive age groups and agricultural labour force; b) acute impoverishment of households; and c) loss of knowledge.

Regarding loss of productive age groups, the Food and Agriculture Organization of the United Nations (FAO) has estimated that some countries could lose up to 26 percent of their agricultural labour by 2020 (FAO 2004a). A lack of available labour was found to be associated with an increase in forest fires in Malawi, where communities resorted to clearing the land by burning the forest rather than selective cutting/processing. Fires destroy larger areas of woodlands than selective cutting and remove all the products and services that woodlands provide to communities (Mike Jurvelius, FAO, personal communication 2002). Other effects of labour shortage are shown as a sharp reduction in the area of land cultivated and a shift from cash to food crops (FAO 2002).

When a member of a household becomes infected with HIV/AIDS there is a need to pay for medical expenses and/or a funeral and productive assets are often sold to meet these expenses. The consequent loss in purchasing power has led to less money being spent on food. For example, a study in Ethiopia calculated the cost of treatment of one AIDS patient was more than the entire farm’s average annual income (Demeke 1993).

The loss of a generation to HIV/AIDS is interfering with the transfer of agricultural knowledge, practices and skills that are normally passed from one generation to the next. This knowledge is critical to both sustainable agricultural production and cultural identity. The epidemic is also responsible for a significant loss in institutional knowledge, since staff of such agricultural service institutions as the extension services are also affected.

The overall impact of the epidemic depends on the actual stage of evolution of infection in the population. As shown in Figure 1, the rate of infection of the HIV virus follows distinct phases. In Phase I, which can take several decades, prevalence rates remain low and increase slowly. Phase II starts when somewhere around 5 percent of the population becomes infected and exponential growth rates in infection occur. Phase III represents a levelling off of infection rates, and finally, a decrease occurs in Phase IV. The precise shape of the curve and the duration of each phase will vary from area to area and depend on a range of factors, including policy and action taken to prevent and mitigate the epidemic. Early and decisive action may keep rates low, without ever reaching Phase II, as in the case of most developed countries.

![Figure 1. Phases in the HIV prevalence curve. Source: Villarreal (2003).](image-url)
HIV/AIDS is a slow epidemic with slow impacts. Impacts only start to be obvious at the population level years after a sharp increase in prevalence rates (Villarreal 2003). This time lag varies in duration, but large numbers of deaths can be expected 5–10 years after the onset of Phase II, depending on the level of nutrition of the population and other factors. Death is one of the main impacts, but before death occurs, the person suffers weakness and decreased ability to work for about two years (again, depending on nutritional, medical and other factors). Impoverishment is another effect, starting more or less at the time of decreased work ability. Impacts at the population level that lag some years behind the death curve include the problems faced by children who have lost first one then both parents. These ‘double orphans’ face tremendous problems in securing both short- and long-term learning and livelihoods. Hypothetical ‘prevalence’ and ‘death’ curves are shown in Figure 2.

The time lag between the peaks of prevalence and impact means there may be little observable impact on a population even when prevalence rates are very high. In addition, low prevalence rates may occur at the same time as high levels of impact during Phase IV. Policies, programmes and other initiatives designed to prevent the spread of HIV/AIDS and mitigate its effects need to take account of the stage of the epidemic (Topouzis 2001).

Very importantly for agroforestry initiatives, the lag between rising prevalence and impact creates a ‘window of opportunity’ for specific interventions. For example, as discussed below, some of the proposed labour-saving initiatives are initially labour-intensive, and only later will produce labour-saving benefits. If they are successful, the people could begin to reap the advantages of such techniques when their need is greatest. Analysis of the progression of AIDS at the household level also shows a time lag between the time of infection of the first adult and the development of full-blown AIDS. Households go through similar stages of prevalence and impact and the death of different family members has different effects on the household.

Recent studies have shown that the precise effects of HIV/AIDS depend upon: a) the previous demographic structure of the household; b) who and how many people in the household are chronically ill or die; c) the length of time that the household has had to cope with the effects of the epidemic; and d) the resources the household had at its disposal for dealing with increased demands (Mushati et al. 2003; Yamano and Jayne 2004).

Figure 3 depicts the different composition of households affected by AIDS over time. There are 13 different types of households that may exist in an area of high HIV/AIDS prevalence. In many communities, all 13 types may exist at the same time. Each type of household has distinct resources, challenges and needs.

