TREASURING TREES FOR AGRICULTURAL TRANSFORMATION

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Abstract

Trees are vital to earth's ecosystem. In many places, loss of trees is faster than their replacement. With particular reference to sub-Saharan Africa, this paper seeks to review in outline the value of trees in order to encourage better understanding, appreciation and practical management response. A treasury is a store of wealth, a treasurer its custodian, and the act of treasuring is a positive response to the value of that wealth. Trees are a multi-faceted source of wealth. Not just foresters and forest communities but especially farmers, and also civil societies, families and individuals at large need to care about and for trees. The paper briefly indicates the global status of forests, their ecological and economic significance, and proposes tree-treasuring strategies and practices together with their integration in agro-ecological systems for global food security. While recognising the excellent work that is being done in some places, it is a wider call for deeper appreciation and fresh endeavours concerning trees and their integral management within farming systems. The paper also reports responses to practical field workshops on trees held in Malawi in 2012.

Keywords: trees, treasuring, agro-ecological, integral, management, extension

1. Introduction

Forests cover some 3.9 billion hectares (9.6 billion acres) which is approximately 30% of the World's land surface. FAO (2012) estimates that around 13 million hectares of forests were converted to other uses or lost through natural causes annually between 2000 and 2010. Their estimated annual rate of forest area increase was 5 million hectares. Globally, the highest proportion of land under forest is in the tiny African nation of Gabon. Rwanda scored the highest global rate of forestation during the decade 2000-10, with around +6.5% per annum, while within Africa, Zambia had the greatest proportion of its land area under national protection (some 41%). In Africa, the largest concentration of forest is found in the Congo basin covering some 1.3 million km². On the other hand, the fastest rates of deforestation recorded globally during 2000-2010 were in Africa: Burundi (5.5%); Togo (4.7%); Nigeria (3.5%). The challenge for Africa is clear (Maathai, 2009) with much of countries like Malawi largely deforested with farmland and 'mango-savanna' instead, owing especially to huge woodfuel demands of the rising population. Informal surveys by the author of some 350 families in rural Malawi in 2006 indicated that the average family spent 30-35% of disposable monthly income on acquiring woodfuel, most of it burnt wastefully to cook on 3 large stones. FAO (2011) notes:-

- Forests are home to 300 million people world-wide, formally employing 14M.
- More than 1.6 billion people depend to varying degrees on forests for their livelihoods, e.g. fuelwood, medicinal plants and forest foods.
- About 60 million indigenous people are almost wholly dependent on forests.
- Some 350 million people who live within or adjacent to dense forests depend on them to a high degree for subsistence and income.

In developing countries, about 1.2 billion people rely on agroforestry farming systems that help to sustain agricultural productivity and generate income.

Mangrove forests, which cover about 15 million hectares worldwide, are essential to the life cycles of the majority of the world's commercial fish species.

2. Treasure

Trees should be valued at various levels (Fig.1) – intrinsically as God's creation, as notable specimens and as landscape features, for their products, for their protection and for their global ecosystem role. Trees are treasured by some as ethical investments (Geographical, 84, No.8. p.73, August 2012), where *Ethical Forestry* (www.ethicalforestry.com) cites a *Moneyweek* claim 'forestry is the only asset class in existence that has risen in three out of the four market collapses of the 20th century'. Timber is uncorrelated to stock markets with almost sixfold investment growth projected over 12 years.

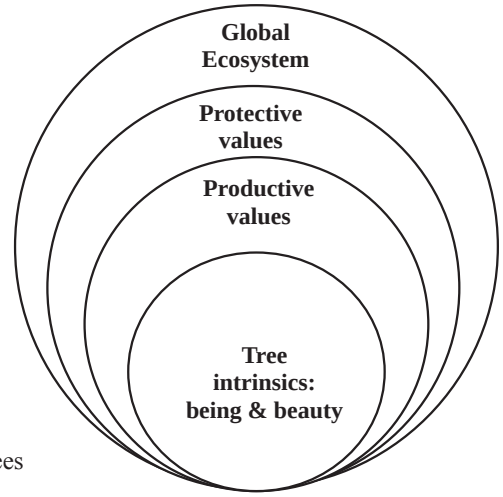

Figure 1. Levels of values to treasure in trees

FAO's 9th biennial issue of ***State of the World's Forests***, published at the outset of 2011, the International Year of Forests, considers the theme 'Changing pathways, changing lives: forests as multiple pathways to sustainable development'. It takes a holistic view of the multiple ways in which forests support livelihoods and should be valued. Chapters assembled for the 2011 *State of the World's Forests* highlight four key areas that warrant greater attention: regional trends on forest resources; the development of sustainable forest industries; climate change mitigation and adaptation; and the local value of forests. Considered together, these themes provide insights on the true contribution of forests to the creation of sustainable livelihoods and alleviation of poverty. Global forest cover (Table 1) is 93% natural, 7% planted.

