RWANDA TECHNICAL NOTES
TREES HEALING A NATION

Tony Rinaudo

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Introduction

« And the leaves of the tree (of life) are for the healing of the nations »
- Revelation 22:2

Rwanda has emerged as a world leader in innovative approaches to forest protection and reforestation. In 2011, Rwanda was awarded the Future Policy Award by the UN Food and Agriculture Organization for having the world’s most inspiring and innovative forest policy. It is only one of three countries in Central and Western Africa to achieve a major reversal in the trend of declining forest cover and is well on course to achieving its goal of 30% forest cover of total land area by the year 2020.

Rose Mukankomeje is one of five individuals from around the world honored (April, 2013) with the Forest Heroes Award by the UN Food and Agriculture Organization for their efforts to sustain, protect and manage this vital natural resource, and inspire positive change. Rose developed Umuganda – a community project in which everyone goes one day a month to clean up the environment and plant trees. It is a unique home-grown solution that ensures that the growth of forests in Rwanda supports livelihoods and benefits the rural poor.

“After the genocide we tried to find ways to bring people together, to prepare nurseries, to plant trees… this is our way of healing,” said Rose, adding that this showed that, even after conflict and genocide, people can come back together and work with each other.

Rose Mukankomeje took the initiative to bring Rwandans together to protect their natural resources and, in the process, restore communities devastated by conflict. Rose, a biologist by training, has devoted her life to the protection and restoration of Rwandan forests. She is currently Director General of the Rwandan Environment Management Authority (REMA).

The Rwanda Government’s very positive attitude towards environmental issues and its favourable policy environment (see Annex 1) also provide a strong foundation for the promotion and rapid adoption of Farmer Managed Natural Regeneration (FMNR).

Much progress has been made in less than two years since the inception of the FMNR Rwanda project. The project targets areas in the Eastern Province which are subject to recurring drought, have economic development issues and a high rate of poverty.

As a result of project interventions momentum for FMNR adoption is growing. Individuals and communities are beginning to appreciate the impact of losing their indigenous tree species. The loss of traditional medicines, lack of fodder and fuel wood and high impact of climate change are now seen as being directly related to loss of indigenous tree species. Even though the program has only been going for less than 12 months, farmers are benefiting from the return of fruiting species, increased fodder,
honey and fuel wood. Some farmers are using pruned branches and leaves to make compost. After pruning they have discovered a fertile soil under branches. Valuable and rare species such as sandalwood are regenerating and habitat for wildlife is being restored.

Two of the main issues being tackled by the FMNR project are:

- Indigenous trees not being valued
- Low number of remaining tree stumps in the landscape

The project is tackling both issues head on:

- Biases against indigenous trees are being tackled through community consultation and awareness creation, production and distribution of booklets and workshops. 1853 community members were mobilized for FMNR by Extension agents, through Community Based organizations (Farmers Cooperatives and associations), Local Government structures, Church structures, etc. Four FMNR Community events were organized and over 800 Community members, Local Leaders, Government institutions participated.
- Remaining living tree stumps are being identified and pruned by communities and FMNR is being supplemented by planting nursery raised seedlings, by direct sowing of seed in fields and by planting cuttings of tree species which can be propagated vegetatively.

Having tasted the benefits of FMNR, communities are keen to expand the area regenerated. The project is advocating for access to government managed and protected lake perimeters and hills. These sites could be greatly enhanced through FMNR while providing environmental services and economic materials (sustainably harvested wood, fodder, medicines, fruit, edible leaves and honey).

Project outputs to date include:

- The project has established a network of volunteer Extension Agents to facilitate the adoption of FMNR. 85 Community members (32 Women and 53 Men), selected by their counterparts from 22 Farmers associations, benefited from the “Training of Trainers” sessions.
- 22 Community Based Organizations have established their own local FMNR demonstration site through which the wider community is being reached.
- Three Environment Clubs in three Schools have been formed.
- 40 Community Hygiene Clubs (CHC) Leaders have received a “Training of Trainers” on FMNR and CHCs have taken on the task of implementing and promoting FMNR in their districts.
- 207,229 seedlings including agro-forestry and indigenous species have been raised in community managed nurseries.
- FMNR has been implemented on over 49 hectares of farmland and non-cultivated, mostly communal lands.
- A National network of FMNR Champions was established.
- Advocacy on indigenous tree species by the FMNR Project though extension agents and FMNR champions has resulted in a high demand of indigenous tree seedlings.
- FMNR is being mainstreamed in all WV/Rwanda Area Development Programs.

