



Policy Brief

No. 52, 2020

Trees on Farms for Enhancing Biodiversity and Food Security in Rwanda

Summary of benefits of trees on farms

- Trees on farms (TonF) improve agricultural systems towards food security and generate income through products and services (e.g. fuelwood, timber, poles, stakes, fodder, fruits, improving soil fertility, erosion control) while protecting the environmental biodiversity, mitigating and adapting climate change issues.
- Rwanda aims to maintain biodiversity by increasing protected areas from 10.1 to 10.3%. Specifically, tree cover has increased by 30.4%, of which trees on farms will contribute up to 85% by 2020 (GoR, 2012).

Key policy recommendations on Trees on Farms

1. The necessity of producing a standalone integrated agroforestry policy and quick harmonization of agroforestry implementation plans and actions is paramount. It is recommended to seek how to operationalize the recent produced agroforestry (AF) strategy (2018) by establishing the coordination for implementing and guiding the agroforestry interventions within different land use systems. The Ministry of environment is hosting agroforestry but as a cross-cutting institution, the Ministry of Agriculture and Animal Resources plays a key role in coordinating mechanisms as well as in elaborating monitoring and evaluation framework.
2. It is recommended to integrate agroforestry extension into existing agriculture extension approaches (FFS and Twigire Muhinzi) within Crop Intensification Programme (CIP).
3. There is a need for increasing awareness on TonF products, benefits and services along value chains by supporting the capacity building of stakeholders through promotion of public private partnership (PPP) and use of communication channels while involving gender balance and youth as cross-cutting issues.
4. The agroforestry extension materials and guidelines adapted to all tree-based land use systems in a local (Kinyarwanda) and English languages, and should be produced and disseminated to farmers and extension agencies. The contents of extension materials and guidelines will be adapted to each category of audience (extension agencies and farmers).
5. Linkages and partnerships between national and international actors involved in TonF should be strengthened for creating strong financing mechanisms and support research programme on trees on farms. Research on TonF should be enhanced by inventory and document sources of quality germplasm/ tree planting materials for both indigenous and exotic species. Therefore Tree Seed Centre (TSC) should be equipped for quality control and has to benefit research infrastructures for producing seeds and trees planting materials.

Background

Over 43 percent (43%) of all global agricultural land now has greater than 10 percent tree cover which represents over 2 billion hectares of land and engages more than 900 million of people (Zomer et al., 2014). Particularly, major increase has been made in tree cover on agricultural lands in many parts of the tropics, including Rwanda. In the context of biodiversity for food security, agriculture, forestry and fishing encompass over two-thirds of the population for income generation and food security (BIOFIN, 2017). Agriculture sector accounts approximately one-third of Rwanda's GDP with more than 80% of the total population that are practicing agriculture farming systems (NISR, 2018). Ecosystems offer a wide range of benefits and opportunities for local and national economic development, improved livelihoods and provision of environmental goods and services that vary on scale from the Albertine Rift in the West to the savannah lake and swamp systems of the Akagera region in the East¹ (GoR, 2011). Biodiversity for food security integrates crops, livestock and trees to support agriculture as the main source of employment, income and improved livelihood in rural areas (Ndayambaje, 2016).

¹Rwanda biodiversity policy (2011)

²Institut des sciences Agronomiques au Rwanda (SAR)

³ICRAF (World Agroforestry Centre)

The country's heavy dependence to its rich biodiversity causes a continuous deterioration of landscape potential and loss of ecosystem function such converting natural and other forests into farming and grazing lands, timber or charcoal production, mining exploitation, decreasing/drying of water bodies and their plant and animal species (GoR, 2016; Ndayambaje, 2016).

