Strategy for Agroforestry Development in Uganda’s Drylands

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Abstract

Uganda’s drylands occupy what is commonly referred to as the “cattle corridor”, an area of approximately 84,000 km², stretching from the north-east, through central to south-east of the country. The major problems in Uganda’s drylands include overgrazing, deforestation, inappropriate farming systems, land and tree tenure and bush burning. Due to the increasing demand for charcoal and other tree related products derived from the drylands, there is a big decline in the tree cover in these areas, justifying the need for concerted efforts by all stakeholders to address this and other environmental issues. A strategy for agroforestry development in the drylands of Uganda, therefore, needs urgent formulation and implementation. The strategy can draw experiences from work initiated in agroforestry research and development activities that have been implemented in the country over the last fifteen years. Opportunities for promoting agroforestry in the drylands of Uganda are identified. The paper recommends a number of approaches for promotion of agroforestry in drylands, which include among others; ecological and socio-economic surveys and inventories of traditionally valued and potential agroforestry species, research trials, propagation and management of potential trees and shrubs. The paper recommends that the strategy should aim at promoting the recommended activities through strengthening of existing initiatives in dryland agroforestry in Uganda.

Key words: Agroforestry, Drylands, Strategy

1. Introduction

Uganda is one of the poorest countries in the world, with a per capita income of about US$ 300 per year (World Bank-World Development Indicators Database, April 2002). Its economy is largely natural resource based, with over 80% of the population living in rural areas and engaged on agro-pastoralism for food and income (NEMA, 2001). With a GDP growth rate of about 6% and a population growth rate of 2.7%, natural resource exploitation will continue to form the basis for livelihoods of the majority people in the foreseeable future. The land under crops in Uganda is being cultivated primarily by small-scale farmers, with an average farm size of 2.5 ha (Zake et al. 1999). According to IFAD (2000), the development of drylands characterized by intense poverty must occupy a prominent position within an appropriate and sustainable development strategy in Africa and Asia.

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Despite the fact that Uganda has a large percentage of arable land, soil degradation and general environmental degradation is a substantial problem. Generally it is estimated that 4% - 12% of GNP is lost from environmental degradation, 85% of this from soil erosion, nutrient loss and changes in crops (Olson and Berry 2002). The two most fragile ecosystems in Uganda are the highlands and the drylands. This paper examines the production constraints in the drylands of Uganda and points out action points for improving their productivity through agroforestry, that is, integration of trees into crop and livestock production systems to improve livelihood options for resource-poor, small holder farmers and to enhance and protect the environment.

Drylands are generally defined in climatic terms as lands with limited rainfall. They are characterized by low (100-600 mm annually), erratic and highly inconsistent rainfall levels (IFAD 2000). According to FAO, drylands are zones falling between 1-74 and 75-119 growing days, representing arid and semi-arid lands, respectively. In this paper a practical working definition of drylands has been adopted, that is, “anywhere that rainfall is a problem because of amount, distribution and unreliability”.

2. Agroforestry under Uganda policy framework

Poverty Eradication Action Plan (PEAP) is one of Uganda Government’s national goals. The Plan for Modernization of Agriculture (PMA), launched in 2000 is Uganda’s strategic and operational framework for poverty eradication. The PMA (2000), Forest Policy (2001) and the National Forest Plan (2002) are all in support of wide-scale promotion of agroforestry in the country. The PMA recognises agroforestry as one of the options for improving farm productivity, and thereby eliminating poverty through increased household incomes. The Uganda Forestry Policy recognizes tree growing on farms for provision of firewood, poles, non-wood products, fruits and even timber. Through this policy, the government pledges to build the capacity of NGOs, CBOs and private contractors as well as government agencies to provide agroforestry advice and training. It also pledges to provide extension and advisory services that support farmers, communities, organizations and entrepreneurs in the development of agroforestry. The National Forest Plan points out that UGADEN with technical support from FORRI, ICRAF, Makerere University and Nyabyeya Forestry College provides a good basis for developing practical training and skills in agroforestry throughout the country.