The 'Great Green Wall' of trees proposed in 2012 by Dennis Garrity of World Agroforestry Centre (formerly ICRAF; www.worldagroforestry.org – '*Transforming Lives & Landscapes*') will extend from the Senegalese coast to the Djibouti coast upon completion. It can be achieved when practices such as Evergreen Agriculture are used against desertification because its affordable, sustainable and accessible farming methods benefit not only rural smallholder farmers but also the environment, encouraging ago-ecological farming systems among the world's around 500 million farm families (Wibberley, Turner, 2012).

To treasure trees, one needs to appreciate something of the rich international diversity of species (Dalziel, J.M., 1937; Hora, 1981; Van Wyk, Van Wyk, 1997; Fay, Nichols, 2009), current

Table 1. Global Forest Cover 2010

Place	Forest Mha	Total land Mha	Forest as % total land
Africa	674	2974	23
Asia	593	3091	19
All Europe	1005	2215	45
N&C America	705	2135	33
S. America	864	1746	49
Oceania	191	849	23
World	4033	13011	31

Source: www.forestry.gov.uk/statistics 2011

realities (CFA, 2010; FAO, 2012) and the history of forests – at least in one's own country (Hinde, 1985; Collett, 1993). For instance, the evergreen red mahogany or *mbawa* (*Khaya anthotheca* = *K.nyassica*) is fittingly the national tree of Malawi. Also among Malawi's special trees is *Aleurites montana* (of *Euphorbiaceae*) introduced in 1931 as a source of tung oil exported for paints and varnishes. A splendid allegory of the value of tree planting has been published, republished and dramatised since it first appeared (Giono, 1954). The spiritual significance of trees perhaps relates in part to the fact that many of them and their associated forests far transcend the span of a human life. There are baobabs in Africa and olive trees in the Garden of Gethsemane in Jerusalem known to exceed 3,000 years of age.