Agroforestry refers to land-use systems and technologies in which woody perennials (trees, shrubs, fruits, bamboos, etc.) are integrated with crops and livestock on the same land management unit (ICRAF, 2017; FAO, 2015). It refers to trees both in farming systems (agroforestry) and forestry/woodlots that follow the ecological variation leading to Rwandan six land use systems (Mukuralinda et al., 2016) in the Figure 1 or 12 different agro-ecological zones (Delepierre, 1974). The concept of agroforestry (AF) has been introduced and promoted in Rwanda since immemorial time known as traditional agroforestry but as science, it was introduced and promoted in Rwanda at least past 40 years through research programs or projects, government and externally funded projects, and non-governmental organizations (NGOs). Important interventions on trees on farms have been made by ISAR² (current Rwanda Agriculture and Animal Resources Development Board, RAB) and its major partner ICRAF.³ These have offset the issue of intensive forest exploitation and pressure

reduction of converting protected forest to agriculture lands, and contribute to social, environmental, biodiversity and economic benefits, particularly for wellbeing of smallholder farmers.

However, the country is still facing severe imbalance between wood or tree supply and demand to meet the three goals of raising land productivity; reducing the vulnerability of agricultural systems to climate change; and reducing greenhouse gas emissions. The targeted national tree coverage of restoring 2 million hectares (76% of total potential land area on AF) with TonF is far more to be reached due to numerous challenges grouped into three categories (MINILAF, 2018): those related to regulatory and

legal aspects, to extension and value chain development, and to limited resources for research and development.

The main issue is proved by a wide variation in the level of adoption of trees on farms at landscape scale from one area to another (see Figure 2 as an example with poor AF systems) which can be attributed to lack of skills and knowledge, policy tools, capital investment and implementation plan. Further, the ability of smallholder farmers to promote agriculture production systems integrated to agroforestry, is hindered by insufficient access to quality inputs, inadequate storage, lack of channels to sell their farm produce, and limited access to suitable financial services.

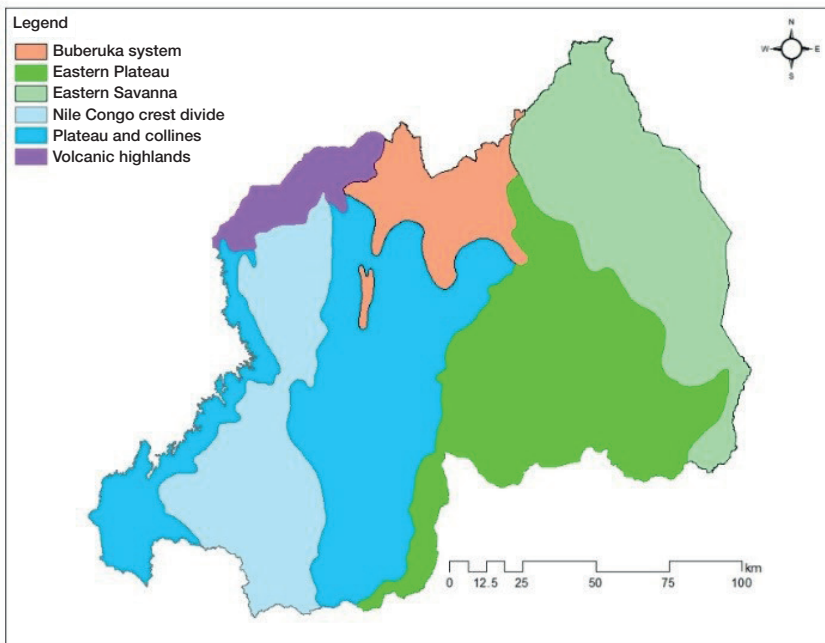


Figure 1: Land use systems identified by Mukuralinda et al. (2016): Buberuka highland, Eastern plateau, Eastern savanna, Congo-Nile crest, Plateau and collines, and Volcanic highland.



Figure 2: Example of poor tree-based systems in terraced land at Nyabihu district
Photo by: Jules Rutebuka

Policy review of agroforestry in Rwanda

The government of Rwanda acknowledges the national and international policy and regulatory framework particularly aligning to the contribution of trees on farms in biodiversity restoration. Several national and international policy tools have been adopted to foster an acceleration in tree-based system while increasing/diversifying their incomes and boosting crop yields. These tools put agroforestry on the forefront to increase agricultural production, reduce soil erosion and nutrient depletion, provide suitable wood fuel while preserving natural forests and enhanced the restoration of degraded landscapes.