**Agroforestry possibilities for the mitigation of HIV/AIDS impacts**

In this chapter we will be using a landscape perspective on agroforestry: “Agroforestry refers to a dynamic, ecologically based natural resources management system that, through integration of trees in farms and in the landscape, diversifies and sustains production for increased social, economic and environmental benefits of land use at all levels,” (Leakey 1996).

Agroforestry can play an extremely important role in ensuring rural livelihoods survive an epidemic of HIV/AIDS because it:

- enhances food security through improving soil fertility;
- produces nutritious foodstuffs (fruits, berries, leaves) that can boost the

**Figure 2. Prevalence and death curves: Window of opportunity.**

Immune system and help protect against opportunistic disease;
• includes medicinal trees and other products that can help treat opportunistic infections;
• provides income generation opportunities that are not labour-intensive;
• offers a safety net of subsistence and income (e.g. firewood for consumption and for sale, animal fodder, potentially high-value tree products, building and thatching materials)
• marks ownership of land; and
• offers short-term and long-term labour management possibilities.

**Improving soil fertility**

One of the greatest challenges for agricultural households affected by HIV/AIDS is to maintain food production while coping with reduced disposable income for purchasing agricultural inputs. The World Agroforestry Centre and its partners in eastern and southern Africa have developed several agroforestry methods for enhancing soil fertility and maintaining soil quality. In the highly populated bimodal rainfall areas of western Kenya, the emphasis has been on short-duration improved fallows and biomass transfer. In the relatively sparsely populated, unimodal rainfall areas of eastern Zambia, the emphasis has been on 2–3-year fallows. Some farmers in eastern Zambia are using biomass transfer as an input into the production of garlic, a plant known for its anti-oxidant properties. In the densely populated areas of Malawi, leguminous trees are being intercropped with maize. All these systems have met with approval, with a total of some 250,000 farmers now testing or adopting one/some of the practices by 2004. In areas with suitable production characteristics, improved fallows allow farmers to produce maize yields roughly similar to those obtained using recommended levels of inorganic nitrogen fertilizer, and two to five times higher than yields obtained under continuous maize production without fertilizer, although the figures do not reach those achieved when maize is grown with fertilizer (Rommelse 2001; Franzel et al. 2002). Table 1 illustrates the success of improved fallows in eastern Zambia.

Studies on these systems generally show that adoption levels are relatively similar for male- and female-headed households and for households with different levels of education. In addition to addressing issues of soil fertility and quality, improved fallows also provide households with nearby sources of fodder and fuelwood, thus contributing to reduced overall labour requirements for the family (Ajayi et al. 2003).

**Agroforestry foods**

People living with HIV are trapped in a vicious cycle in which repeated episodes of illness weaken the body and accelerate the onset of AIDS. HIV weakens the immune system and people become ill more frequently. Repeated illness reduces appetite and, at the same time, nutrients are lost
Moringa oleifera seeds are very effective in clarifying and treating water; fresh moringa leaves contain very high levels of micro- and macronutrients (protein, carotene, calcium, iron, Vitamins A, B and C); and moringa pods and dried leaf powder are used as nutritional supplements (McBur-ney et al. 2004).

Throughout sub-Saharan Africa, people harvest indigenous fruits to supplement their diets and incomes. In southern Africa, the Centre and its partners have initiated a research and development programme to promote the on-farm planting and management of selected varieties of indigenous fruit trees. Greatest progress has been made with Uapaca kirkiana. Scientists are selecting elite germplasm and looking at propagation and preservation, processing and marketing of fruit products. However, the domestication and dissemination of indigenous fruit species is a challenging process. Mithoefer et al. (2004) estimated that the returns to planting non-improved U. kirkiana were only 10–25 percent as high as the returns to gathering the fruit from the wild because of the high costs associated with tree planting and maintenance. Where wild fruit is still available, farmers would find it profitable to plant U. kirkiana only if the domesticated trees yield fruit 2–4 years after planting, if the production per tree was increased by a factor of 8, and/or the price per kg of the domesticated fruit was twice that of the wild fruit.

**Medicinal plants**

Plant products have been used to cure disease since ancient times. In Africa, it is estimated that 80 percent of the population use natural products to treat various ailments. In the Shinyanga region of Tanzania alone, over 300 plants have been identified for their medicinal values (Dery et al. 1999). Although there is no hard evidence to show that traditional medicines can treat HIV and cure AIDS (FAO 2002), it is known that certain tree products can be used to treat opportunistic infections associated with HIV/AIDS and/or to relieve some of their symptoms.