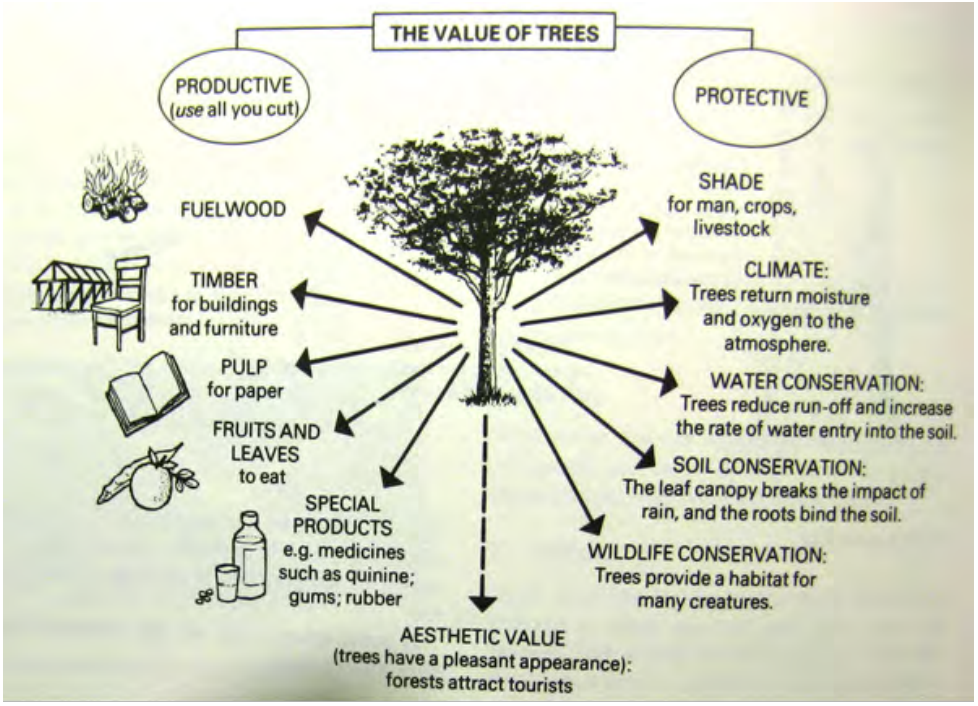

Figure 2. The Value of Trees
Source: Joy & Wibberley, 1979

There is considerable Biblical reference to trees, including several named species, and lessons drawn from them, from which we can derive both spiritual & physical lessons to apply to our lives, land & livelihoods. In the book of Revelation, of all creatures, trees are singled out for protection alongside land and sea (Rev.7:3). In the final chapter of the Bible is the vision of the tree of life bearing twelve fruits in season and having leaves for the 'healing of the nations' (Rev.22:2;14). Substantial healing now is possible using knowledge of the healing properties of various trees (see www.anamed.org). Reasons for growing and nurturing trees are manifold (Wood, Burley, 1991). They can both help halt desertification and also reclaim degraded land. Key productive and protective values of trees are depicted in Fig.2.

3. Resources

The connection between forests, food and people has long been understood (Beresford-Peirse, 1968). Astill (2010) incorporated global climatic considerations into the picture. As cities expand, trees disappear. This is very evident on mountains adjoining Freetown, Sierra Leone.

As for timber, the world's largest exporters are Canada, Sweden and Finland, while by far the largest imports of timber go to China (protecting its own 22 % forest cover), followed by Japan (despite its 68% forest cover) and the UK. Concerning forest loss, African wood removal (Mm^3) totals 712 and is 13.5% of the World's 5259. However, 85-90% of this removal in Africa is as woodfuel while the world average removal as woodfuel is 35% of all. Global Forest Area losses during 1990-2010 were just over 13 Mha (down 0.33%). In Africa, losses were almost 7.5 Mha; S. America was 8.2 Mha down. On the other hand, while Asia lost almost 0.6 Mha from 1990-2000, it gained 2.2 Mha between 2000-2010 (FAO, 2012). Encouragingly too, global designation of forest land for biodiversity conservation increased by 35% to occupy 12% of the world's forests in those 2 decades.

4. Ecology

Humans are an integral part of forest and rural communities. However, indigenous and local communities of Gambella, Ethiopia - 70,000 people in all - are being forcibly relocated to make land available for investment in agriculture. There are plans to relocate an additional 150,000 people, most of whom are subsistence farmers who have been able, until now, to feed their families without receiving government or foreign aid over the last twenty years. (Wibberley, 2011; Oakland Inst. 2012, open letter to US President Obama).

Created in 1959, the African Forestry Wildlife Commission (AFWC) is one of six Regional Forestry Commissions established by FAO to provide a policy and technical forum for countries to discuss and address forest issues on a regional basis. It meets every two years. Nasi & van Vliet (2011) have measured wildlife populations in logging concessions in central Africa in order to monitor and evaluate their biodiversity impacts. The Nyika-Vwaza Trust affords habitat and wildlife protection not only within Malawi but across the border into Zambia. National organisations play a vital role, such as the Wildlife & Environmental Society of Malawi (WESM), as do civil society organisations that have become transnational such as the Green Belt Movement begun in 1977 in Kenya by the late Wangari Maathai (2006; 2007) – though she began with her own small tree nursery in 1974. Engaging local farmers and their management skills is absolutely key.

5. Extension

The principles for extension of tree planting adopted and field tested for four decades by the Green Belt Movement (GBM; Maathai, 2006) are listed in Table 2. GBM bases its work on the following values:- love for environment conservation; self and community empowerment; volunteerism; strong sense of belonging to a community of like-minded people; accountability, transparency, honesty. Groups are crucial (Kyamuwendo, Wibberley, 2011).

From the outset, the GBM tree-planting campaign was linked to food security and water harvesting at household level, civic education, advocacy, Green Belt safaris to gain inspiration from elsewhere, and Pan-African training workshops. Kenya has been well-supplied with information to help appropriate tree-planting there (Teel, 1984; Gammell, 1989). However, GBM results have been spectacular, with well over 30 million trees planted in Kenya alone - a triumph of rural forestation and reforestation. Rural employment has been created and environmental awareness raised. Individuals and communities have been inspired, empowered and mobilised. Biodiversity, a wider range of food crops and water catchments have been protected locally.