National policy tools include:

- Vision 2020 (GoR, 2012) and its new version 2050 in which agroforestry is emphasized to cover 85% of agricultural land.
- The Economic Development and Poverty Reduction Strategy 2 (EDPRS2) and its forthcoming EDPRS 3 which recognize agroforestry as environmental cross-cutting issue.
- Strategic Plan for the Transformation of Agricultural in Rwanda (PSTA II, III and PSTA IV) which integrates agroforestry into farming systems
- National Biodiversity Strategy and Action Plan (NBSAP) (GoR, 2016) aiming to restore and conserve the national biodiversity by 2040.
- Recent National Agroforestry and Action plan (2018-2027) which involve six thematic areas (creating policy and institutional framework, innovative research and knowledge, strengthening communication and extension, marketing of agroforestry products and empowering human capital-women and youth).

Objective

The policy brief intends to highlight important gaps affecting poor adoption of trees on farms and provides key recommendations for sustainable management of biodiversity particularly integration of trees into agricultural farming systems while improving biodiversity, mitigating and adapting the climate change issues, and generating

Overview of agroforestry systems in Rwanda

Heterogeneous tree-based ecosystems are present depending on different agro-ecological zones (12) (Iiyama et al., 2018) and tree-based land use systems (6) (Mukuralinda et al., 2016).

They provide several set of ecosystem goods and services to meet locally-specific smallholders' needs. Rwanda's

- Climate Resilience National Strategy for Climate Change and Low Carbon Development
- Forest Sector Strategic Plan (2017-2021).
- National Forest Law (2013).
- New National Forestry Policy (2018).
- Land policy, Environment policy and Land use laws and New Forest Sector Strategic Plan 2018-2024 (FSSP 2018-2024).
- Forest Investment Plan (FIP) guarantees sustainable utilization of natural resources and the protection of vital ecosystems for present and future generations.

The main international policy frameworks recognizing agroforestry include the UN Convention on Biological Diversity (CBD) for sustainable ecosystem management, Biodiversity Finance Initiative (BIOFIN) for generating finance solutions to biodiversity, Convention to Combat Desertification (UNCCD) for restoring degraded lands, United Nations Framework Convention on Climate Change (UNFCCC) for reducing emissions through agroforestry, Sustainable Development Goals (SDGs) which acknowledges agroforestry in restoring the ecosystems, the Bonn Challenge which is a global restoration goal to bring 150 million ha of lands into restoration by 2020 and 350 million ha by 2030, and the African Landscape Restoration Initiative (AFR100) aiming to cover 100 million hectares of deforested and degraded landscapes. Rwanda is committed to these international and regional obligations for sustainable biodiversity conservation, including regeneration and restoration of forest and agroforestry ecosystems with both native and exotic tree species.

incomes. Relevant recommendations are formulated in line with the recent agroforestry strategy (2018) and other existing policy instruments that capture the promotion of TonF in Rwanda. This will offer the current information status that would help policy makers to sustainably take actions in promoting trees on farms at different land use systems.

sloping topography has an effect to diverse ecological conditions within very small geographical areas on small and fragmented agriculture land. The major and common agroforestry systems are: Farm woodlots, Contour hedgerows, Scattered trees in crop fields, Home gardens and Boundary-planted trees as illustrated in the Figure 3.