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Community members have become passionate practitioners and advocates of FMNR after experiencing benefits including indigenous fruits, traditional medicines, fodder and fuel wood, even within the first year.
Background

In terms of FMNR promotion, Rwanda offers a few unique challenges and opportunities.

Challenges include:

- A long history of forest clearing for agriculture, going back to between 700 BC and 1500 AD
- Very high population density (Av. 408 people/ Sq. Km.; 500 in the Bugesera target area) and high levels of poverty put intense pressure on land and natural resources.
- Total natural forest destruction in the target area, usually involving removal of tree stumps. Very small landholding size and intense pressure on land to generate food and income.

Policies focussed on intensification of agriculture including farm collectivization, mechanization, subsidized promotion of fertilizers, marshland reclamation (Annex 2) and preference for fast growing exotic tree species. Such policies, if not handled well can be detrimental to promoting FMNR.

- Deforestation and poor farming methods (Annex 3) resulting in land degradation, erosion and declining soil fertility.
- Bush and pasture burning practices.
- Overgrazing
- Hunting

Whereas Bugesera was Rwanda’s bread basket in the 1960’s, massive deforestation has contributed to lower and more irregular rainfall patterns, low grain production, soil erosion and lack of grazing land. Drought and famine have become common.

Opportunities include:

- Rwanda’s 2020 vision which includes a target of 20% forest cover
- Government recognition of the environment as a pillar of sustainable development. Government direction, leadership and enforcement is strong.
- General awareness of the importance of healthy environment for development and livelihoods (Annex 4).
- Good local leadership and influence of lead farmers as FMNR champions
- Existing group structures
- Potential of women and children as powerful advocates for environmental sustainability.
- Agricultural extension services
- Rich expertise of collaboration partner, the World Agroforestry Centre.
- Wide range of biodiversity to choose from to fill various functions (Annex 5)
Participants in the Bugesera FMNR workshop grasped the significance and potential of FMNR quickly.

Recommendations:

1. Begin community consultation meetings, group formation and / or capacity building, training, exchange visits to existing FMNR sites.

2. Clarify what the legal status of peoples’ access to regenerated and planted trees is and take appropriate action. i.e. If people already have ownership or user rights to trees, publicise it so that there will be maximum incentive to practice FMNR. If they do not have these rights, advocate to government to acquire them.

3. Invest time in training local FMNR champions and ensure that the FMNR project manager is able to visit the ADP and field sites regularly for monitoring, encouragement, timely trouble shooting and correction.

4. Work closely with government departments (Natural resources, agriculture, forestry) building their awareness and knowledge of FMNR, demonstrating how FMNR can help the government to reach their goals and advocating for the nationwide adoption of FMNR on farm, grazing and forest land.

5. Collaborate with ICRAF with on farm research to introduce Faidherbia albida (Annex 5) to farmland and waste land, and to demonstrate and promote direct sowing methods (Annex 6) and planting of large cuttings of suitable species such as Glyricidia and Vernonia.

6. Work with children, women’s groups, faith based groups, environmental groups and other concerned stakeholder groups to promote and adopt FMNR.
7. In the medium term, facilitate timber and non timber forest products market development (Annex 4).

8. Many existing plantation forests and farm trees are performing very poorly and are wastefully utilized. a) Where possible, work with government to allow community forest management arrangements1; b) consider providing farmers with professional farm and forest tree management training through ICRAF, or the Master Tree Growers course2.

9. Current charcoal making methods are very inefficient and wasteful. Investigate availability of efficient kilns and training opportunities in Rwanda or the East Africa region.