In many villages, basic pharmaceutical drugs are not available, and households rely entirely on wild medicinal plants for treatment of opportunistic infections associated with AIDS (Kolberg and Holding Anyonge 2002). Results of two recent FAO country studies show that in some areas, such plants are becoming scarcer.

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**Table 1.** Labour requirements, maize production and returns to land and labour of Sesbania sesban improved fallows and continuously cropped maize over a 5-year period, using an average farm budget.

<table>
<thead>
<tr>
<th>Option</th>
<th>Work days ha$^{-1}$</th>
<th>Maize t ha$^{-1}$</th>
<th>Returns to land: net present value US$ ha$^{-1}$</th>
<th>Returns to labour: net returns US$ work day$^{-1}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous maize, no fertilizer</td>
<td>499</td>
<td>4.8</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Improved 2-year, sesbania fallow</td>
<td>441</td>
<td>8.5</td>
<td>170</td>
<td>215</td>
</tr>
<tr>
<td>Continuous maize with fertilizer</td>
<td>645</td>
<td>21.9</td>
<td>229</td>
<td>544</td>
</tr>
</tbody>
</table>

Source: Franzel et al. (2002). Note that the economic analysis was conducted under two scenarios, 1996 and 1998 prices. Prices in 1996 were low, following a bumper harvest, while prices in 1998 were high, following a poor harvest.

from the body through vomiting and diarrhoea. Some medicines also cause nutrient loss, while infections interfere with the body’s ability to absorb and use the nutrients in food. This has serious consequences for the poor, who are more likely to be malnourished even before they become infected. Malnutrition may also be associated with an increased risk of HIV transmission from mothers to children (FAO 2004b). Epidemiological evidence shows how vitamin deficiency, protein deficiency and low immunity make people much more susceptible to the disease (Stillwagon 2002).

Forest resources can help to provide the nutritional requirements of people who are HIV-positive. For example, leaves from the baobab (Adansonia digitata) are a source of calcium, Vitamin A and Vitamin C (Boukari et al. 2001) and protein (Nordeide et al. 1996). In Mali, the World Agroforestry Centre has been working with several women’s groups who are managing baobab plants to produce leaves in a similar way to tea. Moringa oleifera is a multipurpose tree that originated in the eastern Himalaya and has been introduced to many tropical countries. In recent years, it has been promoted by non-governmental organizations (NGOs) and faith-based organizations to meet the nutritional needs of communities affected by HIV/AIDS. Moringa oleifera seeds are very effective in clarifying and treating water; fresh moringa leaves contain very high levels of micro- and macronutrients (protein, carotene, calcium, iron, Vitamins A, B and C); and moringa pods and dried leaf powder are used as nutritional supplements (McBurney et al. 2004).

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(Sitoe 2004; Kayambazinthu et al. 2005). Encouraging village forest committees and extension officers to incorporate medicinal species into their management plans could contribute to sustainable management of wild species. There is also potential for the domestication of medicinal plants.

New sources of medicines from plants continue to be discovered. For example, researchers at the University of Lausanne have found that the African tree Bobgunnua madascariensis contains an anti-fungal substance that combats Candida albicans, the bacteria responsible for fungal skin problems, and mycosis, a condition that commonly affects the eyes of AIDS patients. It is also said to fight Aspergillus, a fungus that can cause fatal lung disease (SAF 2004).

**Income generation**

Trees provide many products (food, fuel, fibre, timber, poles and fodder) that households can use or sell. Livelihoods can also be supported by sale of woodland products such as honey and mushrooms. An NGO in Malawi has encouraged young women to make and sell charcoal briquettes instead of engaging in commercial sex for their income (Ngwira et al. 2001).