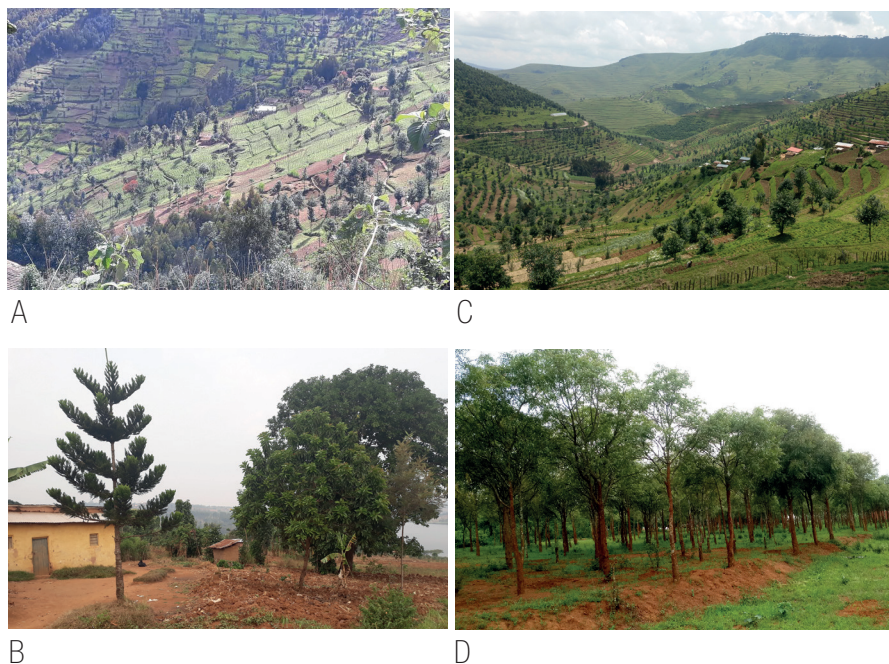


Figure 3. Example of agroforestry systems in: (A) scattered trees in crop fields, (B), home gardens, (C) trees in contour or bench terraced plots, and (D) and farm woodlots. Photos by: Jules Rutebuka

Key recommendations

The key recommendations for promoting TonF are grouped into three categories: Policy and regulatory framework;

Extension network and value chain development; and Research and capacity building development, and financing.

Policy and regulatory framework

1. Develop a new policy specifically supporting trees on farms (TonF) or agroforestry systems (AF) in Rwanda because many agriculture, forestry and environmental policies tend to support segregated rather than holistic and integrated AF systems. It should not be hidden under other national policies particularly in the agriculture and environment sectors (NAP, PSTA, NEP, NST, Forest policy, etc). This recommended new policy would clearly formulate how cross-institutional collaboration and legislation will be organized in promoting AF systems.
2. Operationalize the national agroforestry strategy (2018) by establishing the national platform to coordinate and enhance synergies and support systems (such as seed systems, nurseries, applied research, and extension services) among concerning institutions. This requires mapping all actors that involve in agroforestry such as RAB, ICRAF, MINALOC, NGOs, Civil society, NAEF, UR, CBOs, Districts and others by demonstrating the roles of each institution and elaborate how the leading agency under the Ministry of Environment (MoE) will coordinate.
3. Formulate the implementation plans and guidelines lining to AF strategy and action plan and basing on six tree-based land use systems (Figure 2) to be incorporated into the existing national extension agenda (CIP/TWIGIRE MUHINZI). These will create a strong harmonization and synchronization of plans across institutions in order to establish clear coordination mechanisms and a well elaborated monitoring and evaluation (M&E) framework. Guidelines should clarify a range of suitable species at specific land types and environment conditions to effectively integrate trees into agricultural landscapes.
4. Develop agroforestry master plans for effective scale-up of agroforestry at decentralized entities (District) helping to identify hotspot areas and prioritize the interventions. Currently, interventions in AF at district level are conducted with no guidance, just arbitrarily depending on the subjective choices of extensionists, and grassroot organizations in place.
5. Consider gender balance and equity and involve youth as cross-cutting priorities in promoting and disseminating agroforestry technologies, particularly women are more efficient in the implementation of trees in the home gardens. Women and youth should be involved at all levels such as designers, planners, implementers and evaluators of agroforestry policy decisions and programmes.