The Way forward

The Bugesera target area has potential for FMNR implementation on both farmland and wasteland. Even though the density of live tree stumps is relatively low, there are enough stumps and diversity of tree species to start with and make a significant impact. With supplementary activities described below, restoration of farmland and establishment of bio-diverse, productive agroforestry and small forest plots will be possible. It should be noted that while FMNR has been primarily focussed on indigenous species, it is not restricted to any class of trees and shrubs.

FMNR on farmland

Farmers fear that allowing trees to grow on fields will depress crop yields. However, with selection of crop ‘friendly’ species, thinning and pruning, crop yields in West Africa have doubled through FMNR.

1 L. Rinaudo (2012), Restoring a forest
2 http://www.beyondsubsistence.org.au/
Contributory factors include: increased fertility through increased organic matter deposition and in some cases, nitrogen fixation; attraction of birds and livestock resulting in deposition of manure and urine; and reduced wind speeds and temperatures.

FMNR is in fact not an entirely new concept in Rwanda. It is already practiced in one form or another, for example in eucalyptus tree (coppice\(^3\)) management and therefore, should not be difficult to promote. The main change required is for communities and individuals to start recognizing and valuing indigenous species.

Possible objections to adopting FMNR on farmland

Farm collectivisation and mechanization. When government programs group small farm plots together and introduce mechanization, tree stumps may be removed. This should not stop farmers from practicing FMNR before collectivisation occurs because benefits can be gained even within the first year. Additionally, any stumps occurring in straight rows, or on the contour on steep land should be left as they will not interfere with cultivation.

Exotic trees with fast growth rates are preferred. Around the world, it is a commonly held belief that exotic trees are better than indigenous trees and that they grow faster, even though measurements have rarely been made. In fact indigenous trees growing from mature tree stumps often outperform exotic trees grown from seedlings, and survival rates of FMNR trees which are in the order of 100% are

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\(^3\) Coppicing is a traditional method of woodland management which takes advantage of the fact that many trees make new growth from the stump or roots if cut down. In a coppiced wood, young tree stems are repeatedly cut down to near ground level. In subsequent growth years, many new shoots will emerge, and, after a number of years the coppiced tree, or stool, is ready to be harvested, and the cycle begins again.
far superior to that of planted seedlings. Indigenous trees may appear to grow slowly because stems are continuously browsed and harvested.

Theft can never be fully halted, but through project activities such as all-stakeholder consultation, capacity building, working through champions and farmers (or other) groups and with government support, it can be minimized.

Deliberate burning of crop residues, grazing land and forests is a direct threat to FMNR. Through education and capacity building, FMNR practitioners in other countries have greatly minimized tree loss through fire damage.

**FMNR on ‘Wasteland’**

There are numerous pockets of degraded farmland in Bugesera. Some are temporarily taken out of production while fertility is restored through natural processes, while others appear to be permanently abandoned.

**Strategy for restoration of wasteland:**

- Slash lantana bushes (Annex 7) before seed ripening, and lay branches and leaves on bare ground to provide mulch covering that increases water infiltration and retention and facilitates germination of existing grass and tree seeds.
- Practice FMNR on any existing re-sprouting tree stumps.
- Dig compost pits (zai holes) and direct sow preferred tree species such as Faiherbia albida.

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4 Zai is a micro-catchment technique. Zai holes are small pits (typically 30 cm by 15 cm deep) which provide a place for rainwater to collect and small amounts of manure or crop residue to be added in order to improve soil fertility. The improved soil moisture and fertility have allowed farmers to restore their degraded farmland by planting trees and crops such as sorghum and millet in the zai holes they have dug.
- Plant large cuttings of suitable species such as vernonia and glyricidia.

- Access ICRAF expertise and seed of nitrogen fixing species such as tithonia, lab lab bean, leucaena, glyricidia, etc.

- Provide participants with bean seed and allow them to cultivate between planted and regenerating trees. In East Sumba (Indonesia), communities are assisted in this way, making them highly motivated by the short term benefits to protect and care for the emerging trees. In this way, the trees are afforded extra protection and benefit from cultivation which aerates the soil and eliminates weed competition.