Table 2. The Ten-Step GBM Procedure for adoption of Tree-Planting

1. Dissemination of information to communities on tree-planting importance;
2. Facilitation of Group formation in communities;
3. Registration of Groups with GBM HQ;
4. Preparation of Tree Nursery sites by Groups;
5. Reporting monthly by Groups to GBM HQ;
6. Announcement by Groups to communities:-'seedlings ready', inviting interest to dig holes;
7. Checking of tree holes by Group members;
8. Issuing of tree seedlings to those who dug holes properly;
9. Verification of tree seedling survival by Group members, reporting to GBM HQ;
10. Second verification of seedling survival, and purchase of seedlings by GBM if successful.

Source: Maathai, 2006

Women have risen in status through their practice, associated increase in availability of agricultural tools, advocacy and networking via GBM. All this has led to extensive documentation and recognition of GBM internationally. Lessons learned by GBM include:- community felt needs must be addressed; participants must perceive the sense of this work; good leadership is vital; community motivation requires patience and commitment; short-term incentives help poor people to engage with it; both decision-makers and communities need to be reached simultaneously; GBM field staff must be keen observers; communities must understand the project objectives and own it; limited resources demand prioritisation; democratic administration and management is key. The Mission of GBM is '*to mobilise community consciousness for self-determination, equity, improved livelihood securities and environmental conservation using trees as the entry point*' (Maathai, 2006).

There are constraints in promoting tree-planting, such as the taboos on fruit tree planting in northern Ghana where some fear they will die once the trees planted start fruiting. However, there is real pride in tree planting too such that people will hardly destroy trees they have planted themselves. During long dry seasons, many fodder trees are browsed by livestock but few people plant them. Hay for dry season livestock feeding can be made from the foliage of a number of trees including *Bauhinia* species (Neats-foot in RSA) and a range of mulberry trees (*Morus spp*.).

There is a range of tropical leguminous trees and shrubs *Leucaena spp., Gliricidia spp.* ('Mother of Cocoa'), pigeon pea (*Cajanus cajan*) used for alley cropping. *Calliandra calothyrsus* is an excellent fodder tree candidate and also attracts bees for bee-keeping microenterprises (van Houten, 1998; Wambugu, 2002). The challenge is to scale up the use of such species (Wambugu *et al,* 2001). All steps to plant more trees merit consideration since too many households depend on selling charcoal thus further depleting existing tree cover. Adoption of fuel-saving stoves (www.fourthway.co.uk) needs to go alongside tree-planting. These can save as much as 70% of woodfuel compared with typical cooking on three stones.

6. Systems

An agro-ecological approach in which trees, field crops and livestock are integrated is vital for the secure future of farming systems, and for their sustainable intensification (Koohafkan et al, 2011; Wibberley, Turner, 2012). It has long been known that forest resources can improve agriculture (Adeyoju, 1975). Lack of trees leads to farmers using their maize and other stalks as firewood instead of as mulch, which is crucial in conservation farming (Oldreive, 1993; Kassam, 2011). Agroforestry has been practised in various forms for many years (Douglas, Hart,1980; Barnard, 1990). It has been especially advocated for dryland areas (Rocheleau *et al,* 1988) and for soil conservation (Young, 1989; 2010). Carr (2002) charts the limited spread of agroforestry in Malawi, although it is part of the answer to greater soil degradation as population pressure increases in a context where most families lack capital for both yield-enhancing inputs such as fertilisers and for enough of their own animals to produce manures. *Faidherbia albida* is proving successful in Zambia, interplanted at 100 trees per hectare when it can fix up to 300 kg N/hectare (Aagaard, 2011). Its great advantage is that it sheds its leaves at the onset of rains to enrich the soil also removing their shading effect from the associated annual crop. Results can be spectacular with paradoxically greater crop growth under the trees than away from them! Furthermore, its pods and leaves are protein-rich for livestock feeding.

Secure tenure is an important prerequisite for sustainable forest management (Fortmann, Riddell, 1985). More diversified tenure systems could provide a basis for improving forest management and local livelihoods, particularly where the State has insufficient capacity to manage forests. In the past decade many countries have initiated efforts to reform their tenure arrangements for forests and forest land, devolving some degree of access and management from the State to others, mainly households, private companies and communities.