TonF extension network and value chain development

1. Induce the efficiency and effectiveness of extension services in the implementation and scaling up of agroforestry activities through more-vibrant partnerships between research and development agencies in line with TonF.
2. Integrate agroforestry into existing agriculture extension approaches such as Farmer Field Schools (FFS) and TWIGIRE MUHINZI extension models. This requires to integrate trees on farms in the Crop Intensification Programme (CIP) for effective dissemination. It is advisable to promote the demand-driven extension services at local decentralized levels (district and sectors) for TonF. With the help of participatory approaches, local communities should identify, implement and evaluate their own priorities for tree growing, which will generate more reliable research and extension agendas than using top-down approaches.
3. Increase awareness of agroforestry products and services through several communication channels such as promotion of market information and educational programs in the media (radio and TV) and schools.
4. Establishment of community demonstration plots lead by farmer promoters in strong collaboration with extensionist and researchers while enforcing the supply of seeds and seedling in rural communities. It requires to provide high quality agroforestry and fruit tree planting materials by establishing sustainable, decentralized seedling supply systems through promotion of public private partnership (PPP) in the development of fruit tree value chains and value addition and nutrition. Private sector, farmers (entrepreneurs) and their cooperatives will be sensitized to participate in seed production.
5. Produce and disseminate to farmers and extension agencies the agroforestry extension materials and guidelines adapted to all tree-based land use systems in local language (Kinyarwanda) and English. The contents should be adapted to each category of audience (extension agencies and farmers).

The new project “Trees on Farms for Biodiversity Conservation” aims to improve management of biodiversity in agriculture sector through integration of trees into farming systems. It is targeting to tackle most of suggested recommendations from three identified categories particularly preparation of TonF manuals for the extension systems; supporting research and policy with the knowledge, evidence and tools; and foster linkages to a range of funding and investment options through partnership with local, regional and international agencies.

The existing Trees for Food Security project is also aiming to improve food security for smallholder livelihoods through the widespread adoption of appropriate locally adapted agroforestry practices in key agricultural landscapes of Rwanda. Another on-going project entitled “Reversing Land Degradation in Rwanda by Scaling-up evergreen Agriculture” is tackling several aspects of TonF by improving livelihoods, food security and resilience to climate change by smallholder farmers in Africa and restore ecosystem services, particularly through evergreen agriculture.

Research and human capacity development, and financing

1. Emphasize and advocate the relevance of trees on farms in financing mechanisms proposed under the Biodiversity Conservation Fund to implement the national Biodiversity Strategy and Action Plan (NBSAP). All interventions in agricultural development and climate change adaptation as well as mitigation should involve the promotion of agroforestry systems through initiation of external payment schemes such as payments of environmental services (PES) and carbon funds. NBSAP is visioning to restore and conserve the national biodiversity by 2040 for contributing to economic prosperity and human well-being among five others. Its relevant objective in line with TonF is to restore degraded ecosystems and maintain equilibrium among biological communities targeting sustainable management of agriculture farming systems.
2. Agroforestry adoption can be enhanced with support of earmarked budgets allocated to decentralized entities for identifying and upscaling locally suitable agroforestry systems, rather than giving to individual consultants or experts.
3. Establish and strengthen linkages and partnerships within national and international organizations that can improve domestic/international financing and coordination for better implementation of research programme in agroforestry. The multinational organizations and international research centres should support government in developing researchers and scientists in the field of agroforestry technology development.

4. Build the capacity of extension staffs, technicians and lead farmers on TonF technology and their uses through formal trainings and exchange visits under support of government institutions in partnership with ICRAF-Rwanda.
5. Promote research on diversified agroforestry by inventory and document sources of quality germplasm/tree planting materials for both indigenous and exotic species adapted to each tree-based land use system. New tree species to be introduced should be compatible, non-competitive with crops and non-shading; have tap roots and the ability to be used as stakes; and according to many of the very small farmers, should produce fruit and (fuel) wood simultaneously.
6. Conduct a baseline assessment for inventory and analysis of agroforestry models and technologies adopted in Rwanda. This will cover the nationwide agroforestry landscape by identifying the gaps in AF practices and value chain development that can assist in coping strategies for directing the agroforestry investments.