As an extra incentive to care for trees, and in order to obtain short term benefits, farmers in East Sumba (Indonesia) Sumba plant beans inbetween planted trees.
Annexes

The practice of FMNR is impacted by and impacts all development sectors that World Vision is involved in from food security to health and therefore FMNR has potential to greatly improve child wellbeing outcomes. Some of the following annexes directly relate to FMNR eg. Forest policy, while others are more indirect as they relate to land management.

Annex 1. Excerpts from National Forestry Policy May 2010

Forests cover a total area of 330,576 ha of which 215,739 ha are natural and 114,837 ha are forest plantations. Additionally small wood lots (< 0.5ha ) and agroforestry trees represent approximately 222,520 ha equivalent to conventional forests. Thus the total area of national forest cover is 553,098 ha or 21% of total country area. Natural forests occur on 8% of total country area against 13% for manmade forest (2010 figures). Extractive utilisation of natural forests is prohibited.

The Forestry sector is playing key roles in supporting the livelihood of all Rwandans especially by providing most of the energy consumed by the population, controlling soil erosion and protecting water catchments and supplying other goods and ecological services. A study on the charcoal trade showed that the commercialisation of charcoal alone contributed USD 2.6 billions (BEST 2008) representing 5% of the GDP. This study did not include the value wood used in the building industry or for firewood or timber. Despite all this, the forestry sector has not been given an opportunity to express its full economic potential, Rwanda is still importing all industrially processed forest products from abroad and in many areas, soil erosion constitutes a major threat.

The Vision 2020 and EDPRS set clear target to increase national forest cover and for the forestry sector to play an increasing role in the national economy. However, due to high population density (387 inhabitants/km2 in 2009), farming land per household is shrinking and there is a high competition for land between forestry, agriculture and other developmental activities. Moreover, national economic growth requires more energy leading sometimes to over exploitation of national forest resources. All these impact negatively on our pace towards orientation and targets set in the Vision 2020 and EDPRS and require revision of the 2004 national forestry policy for specifically addressing following issues:

- Increasing competition for land between forestry and other developmental activities
- Poor management of manmade forest compromising a sustained yield
- Low private investment in the creation of forest resources, in value addition and diversification of forest products.
- Existence of over mature and degraded forests
- High dependence on importation of industrially processed forest products.

Forests are a key component of the life-support system in view of both the products and services they provide. This is particularly so in Rwanda where forests protect watersheds, thus making agriculture viable, and meet the energy needs of the bulk of the population. Furthermore, forests generate direct monetary income for households, public entities and the country in general. Forests contributed up to 80% of total energy needed in 2007 (Wood fuel, 57%, Charcoal, 23%).

In addition to wood fuel, Rwandans use wood for building material and for furniture, it is assumed that each Rwandan consumes annually 1.1 m3 of local forest products (MINITERE 2004). All natural forests are protected, they host a rich biodiversity, serve as the backbone of the tourism industry and support invaluable ecological functions such as water and soil protection.
Forestry contribution to vision 2020

This policy is put in place in order to enhance achievement of objectives and targets of the Vision 2020. This is broadly, about improvement of livelihoods of Rwandans through job employment creation, increased forest revenues, value addition, more balanced ecological benefits and a sustained yield. Specifically, this policy aims at ensuring that present forest cover is first over all maintained, well managed and increased to 30% of country total area by 2020.

Vision

Through sound management, our forest resources will play increased roles in our economy and biodiversity conservation; current benefits from forests enjoyed by actual generations will be enhanced to ensure that the well being of future generations is not compromised. Increase of forest cover, high value addition to forest products and rational utilisation of forests will contribute to balanced development through economic growth and promotion of ecological values.

Objectives

The overall goal of this policy is to make the forestry sector one of the bedrocks of the economy and national ecological balance for sustainable benefits to all segments of the society. The specific objectives of this forestry policy are to:

- Encourage the participation of private sector to invest in the forest sector for poverty reduction, employment creation and improvement of livelihood through sustainable use, conservation and management of forests and trees;
- Contribute to sustainable land use through soil, water and biodiversity conservation, and tree planting through the sustainable management of forests and trees;
- Strengthen the participation of communities and other stakeholders in forest management to conserve water catchment areas, forest biodiversity and ensure sustainability of the forest sector;
- Promote farm forestry to produce timber, wood fuel and to supply wood and non-wood forest products;
- Promote forest extension to enable farmers and other forest stakeholders to benefit from forest management approaches and technologies; and
- Promote forest research, training and education to ensure a vibrant forest sector.