Much as agroforestry is supported by several policies, it is not actively being promoted by the concerned government agencies, that is, National Forest Authority (NFA), NAADS, PMA, Forestry Inspectorate Division (FID), MAAIF and others. This calls for concerted advocacy and lobbying at all levels.

3. Extent of drylands in Uganda

Uganda’s drylands occupy what is commonly referred to as the “cattle corridor”, an area stretching from the north-east, through central to south-east of the country. It covers many districts stretching from Kotido, Moroto and Katakwi in the northeast through Nakasongola and parts of Luwero in the central to Rakai, Mbarara and Ntugamo (Fig.1). These areas are mainly rangelands and they cover approximately 84,000 sq. km. (about 40%) of the total land area. In these areas, semi-arid and dry sub-humid conditions prevail. They receive low and unreliable rainfall (450 - 800 mm) and drought is a common recurrent phenomenon, thus the vegetation is
sparse. The drylands are considered to be the second most fragile ecosystem in Uganda, after the highlands.

The land tenure of most of the drylands or rangelands is communal, with grazing mainly on natural pasture. However, major socioeconomic changes are occurring in the drylands and these have affected this ecosystem, for instance, increasing human population density and immigration by agricultural settlers. The increase in both human and livestock populations in Uganda’s drylands over the years is placing pressure on the land with intensive degradation occurring, especially at watering points, along livestock paths and on hilltops. Most of the drylands in Uganda face a lot of environmental problems.

Fig.1: A map of Uganda showing the location of dryland areas
4. Problems in Uganda’s drylands

4.1 Overgrazing

Except in the north, much of the corridor is considered over-stocked and seriously degraded, with problems of vegetation loss and soil compaction leading to erosion. Gully erosion is especially visible in many areas. Particular areas affected are the pastoral districts of Mbarara, Nakasongola and Karamoja region. The resulting effects of overgrazing include soil compaction, erosion (particularly gully erosion) and emergence of low-value grass species and vegetation with subsequent declines in carrying capacity of the land and therefore low productivity.

4.2 Deforestation

The present level of Uganda’s forestland is just about 20% of its original value in 1890 as a result of deforestation. The major causes of deforestation are provision of wood fuel and clearing of land for agricultural activities. About 90% of the total population who live in rural areas directly depend on firewood for their energy needs, and a big fraction of the urban dwellers depend on charcoal. In general, about 92% of Uganda’s source of energy is wood fuel. By 1986, Uganda was already in wood fuel deficit by 2.7 million cubic metres. Bush burning during the dry season is also increasing the extent of wind erosion, especially in the eastern districts of Katakwi, Moroto and Kotido. In general, the extent and frequency of xerophytic species has expanded due to soil degradation, leading to a decline in forage quality (Zake et al. 1999).

4.3 Inappropriate farming systems

The most critical problem in Uganda’s drylands like in many parts of the country is that the majority of farmers have inadequate knowledge of or few opportunities to learn about improved farming methods. For example, crop rotation is often not practiced; with most of the farmers growing the same crops on the same piece of land year after year, a situation which leads to serious soil degradation. According to MAAIF (1999), the situation is worsening because improved agroforestry practices, capable of renewing and regenerating the soil are still lacking in most farming systems.

Other changes in Uganda’s drylands include the fencing of formally communal grazing lands, which have been turned into private lands. This is causing a concentration of livestock that had previously grazed on those lands, thus, leading to severe sheet erosion on hillsides. Similarly, a large land area in Kotido and Moroto districts where the Karimojong graze their huge herds of cattle is being stressed due to the reduction of mobility of the formerly nomadic pastoralists, following the imposition of administrative boundaries, security problems and increasingly frequent droughts. The area is experiencing concentration of cattle and severe degradation including invasion of unpalatable forage species and soil erosion. Apart from the rapid decline in fertility and productivity of the land, soil erosion has also led to the siltation of lakes, rivers and streams. A problem of severe water shortage and serious wind erosion has also been recorded in the districts of Karamoja, Katakwi, Nakasongola, Mbarara and Rakai.