Conclusion

Agroforestry has been widely promoted in Rwanda on agricultural lands for smallholder farmers by government institutions, research and development projects (governments or external funded) International Centre Research in Agroforestry and non-governmental organizations. Its low level of adoption can be improved by implementing the key recommendations proposed in this policy brief. The latter suggests the possible key recommendations within the context of policy and regulation tools; extension network through several

communication channels and value chain development; and research and capacity building development and financing. It also illustrated the current situation of the AF systems by providing information on previous works that have been done so far and raise the challenges to overcome towards sustainable management of biodiversity (Trees on Farms, improving food security and environment protection). A clear setup of coordination mechanism is required to organize how cross-institutional collaboration can function in promoting agroforestry systems.

References

- BIOFIN, 2017. Biodiversity finance policy and institutional review. Rwanda Biodiversity Finance Initiative in partnership with Rwanda Environment Management Authority (REMA) and UNDP.
- Delepierre, 1974. Les régions agricoles du Rwanda. Note technique No. 13. Rubona, Rwanda.
- FAO (2015). Agroforestry. <http://www.fao.org/forestry/agroforestry/80338/en/> (accessed 06/05/2018).
- GoR, 2011. Rwanda biodiversity policy. Ministry of Natural resources in partnership with REMA.
- GoR, 2012. Rwanda Vision 2020 revised in 2012. Republic of Rwanda.
- GoR, 2016. National biodiversity strategy and action plan. Ministry of natural resources in partnership with UNEP and GEF. https://www.worldagroforestry.org/sites/default/files/users/admin/Strategy%20Report_2017.pdf (accessed 06/05/2018).
- ICRAF (2017) Corporate Strategy 2017-2026. Transforming lives and landscapes with trees.
- Iiyama, M., Mukuralinda, A., Ndayambaje, J.D., Musana, B., Ndoli, A., Mowo, J.G., Garrity, D., Ling, S., Ruganzu, V., 2018. Tree-Based Ecosystem Approaches (TBEAs) as multi-functional land management strategies-evidence from Rwanda. *Sustain.* 10.
- MINILAF, 2018. National Agroforestry Strategy and Action Plan 2018-2027. Ministry of Lands and Forestry (MINILAF).
- Mosquera-Losada, M.R., Santiago-Freijanes, J.J., Moreno, G., Den Herder, M., Aldrey, J.A., Rois-Díaz, M., Ferreira-Domínguez, N., Pantera, A., Rigueiro-Rodríguez, A., 2018. Agroforestry definition and practices for policy makers. 4th European Agroforestry Conference – Agroforestry as Sustainable Land Use.
- Mukuralinda, A., Ndayambaje, J. D., Iiyama, M., Ndoli, A., Musana, B. S., Garrity, D., and Stephen Ling, S., 2016. Taking to Scale Tree-Based Systems in Rwanda to Enhance Food Security, Restore Degraded Land, Improve Resilience to Climate Change and Sequester Carbon. PROFOR, Washington D.C.

References continued

Ndayambaje J.D., 2016. The State of Rwanda's Biodiversity for Food and Agriculture. FAO Country reports.

Ndayambaje, J. D., Heijman, W. J. M., Mohren, G. M. J., 2013. Farm woodlots in rural Rwanda: purposes and determinants. *Agrofor. Syst.* 87, 797–814.

Zomer, R., Trabucco A, Coe, R., Place, F., van Noordwijk, M., Xu, J., 2014. Trees on farms: an update and reanalysis of agroforestry's global extent and socio-ecological characteristics.

Citation

Rutebuka J, Hingorani S, Ntawuhiganayo B E, Mukuralinda A. 2020. Trees on Farms for Enhancing Biodiversity and Food Security in Rwanda. Policy Brief No 52. Nairobi, Kenya. World Agroforestry.



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Layout by IUCN
Cover photo by Jules Rutebuka