**Safety net resources**

Forest foods have traditionally complemented agriculture and often sustain people during severe food shortages (Shackleton et al. 2001). The ‘miombo’ woodlands of southern Africa provide such a traditional ‘safety net’ and they occur throughout the area most affected by HIV/AIDS. Despite the mediocre fertility of the soils, the vegetation provides a wide range of products including foods, medicinal plants, firewood and timber. Studies have found that indigenous fruit can be a significant source of food and cash income, especially for poorer households, women and children. In the communal areas of Zimbabwe, for example, Cavendish (2000) found that the poorest 20 percent of households generated 7–9 percent of their total household income from selling collected wild foods. At two sites in rural Zimbabwe, Mithhoefer and Waibel (2003) found that virtually all households consumed some indigenous fruits (Uapaca kirkiana, Strychnos sp., Parinari curatellifolia) and that 7–20 percent of households sold some Uapaca kirkiana. When food is plentiful, it is mostly the children who eat the fruits. However, in times of food scarcity, Uapaca kirkiana, Strychnos sp. and Parinari curatellifolia became the main food for over 70 percent of households at one of the study sites. In total, the three indigenous fruit contributed 5–7 percent of total household income. Returns to family labour invested in gathering, processing and selling indigenous fruit in both villages were found to be higher than returns to crops, livestock, horticulture, exotic fruit trees and casual labour.

**Box 1. Rotational woodlots provide food and cash**

In the tobacco-growing Tabora region of Tanzania, farmers have traditionally harvested wood from natural ‘miombo’ woodlands to make poles for drying the tobacco leaves. To protect these woodlands and create an alternative source of income, the Centre and its partners have developed a rotational woodlot system, where farmers plant fast-growing acacia (primarily Acacia crassicarpa) in 1-ha plots. They continue to grow maize in the same plots for the first two years, then wait until the fifth year to harvest the wood. Compared to the customary maize/fallow system, rotational woodlots required about 2.5 times as much labour, mostly needed to harvest the wood in the fifth year. Despite the high labour cost and longer payback period, the net current value of rotational woodlots was over six times that of maize alone and the return to labour from rotational woodlots was more than twice that of maize. Many farmers are now adopting the system (Ramadhani et al. 2002). While loss of family members due to HIV/AIDS may create long-term labour shortages, it appears that extra labour can usually be hired for harvesting the wood.

**Marking ownership**

In many sub-Saharan African social systems, when a man dies, his relatives take over all productive assets (and sometimes other property) from the widow. In some cultures, the widow, land, property and children are ‘inherited’ by a brother of the deceased. With the spread of AIDS, and worries that they may be ‘inheriting’ infected people, families of deceased heads of households may refuse to care for the widow and children, yet still claim the land that their brother had farmed. Widows are then left with no productive assets (Drimie 2002). Access to and ownership of land can have an important influence on the viability of HIV/AIDS-affected households. Trees have long been an indicator of tenure in Africa. There is some prospect that planting trees in abandoned fields can preserve the land for the family and, at the same time, rehabilitate wasted soils and provide fuelwood, fodder and fruits. On the other hand, investing in trees could also encourage more powerful family members to take over that portion of land. The interpretation of customary practice with regard to land and tree tenure will vary between adjacent communities sharing the same cultural heritage. More evidence
needs to be compiled on how aspects of land and tree ownership can assist people suffering from the effects of HIV/AIDS.

**Labour management**

Most African agriculture depends on manual labour and there are peaks in labour demand, for example, for land preparation, planting and harvesting. When sickness, death and funerals occur during these critical periods, crop productivity will be greatly affected. Caring for the sick also demands time and energy and reduces availability of labour, especially women’s, for agricultural tasks. In Ethiopia, a study found that AIDS-affected households spent 50–66 percent less time on agriculture than households that were not affected (Baryoh 2000). In Tanzania, researchers found that women spent 60 percent less time on agricultural activities when their husbands were ill (Tibaijuka 1997).

Different improved fallows agroforestry systems advocated by the Centre have different implications for total and seasonal labour demand. Short-duration improved fallows, as developed in western Kenya, require less total labour than the typical two-season pattern of maize production, but there is a greater seasonal labour demand during the land preparation phase of the long rain production season. If labour hiring is not a viable option, then shortage of labour may impede adoption (Rommelse 2001). The 2–3-year fallows developed in eastern Zambia typically entail less labour per hectare and per unit output than the continuous maize systems (no fertilizer) that they replace. During the first year of tree establishment, the fallows do require extra labour, but there is quite a wide variation between different fallow systems. Steve Franzel, ICRAF (personal communication) used farm data from eastern Zambia to calculate the extra labour time required to establish 0.27 ha plots of *Sesbania sesban* and *Tephrosia vogelii* fallows. Since the average farm in this region has 1.08 ha of cultivated land, planting 0.27 ha to improved fallow each year for 4 years would allow most farmers to convert their farms to the agroforestry system within 4 years. The calculations showed that pure stands of *S. sesban* and *T. vogelii* require an average of 36 and 22 extra labour days during the establishment year. If, however, the fallows are intercropped with maize during the first year, then only an extra 16 days for *S. sesban* and 3 days for *T. vogelii* are required. Different systems are therefore appropriate for households at different stages of AIDS impact. Households that have already suffered significant labour losses may not be well advised to plant pure stands of *S. sesban*, but they could still manage the extra labour required to intercrop their maize with *T. vogelii*.