It is therefore clear that there is intensified land and environmental degradation leading to loss of the productive potential of the drylands, famines, low household incomes and increased social unrest in the affected areas, particularly in the north eastern part of the country (MAAIF, 1999). This is exacerbated by the fact that in Uganda, there is widespread reliance on rain fed agriculture, subsistence farming and pastoralism, poor crop and animal husbandry practices, water scarcity and population pressure all contributing to vulnerability to drought.
5.  Opportunities

Efforts to initiate a strategy for agroforestry in Uganda already have some clear opportunities, which if well utilized can lead to its success. These include among others:

- Availability of government policies that support promotion of agroforestry as highlighted in the Plan for Modernisation of Agriculture, Forest Policy, National Forest Plan, Forest and Tree Growing Act among others;
- Existing interest by FORRI and ICRAF in scaling up activities in the drylands;
- Presence of NGOs with interest in agroforestry activities;
- Success registered by UGADEN that can be used to bring together and network interested partners;
- Government and non-government initiatives for commercialization of some dryland products e.g. Gum Arabic, Shea Butter, Aloe vera.
- Formulation of National Action Programme (NAP) to combat desertification which points out agroforestry as one of the avenues for development of the drylands.
- Support for tree growing for carbon sequestration. A pilot project is being implemented in Uganda. This present an opportunity to encourage farmers in the drylands to engage in agroforestry
- There is increasing readiness by dryland communities to plant trees, most especially around their homesteads and along boundaries. This is because there is a certain security of tenure for such trees and there is also increasing scarcity of firewood and building materials in the drylands.
- There is concerted effort by political leaders, government agencies and NGOs to promote tree planting in both peri-urban and rural areas.

6.  Efforts to develop drylands

One of the major achievements of the 1992 Rio de Janeiro Earth Summit was the launching of the United Nations Convention to Combat Desertification (CCD) with goal to mitigate the effects of drought. Over 170 countries, including Uganda, are signatories to the CCD, whose primary focus is the loss of natural vegetation and deterioration of physical, chemical, biological and economic properties of the soils. To that effect, Uganda signed the CCD in 1994 and ratified it in 1997.

As required by the CCD, Uganda formulated a National Action Programme (NAP) to combat desertification, with assistance from the United Nations Development Programme/Uganda Development Centre (UNDP/DDC) and other partners. The NAP seeks to mainstream dryland issues into Uganda’s Poverty Eradication Action Plan (PEAP) by ensuring that strategic planning takes into account sustainable development issues of dryland areas with a focus on poverty alleviation, food security, and above all, sustainable environmental management. Following its previous support to formulate NAPs, UNDP-DDC has designed an Integrated Drylands Development Programme (IDDP) to benefit 16 countries, including Uganda.
7.  **Agroforestry activities in the drylands**

7.1  **ICRAF and FORRI**

Agroforestry in Uganda was started by the Forestry Department and CARE in early 1980’s. In the late 1980s The World Agroforestry Centre (ICRAF) established a memorandum of Understanding with the Government of Uganda and agroforestry activities were initiated in the country in collaboration with the then National Council for Research (NCR) under the Ministry of Finance and Economic Development. In 1992, the National Agricultural Research Organisation (NARO) was established and since then agroforestry became one of the programmes under one of NARO’s institutes, Forestry Resources Research Institute (FORRI). ICRAF and FORRI have developed and promoted a number of agroforestry innovations.

Under the EU supported project, FORRI, ICRAF and other partners are promoting different agroforestry technologies in the lowlands of eastern and drylands of southern Uganda. Some of the activities include:

- Participatory pest and disease identification and management, with focus on evaluation of indigenous methods for termite control;
- Evaluation and promotion of improved fruit trees;
- Evaluation and promotion of improved fallows;
- On-farm wood and energy production using species such as *Grevillea robusta*, *Melia azederach*, *Milicia excelsa*, *Cedrela odorata* and *Markhamia lutea*;
- Fodder production using *Calliandra calothyrsus* *Leucaena trichandra* and other exotic species.
- Scaling up activities, mainly through training of farmer groups, supporting group nurseries, establishment of fruit mother gardens and seed stands, and production of dissemination materials.