The Forest Stewardship Council (FSC) website (www.foreststewardshipcouncil.org) informs that it "is a global, not-for-profit organisation dedicated to the promotion of responsible forest management worldwide, founded in California in 1990. FSC enables businesses and consumers to make informed choices about the forest products they buy, and creates positive change by engaging the power of market dynamics. FSC facilitates the development of standards, ensures monitoring of certified operations and protects the FSC trademark so consumers can choose products that come from well managed forests. Members include some of the world's leading environmental NGOs (e.g.WWF), businesses (Tetra Pak and Mondi plc) and social organisations (e.g. The National Aboriginal Forestry Association of Canada), as well as forest owners and managers, processing companies and campaigners, and individuals. Together these diverse voices define best practices for forestry to address social and environmental issues. The membership consensus sets the FSC Principles and Criteria - the highest standards of forest management which are environmentally appropriate, socially beneficial and economically viable (Table 3). This diversity is FSC's strength

and to make sure no one viewpoint dominates the others, its membership has three chambers – environmental, social and economic – that have equal voices in decision-making, with both global North and South sub-chambers. Rainforest desperately needs protection internationally (HRH The Prince of Wales; McMahon, 2009) including Africa's Congo Basin treasury (Maathai, 2009).

Table 3. FSC Certification, Rules & Guidance

Ten FSC Principles require the forest owner or manager to do the following:
1. Comply with all laws, regulations, treaties, conventions, agreements, & all FSC Criteria;
2. Define, document and legally establish long-term tenure and use rights;
3. Identify and uphold indigenous peoples' rights of ownership and use of land and resources;
4. Maintain or enhance forest workers' and local communities' socio-economic well-being;
5. Maintain or enhance long term economic, social & environmental benefits from the forest;
6. Maintain or restore the ecosystem, its biodiversity, resources and landscapes;
7. Have a management plan, implemented, monitored and documented;
8. Monitoring and assessing to demonstrate progress towards management objectives;
9. Maintain or enhance high conservation value forests & attributes which define such forests;
10. Plan and manage plantations in accordance with FSC Principles and Criteria.

Environmentally appropriate forest management ensures that the harvest of timber and non-timber products maintains the forest's biodiversity, productivity, and ecological processes. Socially beneficial forest management helps both local people and society at large to enjoy long-term benefits and also provides strong incentives to local people to sustain the forest resources and adhere to long-term management plans. Economically viable forest management means that forest operations are structured and managed so as to be sufficiently profitable, without generating financial profit at the expense of the forest resource, the ecosystem, or affected communities. The tension between the need to generate adequate financial returns and the principles of responsible forest operations can be reduced through efforts to market the full range of forest products and services for their best value."

7. Discussion

That trees and forests need management is beyond doubt **(**Blyth *et al*, 1987). Plantations have their place (Evans, 1982) and coppicing can provide regular harvests (Macpherson, 1995). Community forestry can engage all ages of people both in new communal plantations and in managing indigenous ancient forests (Sjöholm, 1989). The human dimensions of deforestation need better understanding and action (Sponsel *et al*, 1996; Scales, 2012). While forest protection is imperative as are reduced emissions from deforestation and desertification (REDD), exclusion of indigenous people from forests for the benefit of tourism and extractive business elites is a travesty. Long-term sustainable management and public enjoyment of forests cannot be attained unless indigenous populations and their livelihoods are recognised and mobilised to care (Ogana, 1990; Thomas, Wibberley, 2001). Those who plant their own trees tend to care for them. The work of the Green Belt Movement is an inspiration (Maathai, 2006). Key factors in the evaluation of afforestation are summarised by SWOT analysis (Strengths; Weaknesses; Opportunities; Threats) in Table 4.

Table 4. Forest SWOT Analysis: some key points

STRENGTHS
• Productive – multiple and diverse products
• Protective – multiple benefits from local to global significance
WEAKNESSES
• Ties up land a long time, so softwood monocultures are too often planted
• Takes some years to reach maturity, especially in cooler areas
OPPORTUNITIES
• Integrated systems – agroforestry, silvo-pastoralism
• Adding value – high value items, tourism, ecosystem payments (REDD etc.)
• Investment for steady profit and environmental gain
THREATS
• Mechanised logging penetration rapidly and deeply into forests
• Cheap 'land grab' leases and sales to foreigners
• Deforestation for annual cropping or ranching feedlots

8. Recommendations

Based on experience of rural community development and field extension work in Africa, it is proposed that fourteen points integrate to promote tree progress for sub-Saharan Africa (Table 5).