**Reducing labour peaks**

A study in eastern Zambia showed that land preparation, weeding and harvesting account for 70 percent of the labour demand associated with the production of maize under improved fallows (Ajayi 2003: see Figure 4). Land preparation and weeding are the most demanding, since several essential activities have to be carried out over a relatively short time. Any interventions that reduce labour requirements during these phases will therefore be attractive.

Further analysis showed that in agroforestry fields, farmers spent 27 percent of total labour on land preparation compared to 19 percent in non-agroforestry fields (Table 2). However, in the non-agroforestry fields, farmers spent 34 percent of their labour time on weeding activities compared to 26 percent in agroforestry fields. Weeding is time-consuming and must be completed within a short time to prevent a poor harvest. Thus, by reducing the proportion of time allocated to weeding from 34 to 26 percent, improved fallows help labour-constrained households to have a better chance of a good yield. However, fallows entail more labour for land preparation. The trade-off is in favour of fallows because the time ‘window’ for land preparation is less critical than that for weeding.
**Long-term labour management**
Communities differ in their capacity to recover from external shocks. The time of recovery after a drought, for example, depends on external factors, such as the type of agro-ecological zone, and variable factors, such as labour availability, knowledge, skills and food stocks, including storage facilities and postharvest management. HIV/AIDS affects all the variable factors and creates an increased dependency ratio in households, since it kills mostly productive age adults.

Traditional agroforestry systems vary in different agro-ecological zones and are socially and culturally specific. Appropriate agroforestry strategies can help increase the resilience of communities to external shocks. Combinations of trees and crops can be developed jointly with local communities in line with their short- and long-term needs and according to the current phase of HIV/AIDS. Techniques that have high labour requirements to get them started should be promoted during the low impact phase. Trees planted in the early stages, when labour is still available, will provide a source of food several years later, when labour supplies in the household and community may have dwindled.

So, although some agroforestry technologies appear to be labour intensive, especially in the early stages, they offer a number of benefits towards the mitigation of HIV/AIDS.

1. Increased yields might allow farmers to plant a smaller area of land with maize, reducing labour demand for land preparation, weeding and harvesting. The saving of labour and land would allow the farmer to grow something else, such as vegetables and/or fruits.
2. Most of the agroforestry technologies for improving soil fertility also produce fuel-wood on farms thus saving the labour and energy normally spent gathering wood (especially relevant for women).
3. In some societies, planting trees enhances security of land ownership.
4. Improved fallows suppress weeds, thereby cutting down the amount of labour needed for weeding.
5. Agroforestry technologies improve soil fertility and produce fodder, thereby reducing the need for expensive inorganic fertilizer or livestock feed. However, some agroforestry technologies trade low cost with higher demand for labour.
6. Growing medicinal plants on farm prevents over-harvesting of wild varieties.

**Increasing the relevance of agroforestry to HIV/AIDS mitigation**
One of the defining attributes of agroforestry is its complexity. Across the African continent, farmers have adopted agroforestry systems that vary greatly in terms of types of goods and services produced, length of production period, market and environmental risks, ecological complexity, land, labour and managerial intensity, and dependence on input and output markets. While this complexity may make it difficult to recommend a standard set of agroforestry interventions, it also means that the variety of options are relevant to a wide range of circumstances encountered by households and communities affected by HIV/AIDS. For example, households that have absorbed non-family members may be in a position to establish new agroforestry systems on crop fields, while households that have lost family members may adapt trees into their home gardens.

Another defining attribute of agroforestry is its tight connection with forestry. Farmers access and use trees throughout their landscapes, whether on their farms, on communal lands, or on the margins of forests. Access to forests and communal lands affects farmers’ decisions on what trees they preserve, what trees they plant, and how they manage trees on their farms. Agroforestry interventions therefore need to be based on a good understanding of the trees and tree products that are already available and the potential of agroforestry and other forest management options for enhancing the supply of consumable and marketable products (such as fodder and fruits) and for soil fertility and conservation.