With DFID support FORRI and other partners have implemented activities in the Teso and Lango regions. These involve determination, propagation and evaluation of important trees and shrubs with potential for agroforestry in the two farming systems. The results of field surveys conducted in both Teso and Lango farming systems identified tree and shrub species that have potential for agroforestry as indicated in Table 1 and 2 (FORRI, 2003).
Table 1. Priority indigenous tree species for various uses in the Teso farming system ranked in order of importance

<table>
<thead>
<tr>
<th>Poles</th>
<th>Firewood</th>
<th>Fruits</th>
<th>Shade</th>
<th>Medicine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prosopis africana</td>
<td>Combretum collage</td>
<td>Vitellaria paradoxa</td>
<td>Tamarindus indica</td>
<td>Fagara chalybea</td>
</tr>
<tr>
<td>Terminalia macroptera</td>
<td>Combretum fragrans</td>
<td>Tamarindus indica</td>
<td>Vitellaria paradoxa</td>
<td>Abac</td>
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<tr>
<td>Haeria reticulata</td>
<td>Vitellaria paradoxa</td>
<td>Vitex doniana</td>
<td>Ficus natalensis</td>
<td>Teclea nobilis</td>
</tr>
<tr>
<td>Crossopteryx febrifuga</td>
<td>Acacia hockii</td>
<td>Carissa edulis</td>
<td>Piliostigma thoningii</td>
<td>Esuroi</td>
</tr>
<tr>
<td>Bridelia micrantha</td>
<td>Combretum molle</td>
<td>Ximenia Americana</td>
<td>Vitex doniana</td>
<td>Carissa edulis</td>
</tr>
<tr>
<td>Haeria reticulata</td>
<td>Bridelia micrantha</td>
<td>Bridelia micrantha</td>
<td>Terminalia macroptera</td>
<td>Eyaratom</td>
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<tr>
<td>Pseudocedrella kotschyi</td>
<td>Tamarindus indica</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combretum collage</td>
<td>Terminalia macroptera</td>
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</table>

In the Teso farming system, it is evident that some species such as Combretum collarum, Tamarindus indica, Vitellaria paradoxa and Vitex doniana are important to the households in more than one use. This indicates their multipurpose nature to the farmers, while others such Prosopis africana, Terminalia macroptera, Carissa edulis, Fagara chalybea and Piliostigma thoningii are used mainly for specific purposes. The same applies in the Lango farming system, where species such as Vitellaria paradoxa, Combretum collarum and Combretum molle are multipurpose, while others such Markhamia lutea, Combretum fragrans Vitex doniana Melicia excelsa and Albizia coriaria are used mainly for one purpose.

Some tree species were prioritized for particular uses in both farming systems such as Combretum collarum for poles, Combretum collarum, Combretum fragrans and Terminalia macroptera for firewood, Tamarindus indica, Vitellaria paradoxa, Vitex doniana and Carissa edulis for fruits. This implies wide applicability of these species across the two farming systems.

Table 2. Priority indigenous tree species for various uses in the Lango farming system ranked in order of importance

<table>
<thead>
<tr>
<th>Poles</th>
<th>Firewood</th>
<th>Fruits</th>
<th>Windbreaks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Markhamia lutea</td>
<td>Combretum collarum</td>
<td>Vitex doniana</td>
<td>Markhamia lutea</td>
</tr>
<tr>
<td>Senna siamea</td>
<td>Albizia malacophylla</td>
<td>Vitellaria paradoxa</td>
<td>Ficus natalensis</td>
</tr>
<tr>
<td>Terminalia macroptera</td>
<td>Combretum fragrans</td>
<td>Tamarindus indica</td>
<td>Melicia excelsa</td>
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<tr>
<td>Bridelia scleroneuroidii</td>
<td>Terminalia macroptera</td>
<td>Carissa edulis</td>
<td>Albizia coriaria</td>
</tr>
<tr>
<td>Combretum collarum</td>
<td>Bridelia scleroneuroidii</td>
<td>Strychnos spinosa</td>
<td>Melia azedrach</td>
</tr>
<tr>
<td>Piliostigma thoningii</td>
<td>Vitellaria paradoxa</td>
<td>Annona chrysophyla</td>
<td>Combretum molle</td>
</tr>
<tr>
<td></td>
<td>Combretum molle</td>
<td>Ximenia Americana</td>
<td>Vitellaria paradoxa</td>
</tr>
</tbody>
</table>
7.2 Agroforestry activities by other partners