Table 5. Proposals for Tree and Forest Promotion

• Teach Bible heritage basis	• Plant/retain riverbank trees
• Lift Environment awareness	• Promote Bee-keeping
• Promote Tree Nurseries	• Livestock control/housing
• Encourage 2-trees/house	• Best home & village competitions
• Promote use of tree guards	• Junior Conservation Clubs
• Fuel-efficient stoves	• Environment Care Groups
• Add value to forest produce	• Churches as Demonstration points

Responses following practical workshops facilitated by the author in four villages in Malawi in 2012 are shown in Table 6. Participants were asked to identify what they had learned or been reminded about during the workshop, with whom they would share this, and what they would do during the next six months with the resources that they control or influence. This is an approach followed internationally by the author with farmers over the past four decades at the conclusion of practical workshops.

Table 6. Responses to Practical Tree Management Workshops

MCHIZANJALA ('Healing Hunger'): What have you learned/been reminded about? 18 attendees (60% male) • Trees in the Bible (14) • Caring for Trees (14) • Sustainability of Life • Uses of Trees (4) • Use of bamboo as water-pipe or gutter	**MCHIZANJALA**: What will you do in next 6 months? • Teach how to plant & start a Tree Nursery • Start a Tree Nursery & sell seedlings (2) • Plant trees on eroded/erodible land • Expand Conservation Farming • Use tree guards • Build a fuel-saving stove • Help form FARMS Groups • Raise chickens & use their manure to make compost & 'ring' trees against termites
KONGWE ('Cold'): What have you learned/been reminded about? 25 attendees (70% male) - 2 funerals • Why it is bad to destroy trees • Benefits and values of trees • Manure can also come from trees • Fuel-saving stoves • Importance of livestock care • Environment Care goes with spiritual life • Don't cultivate up to riverbanks • Raised livestock house can be home-made • Leucaena is animal feed (<25% ration) • Bees & Trees benefit each other • Avoid cows & goats eating plastic	**KONGWE**: What will you do in next 6 months? • Plant trees : 10 – 25 each (12 people) • Plant 10 different kinds of tree • Establish a tree nursery (2) • Establish a Conservation Farming plot • Make a fuel-saving stove (5) • Teach how to make fuel saving stoves • Incorporate tree work in Farmers' Group
KASITU: What have you learned/been reminded about? 44 attendees (55% male, including 8 Chiefs) plus children & others • Uses of trees • How to care for trees • Goodness of fuel-saving stoves • God made us responsible to care • It is good to promote bee-keeping • Recommendations are possible to do • How to care for soil • Animal care and disease reduction	**KASITU**: What will you do in next 6 months? • Build proper housing for goats (7) • Start a tree nursery (20) • Do mulching and Conservation Farming (9) • Make a fuel-saving stove (9) • Establish a personal forest • Establish a Community Forest • Make tree guards (12) • Plant trees either side of the river (5) • Promote & start bee-keeping (20) – firstly in Kumi Lanjujhi village ('Ten Bees')
CHILEKA ('To leave'): What have you learned/been reminded about? 20 attendees (60% male); 2 funerals; • How to care for and protect trees • Spirit of working together • Agroforestry • Trees give us oxygen • How to care for animals • Trees give us food for all • Trees purify air of carbon dioxide • God wants us to care, not destroy creation • Managing trees and animals • Conservation farming • Benefits of fuel-saving stoves • Do not cultivate up to riverbanks	**CHILEKA** : What will you do in next 6 months? • Continue/expand conservation farming (7) • Plant 1 papaya and 1 mango (15) • Dry and preserve mangoes (6) • Make a fuel-saving stove (10) • Plant 20 trees (10 fruit/10 fodder) • Keep pigs in a proper pen • Share with existing farmer groups

Source: Malawi 2012

9. Conclusions

Trees and forests, their planting and protection offer a unifying focus for sustainable rural development. Both locally and globally they link to communal well-being – the Biblical 'tree of life'. Reversal of the alarming scale of tree removal is urgent in many places, especially in sub-Saharan Africa. Integral management involving trees is vital for genuinely sustainable intensification for the rising global population's food security. A global policy framework for forest stewardship must be rigorously applied by each nation. However, only by engaging indigenous people and integrating tree care within their livelihoods can progress be attained.

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