**Preserving and adapting knowledge**
Agroforestry systems depend upon local agricultural and biodiversity knowledge to maintain production. When a productive generation is lost, they can no longer pass on their livelihood skills and agroforestry...
knowledge. The consequence is a young population who are ill equipped to manage the impacts of the epidemic and to maintain successful production. Community knowledge of the environment and local genetic diversity are fundamental for nurturing and preserving cultural identity. Indigenous knowledge and, often, technology-related knowledge are typically gendered, with some aspects passed on by men and some by women. Gaps in knowledge will therefore occur when a parent dies. Effective initiatives in facilitating gendered links in indigenous and community knowledge in single-parent households need to be designed, implemented and monitored, and agroforestry education needs to be targeted to the rural youth.

**Strengthening institutions**

Strengthening local institutions is an essential component of the sustainability of any agroforestry intervention. Such an approach also marries well with the current trend in extension towards supporting collective action and empowering local communities to design and manage their own development initiatives. Village forestry can be the main cash generator in a community, and tree resources (customary woodlands, village plantations and trees on farms) have seen communities through periods of severe hardship in the past.

It is also important to strengthen formal institutions, since human resources are being lost from ministries of forestry and agriculture, thereby hampering the development and implementation of agroforestry strategies. In general, the loss of all types of government cadres is creating serious governance problems in the most-affected countries. However, instead of developing strategies to replace lost human resources, which is already difficult for the worst hit countries, it is necessary to rethink government functions and streamline them to adapt to the situation. Extension workers, for example, need to be trained to address the emerging clientele (widows, orphans, etc.) with specific information and knowledge to match their needs. Vocational training institutions may also be required to review their staffing, length and priority of courses, in light of the impact of the pandemic and changing human resource requirements. Specific staff policies need to be developed in the relevant ministries, including awareness building, behavioural change, communication, stigma and discrimination, voluntary counselling and testing, modification of working conditions of employees exposed to high-risk situations, improved access to medicine, etc.

**Forestry policy**

Effective forestry policy needs to take the effects of HIV/AIDS into account. For example, policy makers need to be aware of labour availability and the labour implications of interventions. Extension services need to adapt to a new clientele, with very specific knowledge and service needs. Barany et al. (2005) recommend that current and future forest policies and programmes should be reviewed to assess their effects on key determinants of HIV vulnerability. These include social inequalities, exclusion, creation of cash economies/disposable incomes, displacement and migrant labour. A review process would assist project programmers and policy makers to identify where and for whom prevention and mitigation efforts should be targeted and concentrated.

**Conclusions**

Agroforestry interventions can play a unique role in the mitigation of the impacts of HIV/AIDS. They can improve communities’ long-term resilience against this and other external shocks, in a way that agricultural interventions on their own cannot.

Agroforestry technology can be carefully tuned to respond to the AIDS-affected communities’ lack of labour and cash, both in the short term and in the long term. By providing labour management possibilities, agroforestry technologies can reduce hunger and promote food security.

The capacity to generate alternative low-input income-generating activities and

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**Box 2. Strengthening local communities**

A project in Katunga, Malawi, aimed to enhance the production of woody vegetation and strengthen the capacity of local communities to manage the resource by establishing eucalypts (*Eucalyptus saligna*) on hillsides surrounding the village. After 13 years, the trees were handed over to the community’s natural resource management committee. The area is relatively fertile, with a wide range of crops and trees. Trees, not agriculture, now provide the major source of cash income and the villagers have built a new school classroom. HIV/AIDS is a serious problem in the area and although native medicinal plants are not readily available, funds from the trees support 20 orphans under 5 years old, a basic pharmacy, transport to hospital, and contribute to funeral costs.

*Source: Kolberg and Holding Anyonge (2002).*
provide essential nutrients means that agroforestry interventions can help break the vicious cycle of impoverishment–malnutrition–AIDS. Medicinal plants and trees frequently provide the only source of symptomatic relief available to the poor.

The specific needs of a new clientele created by the epidemic, with high dependency ratio households and unique compositions, must be taken into account when designing agroforestry interventions. Efforts should be made to ensure that basic agricultural skills are passed on to the younger generation, and that local knowledge, including biodiversity and gender-specific skills, are preserved. If a strategy can be developed that can respond effectively to these needs, a significant contribution will be made to preventing and mitigating the consequences of HIV/AIDS within agroforestry communities.

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