NGO and CBO activities

Several NGOs and CBOs are already promoting agroforestry in the drylands. These include among others, Vi Agroforestry Project in Rakai, SOCADIO in Soroti, Katakwi and ADRA in Kotido and ULAMP in Mbarara. Such organizations will be important allies in identification of tree/shrub species and development of technologies for the drylands in Uganda.

Experiences by ICRAF and FORRI indicate that there is need for a concerted effort by different stakeholders to harmonise respective agroforestry initiatives promoted in different areas. A strategy for agroforestry development in the drylands of Uganda, therefore, needs urgent formulation.

Production and commercialization of gum arabic

It is now confirmed that Uganda has reasonable quantities of Acacia senegal and Acacia seyal trees used for the production of gum arabic, which has a high demand in US market. The trees grow wild in Uganda’s dryland regions, especially in Teso and Karamoja regions, stretching up to the Sudan. The trees grow in about 36 districts of northern, south western and central Uganda, most of which are dryland areas. The total area covered is 43,262.5 km². Gum arabic samples from these regions have been taken to the US, for functionality tests, success of which will open an automatic door for Uganda to export directly to the US duty and quota free, under the African Growth and Opportunity Act (AGOA).

Growing of medicinal plants

The World Health Organization estimates that 80% of the populations (principally women) in sub-Saharan Africa rely on herbal remedies for all or part of their medicinal requirements. The plant material used in herbal remedies is harvested mainly from wild sources. Domestication of such medicinal plants may offer a big opportunity to benefit the local people. The drylands of Uganda can be used for growing of medicinal plants such as Aloe vera, Moringa oleifera, and any other useful medicinal plants adapted to such environments. Efforts have already been initiated in Uganda but the quantities produced are still small, thus, difficulty in accessing big markets. Drylands have a prospect to enter into the global medicinal ingredients market through planned cultivation of highly demanded medicinal plants. High economic returns coupled with less management costs will greatly influence the dryland communities to adopt agroforestry innovations involving the growing of medicinal plants. ICRAF and its partners should therefore popularize the growing of medicinal plants in dryland areas in order to make economic utilization of available land in such areas.

8. Lessons learnt in promoting agroforestry in Uganda

Planners and development experts have underestimated the importance of trees in drylands yet the role of trees in dryland silvo-pastoral systems has a direct bearing on the people and livestock production. Woody vegetation survives better for longer periods than non-woody vegetation, and often yields more biomass with a higher nutritional value, at the critical dry times of the year.
It is clear that drylands in Uganda have traditionally been considered as less productive marginal areas and therefore limited efforts have been given to guiding their sustainable utilization. However, the drylands act as an important source of livelihood for the majority of Ugandans through provision of tree related products, such as, firewood, fruits, medicine and poles. They are currently the major suppliers of charcoal to all the urban centres in Uganda.

There is need to base technical interventions in drylands on tree species that are locally acceptable and useful.

Due to the increasing demand for charcoal and other tree products derived from the drylands, there is a big decline in the tree cover in these areas. This calls for concerted efforts by all stakeholders to address environmental issues in the drylands.

9. **Gaps**

Despite the fact that different institutions have tried different initiatives, some gaps exist that have probably limited success to the different initiatives.