Excessive and indiscriminate cutting of forests:

Wood is the main source of energy for most Rwandans (96%) and industries. Demand is increasing in concert with growing human population. Forest harvesting is poorly done and law enforcement is more of an exception than the rule. The two features lead to overexploitation, resulting in excessive soil erosion. It is estimated that Rwanda loses 945,200 tonnes of organic material, 41,210 tonnes of nitrogen, 280 tonnes of phosphorus and 3 tonnes of potassium each year through soil erosion, which lowers agricultural productivity and is a threat to food security;

Charcoal making

One of the most obvious benefits of forests and woodlands is the provision of energy for heating and cooking in the form of charcoal. Charcoal making uses traditional kilns, which are common because of the low capital required. But they are not efficient and result in severe degradation of forest resources.
The demand for charcoal in urban areas is contributing to the pressures on forests. Charcoal making to supply Kigali has resulted in the disappearance of the shrubby savannahs and gallery-forests in Bugesera. Over 50,000 ha of woody savannas were registered in 1983, dropping to less than 10,000 ha by 1988 (MINAGRI 1988).

Annex 2. Raised bed farming (Chinampa)

Rwanda has 278,536 hectares of marshland. Needing to feed a large and growing population, the Government of Rwanda has started a program of marsh drainage to reclaim land for agriculture. Drainage will cause downstream problems of pollution and increased flooding in the wet season and drought during the dry season as the marshes lose their filtering, buffering and flood mitigation functions. One possible solution to help meet growing population needs for land while maintaining the functionality of marshes is the system of raised bed farming developed by the Aztecs called Chinampa. Raised bed farming helps farmers cope with the unpredictable and wildly fluctuating weather conditions. Crops grown on the raised beds are irrigated naturally through capillary action from the water channels through the garden beds. Because the beds are raised, they are not subject to flooding during wet periods.

Large areas of marshland could be utilised in an environmentally responsible way to make a significant contribution to food security

5 Crossley P. The Chinampas of Mexico
Benefits of raised beds include:

- Reduces the susceptibility of farmers to adverse financial and climatic events
- Reduces the risk of total crop failure
- Reduces the amount of water needed to grow crops
- Enables crops that use water more efficiently than rice to be incorporated into a rice-based cropping system
- Enables crops to be rotated to limit the build up of weeds, pests, and diseases

6 Werner L. (1994) *The chinampa system: marshland magic of the Aztecs*
Enables the inclusion of legumes to increase the availability of nitrogen to crops
Enables the inclusion of fodder plants so that livestock can be included into the system
Enables the inclusion of multi-purpose perennials (including trees and shrubs) that provide farmers with a range of useful products
Improves the quantity and nutritional value of the food produced.
Reduces the necessity to practice destructive slash and burn (shifting) agriculture
Helps create new farmland from marshes while minimizing environmental damage.

Annex 3. FMNR and Conservation agriculture.

Most agricultural soils in Bugesera district are depleted of organic matter and therefore are infertile and prone to erosion and degradation. Low organic matter content reduces soil water holding capacity and hence, crops are affected by drought more readily. While FMNR increases soil organic matter, FMNR in combination with Conservation Agriculture will have a much greater impact.

From slash and burn to slash and mulch

It is very difficult for farmers who have been burning grasslands and crop residues all their lives to suddenly stop burning. There are a number of practical reasons why farmers do burn – on agricultural land burning removes weeds, clearing the way for ploughing and it destroys pathogens and pests. On grassland, burning gives a transitory burst of green growth. Burning is also a tool to flush out wildlife for hunting. However, the long term consequences of regular burning include biodiversity loss, reduced soil fertility, increased erosion and water runoff and eventual abandonment of the land. See attachment above on the ‘Slash and Mulch agroforestry’ system.

Annex 4. FMNR and Economic Development

The practice of FMNR in some countries has led to increased income even from the first to second year after adoption. In Niger Republic for example, farmers earn an estimated additional $200 per year from wood, wild foods, traditional medicines and increased crop yields. FMNR helps to build a communities’ natural assets.

Markets can be facilitated through such measures as:

- formally registering FMNR Farmer Groups and individuals with the forestry service;
- exploring opportunities to add value to timber and non timber forest products through milling, craft items, small furniture and tool handle manufacture and packaging of products such as honey, traditional medicines and wild harvest fruits.
- establishing a Central Wood and non timber forest product market and link linking timber growers with wholesalers and negotiating better prices;

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Community based forest management in various African countries has resulted in tourism opportunities, value adding and packaging of cosmetics and wild foods and fair trade sale of craft items.

Organized wood markets in Africa have made it possible for farmers to have better market access and to receive better prices.

Non-timber forest products are commonly found in the following categories: plants used in traditional human and veterinary medicine, fodder, honey and melliferous plants, fruits, tree seeds, essential oils, handicraft material, mushrooms, ornamental plants, game and fish and ecotourism.
Annex 5. Biodiversity

This annex lists just four out of dozens of perennial species already available. Trees and other perennial species can be planted or regenerated to advantage on farmland but also can be used to turn so called wasteland and underutilized hills into useful land.

Traditionally, perennial species have not figured prominently on cultivated land, in fact it is practically a universal global practice to remove them from farmland. Yet they have enormous potential to greatly enhance resilience to environmental shocks such as drought and insect attack while providing food, fodder and environmental services such as reduced wind speeds and temperatures which in turn contribute to increased annual crop yields.

**Vernonia** is indigenous to Bugesera and is widespread on farmland. It grows quickly and has multiple uses including medicinal applications for humans and livestock, and fuel wood. Vernonia produces a lot of biomass which can be used for mulch and for increasing soil fertility.

Vernonia can be planted from cuttings and should be promoted on farmland and wasteland.

**Osyris lanceolata**⁹ is the African Sandalwood¹⁰, used for its scented wood and to extract essential oil. The wood is over-exploited in parts of its range despite legal protection. Propagation techniques of this valuable species should be tested. It may involve first planting host trees before sowing sandalwood seed.

**Faidherbia albida** is an extremely valuable indigenous species yet it was not observed on farmland during two field visits in Nyamata ADP, Bugesera District. In West Africa, crops growing under a canopy of this nitrogen fixing tree produce an extra 2.5 – 3 tons of stalks per hectare and two and a half times the grain (equating to an extra 1,200 – 1,500 tons of grain) with three times the protein content, compared to crops growing in the open. Twenty five trees per hectare provide a full fodder ration for one to one and a half sheep per year. This is three times the optimal stocking rate for the Sahel. The high protein seed pods are called sheep biscuits in Ghana. The trees also host cattle egret and many other predators of insects, helping to protect crops against pests. An adult egret for example eats 30-50 locusts per day.

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The trees are unusual in that they shed their leaves during the rainy season when crops need maximum sunlight and bear leaves in the dry season when livestock and soils need protection from the strong sun and wind.

The trees are slow growing at first but once their deep tap root hits the water table they are one of the fastest growing trees in Africa. After treatment, seeds can be direct sown in fields.

**Recommendations:**

- Promote farmer exposure visits to stimulate interest in F. albida as a simple and cheap means of increasing soil fertility, crop yields, livestock productivity and farm tree cover.

- Promote direct sowing F. albida seeds in farmland and wasteland sites.

**Glyricidia sepium**, a nitrogen fixing multi-purpose tree is widely used in the tropics and subtropics for land restoration, building soil fertility, fencing, fodder and fuel wood. It can be propagated by seed or by planting large cuttings.