- Some initiatives and technologies have been tried with limited scientific based research for commercialization.
- There is limited follow-up for some of the initiated activities.
- Reliable information on availability, productivity and management of most promising dryland agroforestry species in Uganda is lacking.
- Because of the importance of trees in the drylands, local people often possess an extensive knowledge on use and sometimes management of the various tree species. Such knowledge also exists in the high-potential areas, though often not so detailed, since dependence on it is not so great. However this knowledge has not yet been taped. Some trees in the drylands have for long been deliberately retained and managed by local people in different systems. Investigating and understanding such knowledge systems gives a better understanding of the human ecology in terms of environmental perception and understanding. According to Barrow (1996) woody vegetation may constitute the most valuable resource in drylands.
- There is a need for detailed studies on uses and perceptions of tree by communities in drylands of Uganda. This will be vital for successful dryland agroforestry and natural resources management and therefore, development. This knowledge will provide the basis for research and can be built upon, through research, to develop sound agroforestry technologies for the drylands.

10. **Strategies for scaling up agroforestry in Uganda**

Agroforestry technologies can be used to significantly improve the livelihoods of the small-holder farmers in the drylands of Uganda. There is therefore a need to develop and disseminate agroforestry technologies that address the primary production constraints facing the farmers in the drylands of Uganda. Supportive policies for increased adoption of these technologies should also be put in place. Emphasis should be put on the production of dryland crops, pasture
improvement and better land management, for example, through intercropping. Training is also needed in pasture management and establishment of fodder banks using both indigenous and exotic fodder shrubs and trees. Horticulture development also holds potential for the drylands communities to improve their diet and income. The growing of fruit trees, either in pure or mixed stands has already been initiated in some of the dryland districts of Uganda. Experiences should be drawn from some of the improved fruit trees that have been introduced in these areas with success, for instance, mangoes, oranges, guava and avocado.

Based on the lessons learnt by ICRAF and FORRI, a number of approaches are suggested for promotion of agroforestry in drylands of Uganda. These include among others:

- Ecological and socio-economic surveys and inventories of traditionally valued and potential agroforestry species in the drylands.
- Identification of indigenous tree/shrub species with a potential for agroforestry in the drylands.
- Assessment of the management aspects for the dryland species, including issues related to tree and land tenure.
- Studies on approaches to ways of commercializing some species e.g. Gum arabic and Shea butter and consideration of integration on farm and domestication;
- Trials for domestication of some selected high value dryland tree species.
- Focused studies to assess increased production potential to guide domestication of indigenous agroforestry species identified through surveys, for example, *Carrisa edulis* and *Termarinthus indica* identified in the Teso and Lango farming systems.
- Research on propagation and management of trees and shrubs with a potential for dryland agroforestry.
- Evaluation of the production and marketing of dryland tree products, to guide value addition.
- Monitoring the yield from some commercial tree products from drylands.
- Research trials on potential exotic tree/shrub species for introduction in Uganda’s drylands for example, *Melia volkensi*.
- Support to generate sound dryland agroforestry technologies.
- Development of participatory action plans aimed at reducing rangeland degradation and achieving the control and sustainable management of resources. The plans should be developed through working with the local communities in the respective dryland areas, and through use of participatory resource assessment and management methods.
- Raising the awareness of the dryland communities about the potential of agroforestry in addressing the looming land degradation and providing them with basic tools to diagnose changes in the local environment.
- Evaluation of alien or invasive species in drylands so as to define clearly the environmental, economic and social problems and advantages.
- Designing community level projects in partnership with CBOs aimed at demonstrating the potential of agroforestry in the drylands, while building the capacity of CBOs for sustainability purposes.
11. Way forward for dryland agroforestry in Uganda

In conclusion, it is clear that a variety of best practices are being implemented to promote sustainable benefits from Uganda’s drylands by different institutions. However, for most of these practices to succeed, they should be focused on provision of direct benefits to the communities, including raising their incomes. Local capacity of the beneficiaries should also be enhanced to effectively implement these practices. Efforts to harmonise different activities should be made in order to maximize success and minimize duplication. ICRAF and FORRI should, therefore, consider promoting activities to strengthen the existing initiatives in dryland management in Uganda.

References