**Glyricidia fence in Praibakul, East Sumba (Indonesia)**

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11 [http://www.tropicalforages.info/key/Forages/Media/Html/Glyricidia_sepium.htm](http://www.tropicalforages.info/key/Forages/Media/Html/Glyricidia_sepium.htm)
Annex 6. Direct sowing of tree seeds

Some FMNR pilot sites may have areas of bare ground with no obvious capacity for natural regeneration. On such sites, experiment with direct sowing of seeds. There are a number of excellent ‘pioneer’ species, both exotic and indigenous, which could be trialled. Examples include Leucaena and Acacia species which produce prolific volumes of viable seed which can be collected for free. Generally, pioneer species grow quickly on difficult sites and create more favourable growth conditions for other species which may have greater economic value. There are numerous articles on the web on direct sowing of seeds which can be used as guides but obviously need to be adapted to actual conditions in Rwanda.


Weed invasion is often an indication of disturbance of natural environments. This is certainly the case in many parts of Rwanda where soils have become degraded through deforestation and damaging agricultural practices. Lantana camara is frequently found on such disturbed and degraded sites and is considered a serious weed problem. However, lantana does make some very positive contributions to local ecology. The dense bushes colonize bare low-nutrient soils, reducing soil erosion and building up soil organic carbon stocks. If managed well, lantana can not only become a useful tool in land restoration, it has several possible commercial benefits as well.

**Lantana camara** is an invasive species and has covered large areas in Rwanda and other countries. It colonizes new areas when its seeds are dispersed by birds. Once it reaches an area, *L. camara* spreads quickly. It coppices so well, that efforts to eradicate it have completely failed. It is resistant to fire, and quickly grows in and colonizes burnt areas. It has become a serious obstacle to the natural regeneration of important native species including in some countries. Other uses include Biogas and compost.

Other weed species observed included (Siam Weed) and *Tithonia diversifolia* (Mexican sunflower).

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12 R. Hall (1991) Direct sowing trees and shrubs
13 http://en.wikipedia.org/wiki/Lantana_camara
14 FAO, Invasive Pest Fact Sheet: Lantana Camara
These weed species can also be viewed as an asset. They colonize disturbed sites, reducing erosion and generating massive volumes of organic matter and recycle nutrients back into the soil. If managed through a slash and mulch regime, they can become strong allies in soil and forest restoration. Mulching with plant organic matter has been shown to reduce nematode population densities in various cropping systems. The level of nematode control is increased when such mulches are incorporated into the soil as organic amendments. Currently, farmers deal with weeds by burning them. But burning destroys much of the potential benefits. Weeds can be turned into an asset. By slashing them before seed set, and using them as mulch, the soil will be covered and protected from sun and rain, organic matter and vital nutrients will be returned to the soil, soil temperatures will be reduced, rainfall infiltration and retention into the soil will be increased and emerging weeds will be shaded out.

*Tithonia diversifolia* has been used for a wide variety of purposes around the world, including fuel, compost, land demarcation, soil erosion control, building materials and shelter for poultry. *Tithonia diversifolia* is commonly used as a fodder for ruminants and rabbits, which can eat the leaves, soft branches and even the flowers and its potential has been tested in pigs and poultry.

*Tithonia diversifolia* produces a nutrient-rich biomass and its use as an effective source of biomass for annual crops has been reported for rice and maize in Africa. Its abundance and adaptability coupled with its rapid growth rate and very high vegetative matter turnover makes it a candidate species for soil rejuvenation and improvement, as a green manure or as a major component of compost manure. Dried *Tithonia* plants should be preferably left to decompose on the field rather than burned. Yields of kale, French beans, tomatoes and Napier grass all increased when these crops were planted with *Tithonia diversifolia*. It has also a positive effect on crop yields when used in intercropping.
About the author

Tony, or ‘chief’ as he is known in the Program Research & Advisory team, is involved in the development and promotion of agricultural-forestry-pastoral systems across a range of environments. Tony previously spent 18 years in Niger managing a long-term agricultural development program. The natural-regeneration reforestation methods Tony developed were adopted by farmers and contributed to over five million hectares of land being revegetated in Niger alone. Tony was also instrumental in introducing edible seeded Australian acacias into Nigerien farming systems and in their promotion as a human food.

Tony’s specialist areas are de/reforestation, desertification, sustainable farming and food production. Tony is currently engaged primarily in promoting reforestation internationally and facilitating ongoing research and development of edible seeded Australian Acacias.
For more information:
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